QUESTION PAPERS FOR END TERM THEORY EXAMINATIONS
MAY-2025

B.Tech, B.Tech (Evening), B.Design,
2nd, 4th , 6th & 8th SEMESTER

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SEMESTER- 2nd & 4th

B.Tech.

END TERM EXAMINATION ***May-2025***

AEC-1/FEC-16 APPRICIATION OF FICTION

Time: 2:00 Hour **Max. Marks: 50**

Note: All questions carry equal marks.
All questions are compulsory.
Assume suitable missing data, if any.

Q.1 What do you understand by fiction ? Explain different genres of fiction in detail. [10] [CO1] [BTL 2]

Q.2 Discuss the main theme of the novella "The man who died" by D.H. Lawrence. [10] [CO4] [BTL 3]

Q.3 "Literature is the mirror of society". Do you agree or not? Defend your answer with a suitable example. [10][CO5][BTL 6]

Q.4 Write a character sketch on **Any One** of following: [10] [CO3] [BTL 4]
A. Gerasim
B. Jesus Christ

Q.5 Write a short-note on the following: [5+5] [CO2] [BTL 1]
A. D.H. Lawrence
B. Leo Tolstoy

Total no. of pages: 03 *Roll No.....*

End Term Exam **Apr 2025 Even** **Time: 2 Hour**

Course Code: AEC 2 /FEC15 **Max. Marks: 50**

Course Title: Appreciation of Poetry and Prose

Note: Attempt any *Five*. Each question carries 10 marks.

Q1. RTC: **10M [CO1,2][L3]**

Call the roller of big cigars,
The muscular one, and bid him whip
In kitchen cups concupiscent curds.
Let the wenches dawdle in such dress
As they are used to wear, and let the boys
Bring flowers in last month's newspapers.

1. What's the occasion in the above lines? Mention any two words that suggests so. 3M
2. Identify the figure of speech in expression, "cups concupiscent curds' 1M
3. Identify the poem and the poet. 2 M
4. How does poem reflect 'contradictions' of the modern world? 3M
5. Name the country to which poet belongs. 1M

Q2. a Poetry can serve as a sensitive tool in remembering the departed. Comment in reference to the poem, "Last Words to a Dumb Friend," What does the writer suggest about memory and its role in mourning? (60-70 words) ***5M[CO 1,3][L4]***

b. Discuss (central Idea) any other poem from the syllabus that dwells on the similar subject of remembering the dead one. (60-70 words) ***5 M[CO1,5][L4]***

Q3. a) In the essay "The Two Races of Men", which two races are being referred to? Did the author cite any exception to the rule? (60 words)
5M [CO1,3][L2,3]

Q3. b) Is Charles Lamb's essay still relevant in today's time? Justify in 60 words.
5M [CO 1,5][L2]

Q4. a) In the light of the poem "My Last Duchess", discuss the position of a married woman in Victorian era nobility. (60-70 words) **5M**

Q4. b) RTC **5 M[CO2,4][L5]**

Somehow—I know not how—as if she ranked
My gift of a nine-hundred-years-old name
With anybody's gift. Who'd stoop to blame
This sort of trifling?

1. Who is "she" in the above lines? 1M
2. Identify the author and his/her country. 2M
3. What information do you get about the speaker in above lines. Mention in 30 words. 2 M

Q5.RTC **10M [CO 2,4][L3,L5]**

The moth having righted himself now lay most decently and uncomplainingly composed. O yes, he seemed to say, death is stronger than I am.

1. Comment on the significance of the Moth against life forces in above lines in 40-45 words. 3M
2. Identify the figure of speech in line, "O yes, he seemed to say, death is stronger than I am." 1M
3. Name the author and the country he/she belongs to. 2M
4. The essay crystallises the essence of the modern era. Do you agree? (40 words). 2M

5. What information do you get about the author from the essay. Mention any two. 2 M

Q6. a) "Literature mirrors the society"—Comment in light of any two texts from the syllabus. (60 words) **5M[CO1,5][L2,4]**

Q6. b) Mention any one author/poet from the syllabus with whose works you may identify. Cite reason for your choice. (60 words)
5M [CO 1,5][L1,5]

Total No. of Pages: 01 *Roll No.....*

2nd/4th Semester

B.Tech

End-Term Examination **May-2025**

AEC3/FEC 14 Appreciation of Short Stories

Time: 2 hours **Total Marks: 50**

Note: All questions are compulsory

1. Elucidate the debate between Paganism and Christianity as portrayed in Dylan Thomas' "The Enemies." (10 marks) (BTL3) (CO2)

2. Present critical review of "Wet Saturday." (10 marks) (BTL5) (CO 4)

3. Which one character do you praise the most from the stories prescribed in the syllabus? Give valid reasons for the same. (10 marks) (BTL1) (CO 1)

4. Describe various symbols used in "In Another Country." (10 marks) (BTL1) (CO 1)

5. Critically evaluate the Story "The Use of force."

   Or

   Analyse the character of Mr. Martin.

   (10 marks) (BTL5) (CO 1, 2, 4)

5

Total No. of Pages - 2

Roll no.....

II & IV SEMESTER

B.Tech

END SEMESTER EXAMINATION **MAY 2025**

COURSE CODE: AEC 4/FEC12

COURSE TITLE: BUSINESS COMMUNICATION AND PRESENTATION SKILLS

Time: 2 Hours *Max. Marks: 50*

Note: Attempt any 5 questions.
Assume suitable missing data, if any.

Q1At Sunshine Ltd, a new manager, Riya, notices that her team's project reports often miss key details. Instead of harshly pointing out mistakes in public meetings, she schedules one-on-one feedback sessions. During these sessions, Riya praises the team's effort first, then clearly highlights areas for improvement, and suggests practical ways to enhance their reports. Over time, team performance improves significantly, and employee morale remains high because they feel respected and supported.

Question:

How did Riya's approach to constructive criticism helped in improving the team performance and what key principles of constructive criticism can be identified from her actions? **(10 Marks)**(CO 1) (BTL 2,4)

Q2. What key qualities should a presenter possess to deliver an impactful and engaging presentation, and how can these qualities influence the audience's reception of the message? **(10 Marks)** (CO 2) (BTL 2)

Q3. At a team meeting at Alpha Ltd, some members dominated the discussion while others stayed silent. The team leader then introduced a rule for everyone to speak in turn, which led to more ideas being shared and a more balanced conversation.

Question:

How did the change in the group discussion approach help improve participation and communication? **(10 Marks)** (CO 3) (BTL 3,5)

6

Q4. During an interview for a senior role at Global Tech Ltd. the interviewer asked Arjun about a mistake he made in his previous job. Instead of avoiding the question or getting defensive, Arjun calmly acknowledged the mistake, explained how he handled it, and discussed the improvements made afterward. His honesty and solution-oriented approach impressed the panel.

Question:

How can you handle tough or tricky questions in an interview like Arjun did, and why is it important to remain calm and solution-focused?

(10 Marks)(CO 4) (BTL 5)

Q5. What are the key elements to include when preparing a resume, and how can you ensure it effectively highlights your skills, experience, and qualifications to potential employers? **(10 Marks)(CO 4) (BTL 2,5)**

Q6. What are communication inhibitions in a professional setting, and how can individuals overcome these barriers to ensure effective workplace communication? Illustrate your answer with examples. **(10 Marks) (CO 1, BTL 2, 3)**

Total no. of Pages: 1

Roll no.....

4th Semester
B.Tech.

END TERM EXAMINATION
AEC 5/FEC10 COMMUNICATION SKILLS
May. 2025

Time: 3.00 Hours
Max. Marks: 50

Note: Answer any five questions as directed.
All questions carry equal marks.
Assume suitable missing data, if any.

1. Define communication as a cyclic process. Explain its major components. (CO1) (BTL 1, 2) 10

2. Discuss the major barriers to communication. (CO2) (BTL 2)10

3. Write a note on Language; technology and communication. (CO1) (BTL 1)10

4. Present the phonemic transcription of any five of the following words: (CO 3) (BTL 3)10
Distraction, Abundance, Table, Character, Humanity, Go, Truth, Pencil, Queen, Symbol

5. Distinguish between group discussion and debate. (CO3) (BTL 3) 10

6. Explain the major types of writing with example. (CO4) (BTL 4) 10

7. Discuss *Animal Farm* as a political allegory. (CO5) (BTL 5)10

Total no. of Pages: 2

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8

END TERM EXAMINATION-2025

COURSE CODE: AEC-6/ FEC-53

COURSE TITLE: COMMUNICATIVE HINDI

Time: 03:00 Hours

Max. Marks: 50

Q.1 निम्नलिखित मुहावरों में मिलान कीजिए (Match the following) [5][CO-3]

a)	अंगारे बरसाना-	Apple of one's eyes
b)	आंख का तारा-	to add fuel to the fire
c)	नौ दो ग्यारह होना-	feeling very hot
d)	किताबी कीड़ा होना-	to run away
e)	आज में घी डालना-	to be a bookworm

Q.2 अपना परिचय दीजिए। (Write your introduction in 5 lines in hindi) [5][CO-3]

Q.3 विलोम शब्द लिखिए (Write the antonyms) [5][CO-4]

a) दिन-

b) सुबह-

c) मीठा-

d) नया-

e) अमीर-

Q.4 Identify and write the स्वर (vowel) out of the following: [5][CO-1]

a) व, ल, अ, च

b) न, आ, क, ग

c) च, छ, ऊ, र

d) प, ई, ज, न

e) फ, घ, ए, स

Q.5 मां और बेटे का संवाद लिखिए (Write a conversation between a mother and a son) [5][CO-5]

Roll no.....

Total no. of Pages: 2

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END TERM EXAMINATION-2025

COURSE CODE: AEC-6/ FEC-53

COURSE TITLE: COMMUNICATIVE HINDI

Time: 03:00 Hours **Max. Marks: 50**

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a)	अंगारे बरसाना-	Apple of one's eyes
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c) मीठा-

d) नया-

e) अमीर-

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a) व, ल, अ, च

b) न, आ, क, ग

c) च, छ, ऊ, र

d) प, ई, ज, न

e) फ, घ, ए, स

Q.5 मां और बेटे का संवाद लिखिए (Write a conversation between a mother and a son) [5][CO-5]

Q.6 Write the names of the following fruits or vegetables in Hindi: [5][CO-1]

a) Apple
b) Pea
c) Banana
d) Potato
e) Mango

Q.7 रिक्त स्थानों की पूर्ति कीजिए। (Fill in the blanks) [5][CO-5]

a) महात्मा गांधी का पूरा _____ मोहनदास करमचंद गांधी था।
b) इनका _____ गुजरात में हुआ था।
c) महात्मा गांधी _____ और अहिंसा के पुजारी थे।
d) महात्मा गांधी ने _____ की पढ़ाई इंग्लैंड से की थी।
e) इन्हें भारत के _____ के नाम से जाना जाता है।

Help box- (सत्य, नाम, जन्म, राष्ट्रपिता, कानून)

Q.8 Write Hindi counting from 5 to 10. [5][CO-1]

Q.9 Write the names of the following colors in Hindi: [5][CO-2]

a) Red
b) Blue
c) Green
d) Yellow
e) Black

Q.10 Identify and write the correct season out of the following: [5][CO-2]

a)	दिन ।	बस ।	चाय ।	बसंत
b)	ग्रीष्म ।	गाय ।	केला ।	खाना
c)	थाली ।	वर्षा ।	दूध ।	राजा
d)	खीर ।	गीत ।	हेमंत ।	फल
e)	शीत ।	कान ।	बाल ।	माला

10.Der Professor spricht sehr schnell. _____ verstehen ihn nicht.

b)Bilden Sie Sätze? (form Sentences) CO3 (2)

a. Abend / trinke/ einen Tee/ gern/ ich/am.
b. Um / Klasse /die/ beginnt/8 Uhr.
c. Gern/ Auto/ fährt/ Tennis/ und/ Thomas/ spielt.
d. du/mich/treffen/ Abend/ / kannst/am.

) Ergänzen Sie die Präpositionen: (Fill the prepositions) CO4 (3)
mit, aus, für, bis, ohne, durch

1. Ich gehe _____ meiner Mutter in den Park.
2. Ich bekomme die Information ____ die Medien.
3. Ich kaufe ein Parfüm _____ meinen Bruder.
4. Wir fahren _____ dem Bus nach Jaipur.
5. Die Examen sind _____ elften Mai.
6. Ich lerne online. _____ das Internet können wir keine online Klassen haben.

0) Schreiben Sie 10 Sätze über Ihre Universität? CO5 (5)

oder

) Was machen Sie am Wochenende? Schreiben Sie 10 Sätze darüber?)

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Total No. of Pages 4 *Roll No. .....*

B.Tech MAY 2025

END SEMESTER EXAMINATION

AEC10/FEC40 : GERMAN

Time: 2:00 Hours *Maximum Marks : 50*

Note : Answer all the questions.
Assume suitable missing data, if any.

1) Lesen Sie den Text und markieren Sie die Sätze richtig oder falsch. CO3 (2)

Anjela Jolie ist Schauspielerin von Beruf. Sie kommt aus Los Angeles. Sie ist sehr schön und populär.Sie war verheiratet mit Brad Pit.Ihre Eltern heissen Jon Voight und Marcheline Bertrand. Sie hat einen Bruder. Er heisst James Haven.Er ist auch Schauspieler. Angelina wohnt in Kalifornien und hat sechs Kinder. Sie spricht Englisch und ein bisschen Französisch.Sie arbeitet auch für die United Nations.

Richtig Falsch

Angelina Jolie arbeitet in Filmen.
Ihr Bruder ist Arzt von Beruf.
Sie hat vier Kinder.
Sie spricht zwei Sprachen.

2a)Welche Sätze passen zusammen?Ordnen Sie sie zu. (Match the following sentences) CO3(5)

1. Wir wohnen in Nord Delhi.	a. ihre Qualität ist nicht gut.
2.Rolf, bist du Student an der DTU?	b. sein Name ist Peter Muller.
3. Mara arbeitet in einem Start-up	c. Wie heisst deine Abteilung
4. Die chinesischen Produkte sind billig, aber	d. sie findet ihre Arbeit interessant.
5.Heute kommt der neue Professor	e. unser Haus ist klein aber schön.

2b. Welches Wort passt nicht?(Which word does not fit here) CO2 (2)

1.Universität	Studenten– Lehrer – Flughafen – Projektor- Klasse
2.Produkte	gut – teuer - preiswert - heiss
3.Deutsch	langweilig – logisch - kalt - interessant
4. das Radio	hören – haben – spielen – kaufen

3)Ergänzen Sie die geeigneten Verben in der richtigen Form. CO3(6)
danken, sehen, helfen, treffen, schmecken,haben

1. **Ich finde die Adresse nicht.Kannst du mir _____ ?**
2. **Ich _____ meine Freundin im Cafe.**
3. **Wann _____ wir das Engifest.**
4. **Das Essen in der Kantine _____ mir nicht.**
5. **Wir_____ Ihnen für die Hilfe.**
6. **Können wir heute abend einen Film _____?**

4)Ergänzen Sie W- Fragewörter? CO3 (5)
was, wie viel, wie viele, wen, wie .

a. **_____ sprechen Sie am Telefon?**
b. **_____ machen Sie am Abend?**
c. **_____ geht es Ihnen heute?**
d. **_____ kostet das neue Auto von Porsche?**
e. **_____ Studenten gibt es an der DTU?**

5)Übersetzen Sie ins Englische? (Translate in English) CO4(5)

1. **Unsere Klasse ist im zweiten Stock.**
2. **Das Meeting beginnt um halb vier.**
3. **Unsere Universität hat eine gute Bibliothek.**
4. **Meine Schwester wohnt in der Schweiz.**
5. **Heute abend möchte ich einen Film sehen.**
6. **Darf ich den Direktor sprechen?**
7. **Morgen habe ich einenTest.Ich muss Deutsch lernen.**
8. **DTU hat einen grossen Parkplatz.**
9. **Am Mittwoch habe ich meinen Geburtstag.**
10. **Wie viel Uhr ist es?**

6)Lesen Sie den Text und beantworten Sie die folgenden Fragen? (Read the text and answer the following questions?) CO5(5)

Anna steht am Samstag um 8.00 Uhr auf. Zum Frühstück isst sie ein Butterbrot und trinkt Kaffee. Dann geht Anna einkaufen. Sie kauft Tomaten, Nudeln, Bananen, Milch und Orangensaft. Um 10.00 Uhr macht geht sie ins Fitnessstudio und trainiert sich. Mittags kocht Anna Nudeln mit Tomatensoße. Zum Mittagessen trinkt sie Orangensaft. Nachmittags trifft sich Anna mit ihren Freundinnen Maria und Monika. Sie trinkenTee in einem Café. Dann geht Anna nach Hause und arbeitet am Computer.Am Abend isst sie ein Käsebrot und trinkt ein Glas Milch Sie sieht sich im Fernsehen einen Film an. Um 22.00 Uhr ist Anna müde Sie geht ins Bett und schläft sofort ein.

1.Wann steht Anna am Samstag auf?
2: Was kauft Anna ein?
3.Was macht Anna um 10.00 Uhr?
4:Wen trifft Anna am Nachmittag?
5.Um wie viel Uhr geht Anna ins Bett?

7)Lesen Sie den Text und beantworten Sie die folgenden Fragen? (Read the text and answer the following questions?) CO5(5)

Paul Schumacher studiert an der Freiburg Universität. Von Montag bis Freitag hat er Klassen an der Universität und am Wochenende arbeitet er in einem Restaurant. Seine Hobbys sind Fussball spielen und Ski fahren. Seine Eltern wohnen in der Schweiz. Er hat zwei Schwestern. Seine ältere Schwester ist Lehrerin. Sie ist verheiratet und lebt in Amerika. Seine jungere Schwester wohnt noch bei den Eltern in Bern. Sie ist in der zehnten Klasse. Paul liebt seine Familie, aber er möchte in Deutschland leben und bei Siemens oder bei Bosch arbeiten.

1. Wo studiert Paul?
2. Welche Hobbys hat er?
3. Was ist seine ältere Schwester von Beruf?
4. Was macht er am Samstag?
5. Wo möchte er arbeiten?

8a)Ergänzen Sie die Pronomen: CO4 (5)
mich, wir,du, mir,uns, Ihnen, sie, er, ihn, Sie,dich

1. **1.Frau Martina, können _____ Deutsch sprechen?**
2. **Mara, kannst du _____ hören?**
3. **Martin, Wann gehst _____ zum Supermarkt?**
4. **Frau Olivia, Ich danke _____ für das Buch.**
5. **Meine Mutter ist Ingenieurin, aber _____ arbeitet nicht.**
6. **Der neue Professor kommt. _____ ist sehr intelligent.**
7. **Der Freund von Tina ist sehr freundlich.Wir mögen _____.**
8. **Paul, wo bist du? Ich sehe _____ nicht.**
9. **Es geht _____ sehr gut.**

Total no. of pages: 01 *Roll no.....*

B.Tech (II and IV Semester)

END TERM EXAMINATION **May 2025**

Course Code: FEC 11/AEC 11

Course Title: Soft Skills and Personality Development

Time: 2 hours **Max marks: 50**

Note: Answer all the questions. Assume suitable missing data, if any.

1. Write a short note on the following. **[CO1][BTL2][10]**
   a) What is goal setting? What are the major things required to achieve your goal? Explain with examples.
   b) Explain the KISS Rules.

2. What is the difference between empathy and compassion? Explain. **[CO2] [BTL3][10]**

3. Explain the following and tell their difference: **[CO3][BTL4][10]**
   Self Esteem, Self Awareness, Self Confidence and Self-Assessment

4. Give arguments for a G.D. on "how meditation and happiness help people to grow their personality." **[CO4][BTL5][10]**

5. Write a resume with a cover letter for applying in a famous startup as creative director. (Imagine details) **[CO5][BLT2] [10]**

Q.7 Find the correct word for days in Hiragana. [5][CO-2]

1. Monday

ⓐ げつようび ⓑ げつよび ⓒ けつようび ⓓ げつようひ

2. Wednesday

ⓐ すえようび ⓑすいようび ⓒ すいよび ⓓ せいようび

3. Thursday

ⓐ もくよび ⓑ もけようび ⓒ まくようび ⓓ もくようび

4. Friday

ⓐ けんようび ⓑ きんよび ⓒ きんようび ⓓ ぎんようび

5. Saturday

ⓐ とようび ⓑ どうよび ⓒ どうようび ⓓ どようび

Total No. of Pages:4 Roll no.....

II / IV SEMESTER

B.Tech.

ENDTERM EXAMINATION ***May -2025***

FEC-39/AEC-12 JAPANESE

Time: 2:00 Hour ***Max. Marks: 50***

Note: All questions are compulsory.

Q.1 Write the following words in Hiragana. [5][CO-1]

Example: nihon-にほん

(1) junbichuu

(2) kokkaigijidō

(3) chūshajō

(4) nyūjōken

(5) hijoubukuro

(6) zousengyou

(7) kyūkyūsha

(8) shugakuryoko

(9) dankyūsei

(10) chugakkou

Q.2 Write the following words in Katakana. [5][CO-1]

Example: aisu-アイス

(1) sukejurū

(2) ōtomēshon

(3) kyanpasu

(4) nyūyōku

(5) supōtsukurabu

(6) torēningu

(7) rapputoppu

(8) anaunsā

(9) daunrodo

(10) sūpāmaketto

Q.3 Write the following numbers in Hiragana. [10][CO-3]

Example: 25- にじゅうご

(1) 379
(2) 638
(3) 785
(4) 856
(5) 1347
(6) 1935
(7) 3776
(8) 8442
(9) 54321
(10) 93599

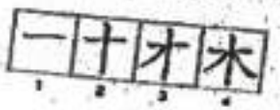
Q.4 Find the correct Katakana word for Country name. [5][CO-1]

(ロシア, ポルトガル, エジプト, アフリカ, スペイン, マレーシア, イタリア, ブラジル, トルコ, ベトナム)

(1) Spain
(2) Africa
(3) Egypt
(4) Brazil
(5) Vietnam
(6) Turkey
(7) Portugal
(8) Russia
(9) Italy
(10) Malaysia

Q.5 Write the Stoke order of following Kanjis. [10][CO-4]

Example: 木 (ki)



(1) 百 (hyaku)
(2) 水 (mizu)
(3) 金 (kin)
(4) 日 (nichi)
(5) 月 (gatsu)

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Q.6 *Fill-in-the-blanks with appropriate word in English related to Hiragana and Katakana.* *[10][CO-2]*

1. Hiragana script is primarily used for writing _____ words and grammar particles.
2. Katakana is commonly used for writing _____ words borrowed from other languages.
3. Hiragana is often used in children's books because it is _____ to read and write.
4. The Katakana character 'タ' represents the sound _____ in Japanese.
5. Japanese writing consists of three scripts: _____, _____, and _____.
6. The Hiragana character 'ん' represents a _____ sound and is unique because it can appear at the end of words.
7. The Katakana character 'モ' represents the sound _____ in Japanese.
8. Hiragana and Katakana both have the same number of basic characters: _____ in total.
9. The character 'ワ' in Katakana corresponds to _____ in Hiragana.
10. The Hiragana character 'は' is pronounced as _____ when used as a Subject or topic particle in a sentence.

Total No. of Pages: 1. Rollno.....

2ND/4TH SEMESTER

B.Tech/B.Des

END TERM EXAMINATION *May-2025*

COURSE CODE: AEC 18

COURSE TITLE: SPOKEN SKILLS IN ENGLISH

Time: 2:00 Hours *Max. Marks: 50*

Note: All questions are compulsory.
All questions carry equal marks.
Assume suitable missing data, if any.

Q1. Elucidate 4 types of barriers which hinder effective communication. [10][BT1][CO1]

Q2. Write a paragraph on Balancing Screen Time: Navigating the Digital Age. (450-500 words). [10][BT5,BT6][CO5]

Q3. Write a short note on the following-(i) Elements of communication cycle. [05][BT2][CO2]

(ii) Effective group discussion skills. [05][BT2][CO4]

Q4. Explain the 7 C's of communication. [10][BT1][CO2]

Q5. Write a CV of your dream job.(Assume the details). [10][BT5,BT6][CO3]

16

Total No. of Pages: 1 Roll no.....

2ND/4TH SEMESTER

B.Tech/B.Des

END TERM EXAMINATION May-2025

COURSE CODE: AEC 19

COURSE TITLE: Technical Communication

Time: 2:00 Hours *Max. Marks: 50*

Note:All questions are compulsory.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Write a short note on the following-
(i)Netiquettes. [05][CO2][BT2]
(ii)Effective group discussion skills. [05][CO4][BT2]

Q.2 Explain the 7 C's of communication. [10][CO1][BT1]

Q.3 Define the term interview. Explain any 4 types of interviews. [10][CO1][BT4]

Q.4 You are Emily/Eric,working for Google Inc.Write an inspection report on the suitability of the proposed venue for the company's Hackathon; (19 May, 2025,participants-aspiring IT Students).Suggest some recommendations if any. (Imagine the details). [10][C05][BT5,BT6]

Q.5 Write a minutes of meeting as per the following information-

You have been assigned as the Secretary for a Technical Workshop organized by your department. Write the minutes of the meeting held to plan the event. Include details such as the meeting date, time, attendees, key decisions made, tasks assigned, and the deadlines for each task. [10][C02][BT6]

Total no. of Pages:01 Roll no.....

II & IV SEMESTER

B.Des. B.Tech.

END TERM EXAMINATION *May2025*

FEC49/ACE20 Sketching & Rendering

Time: 02:00 Hours *Max. Marks: 50*

Note : Assume suitable missing data, if any.
Material: 02 A3 Drawing sheet.

Q.1 Sketch <u>ANY TWO</u> of the following human poses of it in line drawing with details:

a) Running (Racing)
b) Seated on bench
c) Standing, Leaning against the wall

[25 Marks][CO3,4][BTL3,4]

Q.2 Draw a detailed interior room using **one-point perspective**, incorporating light and shadow to enhance depth and detail.

<u>OR</u>

Create a detailed city scene in **two-point perspective**, featuring buildings, roads, street lamps, and trees, with light and shade to emphasize structure and atmosphere.

[25 Marks][CO5,6][BTL5,6]

Total no. of Pages: 2 Roll no.....

II/IV SEMESTER

B.Tech./B.Des.

END TERM EXAMINATION *May-2025*

COURSE CODE:AEC21/FEC50

COURSE TITLE: Tinkering & Element of Design

Time: 03:00 Hours *Max. Marks: 40*

Note : All questions are mandatory.
Assume suitable missing data, if any.

Q.1 Define tinkering in the context of design and innovation. How does tinkering encourage creative problem-solving? Compare and contrast the exploration phase and implementation phase in a typical tinkering project, also explain the term Fuzzy Back End, Fuzzy Front End and Core with example. [10][CO2,3][BTL1]

Q.2 Explain the key differences between thermoplastics and thermosetting plastics. Describe two molding processes used to manufacture polymer-based products. [5][CO3][BTL2]

Q.3 Identify and explain any five elements of design. How do these elements interact to influence user perception and usability in a product? [5][CO3][BTL2]

Q.4 Describe any four core principles of design—such as balance, contrast, emphasis, and unity. For each principle, provide an example of how it can be applied in product design to improve functionality and aesthetics. [10][CO4][BTL3]

Q.5 Refer to the given illustration of a redesigned household gadget. Describe its use and user interaction. Identify and label Front End, Back End and Core, suggest materials for each component. [10][CO5][BTL4]

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Total no. of Pages - 2 Roll no.....

II/IV SEMESTER

B.Tech

END TERM EXAMINATION *May-2025*

COURSE CODE: AEC-25/FEC51

COURSE TITLE: ENTREPRENEURSHIP EXPLORATION

Time: 02:00 Hours *Max. Marks: 50*

Note : All questions carry equal marks (10).
Attempt any FIVE questions.
Assume suitable missing data, if any.

Q.1 Raghav Enterprises has developed "AquaPure," an IoT-enabled water purifier that costs ₹15,000 with a ₹500 monthly subscription for monitoring and filter replacements. The company targets both B2C and B2B markets while focusing on R&D, patented technology, manufacturing partnerships, and a digital service platform. Apply the Business Model Canvas framework to analyze Raghav Enterprises' business model for AquaPure. Your analysis should cover all aspects of how the company creates, delivers, and captures value through its smart water purification solution.

(10 Marks) [CO4][BTL4]

Q.2 The Indian electric vehicle (EV) industry has been experiencing significant growth and transformation. The government has implemented several policies including FAME II (Faster Adoption and Manufacturing of Electric Vehicles) scheme with an outlay of ₹10,000 crores, introduced tax benefits for EV buyers, and set ambitious targets for EV adoption. Meanwhile, technological advancements in battery technology continue to improve range and reduce costs, though charging infrastructure remains limited in many

areas. Rising fuel prices, growing environmental awareness, and increasing urbanization are influencing consumer preferences. However, the industry faces challenges related to high initial vehicle costs, supply chain issues for critical raw materials, and competition from established conventional vehicle manufacturers. Evaluate PESTEL factors for a company planning to enter the Indian electric vehicle market.

(10 Marks)[CO3][BTL5]

Q.3 TechNova, an agritech startup with an AI water conservation system, needs $500,000 for production after investing $50,000 in personal savings. As their financial advisor, analyze five funding options appropriate for their early stage. Recommend and justify the optimal financing strategy for their specific circumstances.

(10 Marks) [CO1][BTL5]

Q.4 Write brief notes on the following:

1. Design Thinking Challenge
2. Identifying and Evaluating Business Opportunities

(10 Marks) [CO3][BTL2]

Q.5 Entrepreneurs play a vital role in economic development through their innovative ventures. Drawing from your understanding of entrepreneurship, identify and explain five key characteristics that define successful entrepreneurs. For each characteristic, provide an example of how it manifests in entrepreneurial behavior and contributes to venture success. **(10Marks) [CO1][BTL2]**

Q.6 Explain the concept of STP analysis in marketing. Describe each component of the STP framework and discuss how businesses use this approach to develop effective marketing strategies.

(10 marks)[CO4][BTL3]

End-Semester Examination

May, 2025 (Even semester) **Roll NO.----------** 21

Subject Code: FEC-18 **Title: Financial Statement Analysis**

Time: 2 Hours Maximum **Marks: 50**

Note : Attempt any 5 questions.
Assume any missing data

1) What is the annual report of a company, and what two broad types of information does it provide? What four financial statements are typically included in the annual report? Also state two limitaions of financial statements in general? Why is the annual report of great interest to investors and othe4r stakeholders?
(10 Marks) (CO,1)

2) a) Dual aspect concept is the foundation of accounting. Explain this statement highlighting the relevance of this concept.

b) Sona limited has imported a machinery from Germany at a purchase price of Rs.5 million. The life of the machine is expected to be 10 years. Following additional expenses were incurred for the machinery:

i) Freight and insurance Rs.12 lakh
ii) Domestic Logistics Rs.3 lakh
iii) Custom Clearance at Mumbai airport Rs.15 lakh
iv) Wages paid for installation Rs.2 lakh

The accounts executive is a fresher. He is not sure about recording the value of the imported machinery. You are required to advise the accountant for proper recording of the transaction explaining the importance of accounting assumptions involved in this. **(10 Marks) (CO,1)**

3) Explain the key differences between a Journal and a Ledger in terms of their function, structure, and usage.
(10 Marks) (CO,1,2)

4) Baltimore Company's financial data includes the following assets and liabilities:

- Accounts Receivable: $800
- Equipment: $10,000
- Accounts Payable: $4,850
- Prepaid Rent: $2,000
- Supplies: $400
- Bank Loan: $2,750
- Machinery: $1,000
- Land and Building: $10,000
- Rent: $500
- Salary: $1,000
- Insurance Premium: $300

Based on the above information, determine the following: 22

22 1. Current Liabilities

2. Non-Current Liabilities

3. Total Liabilities

4. Current Assets

5. Non-Current Assets

Also, briefly explain the difference between Assets, Liabilities, and Equity.

(10 Marks) (CO,1,

5) Mr.Raman Bhalla is a sole proprietor who runs a provisions store. The following are the business transactions that took place during the month of January 2025. You are required to **journalize** these transactions:

Date	Transactions	Amount (Rs.)
Jan 1	Commenced business with cash	80,000
Jan 2	Deposited cash into the bank	40,000
Jan 3	Purchased goods for cash	5,000
Jan 4	Purchased goods on credit from Lipton & Co.	10,000
Jan 5	Sold goods for cash to Joy	11,000
Jan 6	Paid salaries in cash	5,000
Jan 7	Paid Lipton & Co. by cheque for the purchase made on Jan 4	10,000
Jan 8	Bought furniture for cash	4,000
Jan 9	Paid electricity charges in cash	1,000
Jan 10	Bank paid insurance premium on furniture as per standing instructions	300

Required:
Prepare **journal entries** for the above transactions in the books of Mr. Joy.

(10 Marks) (CO,1,2)

6) Write short notes on:

(a) Gross Profit and Net Profit
(b) Accounting Conventions

(10 Marks) (CO,1,2)

Total no. of pages :2	Roll No._____
2nd SEMESTER	B.Tech (All Branch)
END SEMESTER EXAMINATION	MAY 2025
AM102/MA102 Mathematics II	
Time : 3 hrs	Max. Marks: 50
Note: Answer any five questions. Assume missing data, if any.	

1.	(a)	Find the Laplace Transform of the function $f(t) = (t - \frac{3}{t} + 1)Sin(3t)$	5 CO4 BL3.5
	(b)	Solve the differential equation using Laplace Transform $y'' + 4y' + 13y = e^{-t}$ give that $y(0) = 0, y'(0) = 2$.	5 CO2.4 BL3.5
2.	(a)	Define Unit Step function. Find the inverse Laplace Transform of $\frac{e^{-7s}}{(s-3)^3}$	5 CO4 BL1.5
	(b)	Determine eigenvalues & eigenvectors of the matrix $A = \begin{bmatrix} 2 & -2 & 2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$	5 CO1 BL2
3.	(a)	Find the complete solution of differential equation $(D^2 + 4)y = xCos^2(x)$	5 CO2 BL2.3
	(b)	Find the series solution of the differential equation $xy'' + y' - xy = 0$, about the point $x = 0$.	5 CO3 BL2.4
4.	(a)	State and prove the Rodrigues Formula. Represent the polynomial $ax^3 + bx^2 + cx + d$ in terms of Legendre's Polynomial.	5 CO3 BL1.5
	(b)	Prove that $\int_0^1 x J_n(\alpha x) J_n(\beta x) dx = 0$, if $\alpha \neq \beta$. α & β *are roots of* $J_n(x) = 0$. $J_n(x)$ is Bessel's function of first kind of order n.	5 CO3 BL1.2

24

5. (a) Obtain the Fourier series for $f(x) = x^2 + x, for -\pi < x < \pi$ and prove that $\frac{\pi^2}{6} = 1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \cdots$. 5 CO5 BL4.5

(b) Obtain the Fourier Sine series for $f(x) = x(\pi - x)$, $for\ 0 < x < \pi$. 5 CO5 BL4.5

6. (a) The following table gives the variations of a periodic current over a period 5 CO5 BL1.2

t sec	0	T/6	T/3	T/2	2T/3	5T/6	T
A amp	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

Obtain the Fourier Series for current A at any time t up to 1st harmonics, also find the amplitude of 1st harmonics.

(b) Find the Fourier Series to represent the function 5 CO5 BL4.5

$$f(x) = \begin{cases} x & for\ \ 0 < x \leq 1 \\ 0 & for\ \ 1 < x \leq 2 \end{cases}$$

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Total Number of Pages 2 Roll. No.....

SECOND SEMESTER **B.TECH(Re-registered)**

END-TERM EXAMINATION **May 2025**

AP 102: Physics-II

Time: 3:00 Hours *Max. Marks: 40*

Note: Question 1 is compulsory.
Attempt any four questions from Question 2 to 7.
Assume suitable missing data, if any.

Q1. Answer the following [2×4=8][CO#1-5][BTL#1,2,4]

(a) Write postulates of Quantum mechanics.

(b) Explain the concept of Simultaneity.

(c) Differentiate between interference and diffraction of light.

(d) What are the components of a LASER system?

Q.2 [a] Calculate the percentage contraction in the length of a rod in a frame of reference, moving with velocity 0.8c in a direction (i) parallel to its length and (ii) at an angle of 30° with its length. What is the orientation of the rod in the moving frame of reference in case (ii)?

[4][CO#1]][BTL#1,3]

[b] State and deduce the mathematical expression for the law of addition of relativistic velocities. Show that in no case can the resultant velocity of a material particle be greater than c.

[4] [CO#1]][BTL#1,2,5]

Q.3 [a] Derive an expression for the intensity distribution due to Fraunhofer diffraction from N slits. Also, plot the intensity distribution corresponding to N=4.

[4][CO#2]][BTL#3,6]

[b] In Newton's ring experiment, the diameters of the 4th and 12th dark rings are 0.400 cm and 0.700 cm respectively. Find the diameter 20th dark ring.

[4][CO#2]][BTL#1,3,5]

Q.4 [a] A three-level laser emits a light of wavelength of 5500 Å, (i) What will be the ratio of population of upper level (E2) to the lower energy level (E1) if the optical pumping mechanism is shut off (Assume T =

26

300 K). (ii) At what temperature for the conditions of (i) would the ratio of populations be ½?

[4][CO#3]][BTL#1,3]

[b] Discuss the propagation of light through optical fiber. Derive an expression for the numerical aperture.

[4][CO#3]][BTL#2,3,6]

Q.5 [a] What do you mean by Compton Effect? Consider an X-ray beam of wavelength 0.2 nm. If the radiation scattered from free electron is viewed 90° to the incident beam - (i) what is Compton shift, (ii) what kinetic energy is given to the recoiling electron and (iii) what percentage of the incident photon energy is lost in the collision.

[4][CO#4]][BTL#1,3]

[b] What is the physical significance of wave function? Write down the time-dependent form of the Schrodinger equation and obtain the time-independent form of the Schrödinger equation from this.

[4][CO#4]][BTL#1,2]

Q.6 [a] Discussing drift and diffusion current in semiconductors, Derive an expression for Einstein's relation.

[4][CO#5]][BTL#2,6]

[b] What do you mean by intrinsic carrier concentration? Obtain an expression for the same. Show that the Fermi level in an intrinsic semiconductor is situated in the middle of the valence and conduction bands.

[4][CO#5]][BTL#1,3,4]

Q.7 [a] Consider a particle trapped in an infinite potential box of width 'a',

$$V(x) = \begin{cases} 0, & 0 < x < a \\ \infty, & x \leq 0, x \geq a \end{cases}$$

Write the Schrodinger equation for this particle and hence get the expression for the energy eigen values and eigen functions for the particle. Draw the probability densities for the first three wave functions.

[4][CO#4]][BTL#1,3,6]

[b] What is LASER? Explain the working principle of Ruby laser with the help of a suitable energy level diagram.

[4][CO#3]][BTL#1,2,6]

—END—

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Total Number of Pages: 2
SECOND SEMESTER
END-TERM EXAMINATION

Roll. No.....
B.TECH (All Groups)
May 2025

AP102n: Physics

Time: 3:00 Hours *Max. Marks: 40*

Note: Question 1 is compulsory.
Attempt any Four questions from questions 2 to 6.
Assume suitable missing data, if any.

Q1. Answer the following [2×4=8][CO#2-5][BTL#1,2]

[a] What is the difference between Fresnel's and Fraunhofer diffraction?

[b] What do you mean by degenerate energy states? Explain with examples.

[c] Briefly explain the drift and diffusion current.

[d] What is Compton wavelength? Explain its physical significance.

Q2. [a] A reference frame S' moves with respect to rest frame S with a uniform velocity 'v' parallel to x-direction. Show from Lorentz transformation that two events simultaneous ($t_1 = t_2$) at different positions ($x_1 \neq x_2$) in S frame are not in general simultaneous in S' frame. [4][CO#1][BTL#1,3]

[b] In a Newton's ring arrangement with a source emitting two wavelengths $\lambda_1 = 6\times10^{-7}m$ and $\lambda_2 = 5.9\times10^{-7}$m, it is found that the nth dark ring due to one wavelength coincides with the $(n+1)^{th}$ dark ring due to the other. Find the diameter of the nth dark ring, if the radius of curvature of the lens is 90 cm. [4] [CO#1][BTL#3,5]

Q3. [a] In He-Ne laser, what is the function of He gas? Explain the working of He-Ne laser with neat and clean diagram. [4][CO#3][BTL#3,4]

28

[b] Write conditions for working of a step-index optical fiber. In a step-index fiber, the core and cladding materials have refractive indices 1·50 and 1·43, respectively.
Find the following

(i) Critical propagation angle
(ii) Acceptance angle
(iii) Total time delay in 1 km length of the fiber

[4][CO#3][BTL#3,4]

Q4. [a] What is De-broglie concept of matter wave? Evaluate de Broglie wavelength of Helium that is accelerated through 300 V. (Given mass of proton = Mass of neutron = $1 \cdot 67 \times 10^{-27} Kg$).

[4][CO#4][BTL#3,5]

[b] An electron of energy 342 eV is confined in a one-dimensional box of length 1.0 $A°$. Calculate (i) the quantum number n of the energy level of the electron and (ii) the energy required to take the electron to the next higher level.

[4][CO#4][BTL#3,4]

Q5. [a] Explain the Hall Effect in semiconductors. Derive the expression for the Hall voltage and Hall coefficient. Also, discuss applications of Hall coefficient.

[4][CO#5] [BTL#2,6]

[b] The resistivity of an intrinsic semiconductor is 4.5 ohm-m at 20°C and 2 ohm-m at 32°C. What is the energy band gap?

[4][CO#5][BTL#3]

Q6. [a] A particle constrained to move along x – axis in the domain $0 \leq x \leq L$ has a wave function $\psi(x) = \sin(n\pi x/L)$, where n is an integer. Normalize the wave function and evaluate the expectation value of momentum of the particle.

[4][CO#4][BTL#5,6]

[b] What is the physical significance of Einstein's A-coefficient? Explain why it is more difficult to achieve Lasing action at X-ray wavelength than at infrared wavelength.

[4][CO#3][BTL#1,2]

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Total No of Pages...Three..

Roll No.....

B Tech Second Semester

Automobile Engineering

End Semester Examination

(May-2025)

AE – 104:

Engineering Mechanics

Paper Code

Title of the Subject

Time: 3:00 Hrs.

Max Marks. 40

Note: Attempt any Five Questions.
All Questions carry equal marks.
Assume missing data, if any

Q No.1 Differentiate between (2x4=08
CO 01

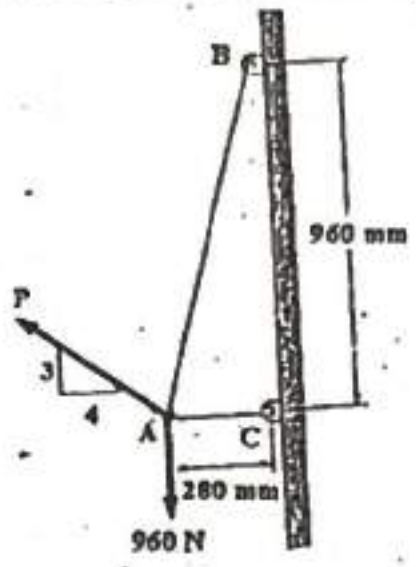
(i) – Beam and Column.

(ii) – Sliding and Rolling friction.

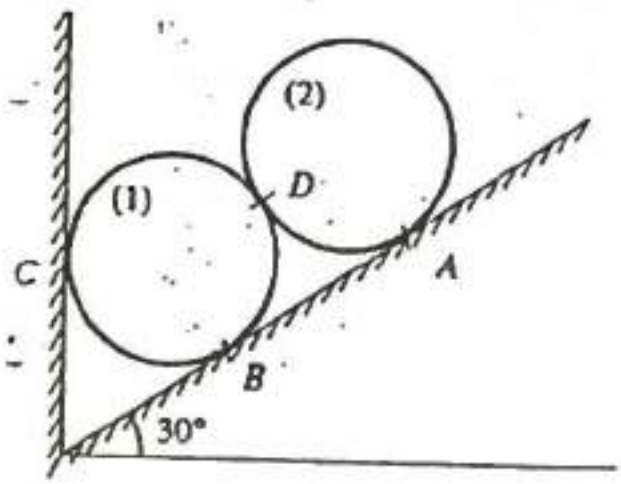
(iii) – Absolute Motion and Relative Motion.

(iv) – Parallel Axis Theorem and Perpendicular Axis Theorem.

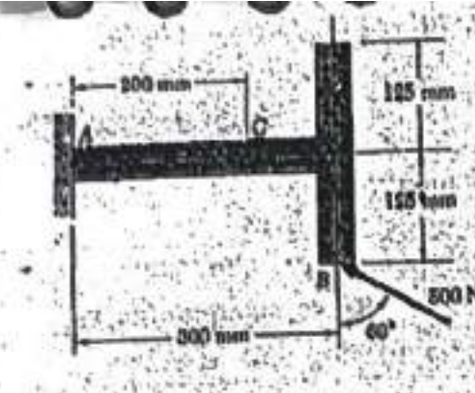
Q 2(a) Two cables AC and AB are tied together at A and loaded as shown in the following figure. Knowing that P = 640 N, determine the tension in each cable. (4)
CO 02



Q 2(b) Two identical rollers each of weight 50 N are supported by an inclined plane and a vertical wall as shown below. Determine the reactions at the points of support A, B and C, assuming all the surfaces of the contact to be smooth. Also find the reciprocal force between the rollers. (4)
CO 04

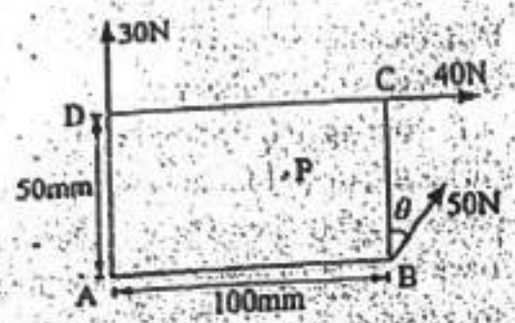


Q 3(a) Find out the Moment of the given force of 500 N about the point A, by applying the Varignon's theorem.



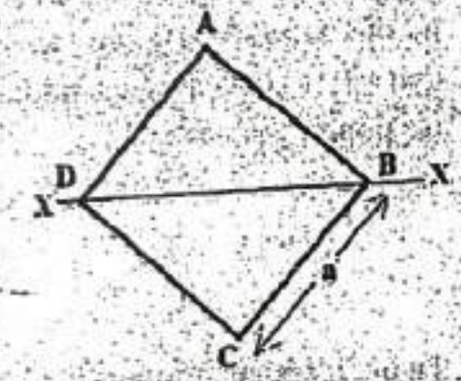
(4) CO 03

Q 3(b) In the following figure the angle θ is such that the vector sum of the three forces is zero. Determine the moment of the three forces about A.



(4) CO 02

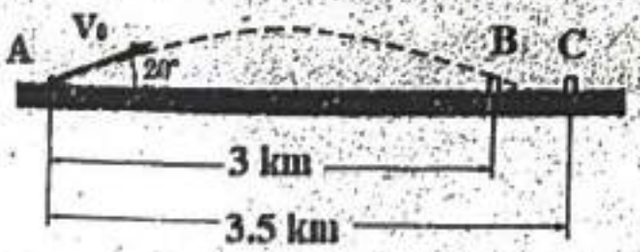
Q 4(a) Find the moment of inertia of the following square shaped cross section of a Beam as shown, about it's centroidal XX axis.



(4) CO 04

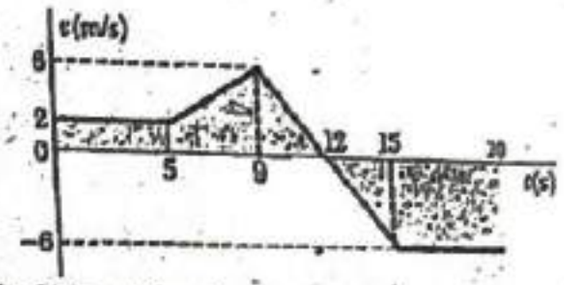
Q 4(b) Describing Equivalent couples, also, explain how a Force Couple system acting over a body can be converted into a Force only or vice versa. (4) CO 03

Q 5(a) A Projectile is fired with an initial velocity v_o at an angle of 20° with the horizontal as shown. Determine the required value of v_o if the projectile is to hit (a) – point B, (b) – point C (as shown in the diagram). (4) CO 03



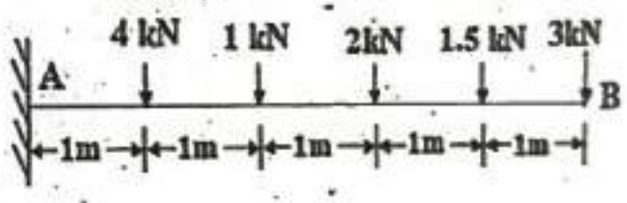
Q 5(b) Differentiate between (in brief) the principles of:
(i) – Elastic and Inelastic collision
(ii) – Conservation of Linear and Angular momentum

Q 6(a) A particle moves in a straight line with the velocity shown in the following figure. Knowing that x = – 8 m at t = 0, draw the a – t curve for 0<t<20 s.

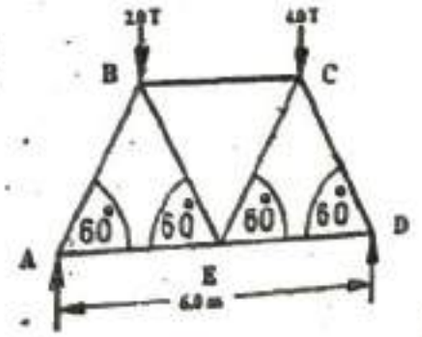


Q 6(b) A cylindrical body is rotating about its axis with speed of 900 rpm. Find out (i) – In order to stop it in 45 seconds, what angular deceleration should be applied to it. (ii) – In how much time after the application of this deceleration, the speed of this body will be half of its initial speed.

Q 7(a) Draw the Shear Force and Bending Moment diagrams (SFD and BMD) of the following Cantilever beam AB, under loading conditions as shown.



Q 7(b) Using the method of joints, determine the force in each member of the truss.



Q 8 Explain any four of the following in brief.
(i) – Resolution of Force in Space.
(ii) – Angle of Repose
(iii) – Radius of Gyration.
(iv) – Addition of Couples
(v) – Relative motion
(vi) – Self Locking Machines.

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Total No. of Pages 2 *Roll No.--------*

(IV) SEMESTER B TECH EVENING
END SEMESTER EXAMINATION May. 2025
BME-204 –INTERNAL COMBUSTION ENGINES

Time: 3 Hours **Max. Marks: 40**

Note: *1. Answer ANY FIVE questions.*
2. Answer to each question (or its parts/Subparts) must start on a fresh page.
3. Draw properly labeled diagrams wherever required.
4. All questions carry EQUAL MARKS.

1. a. Explain the principle of working of 2 stroke IC Engines with a properly labelled diagram. [4][CO1][BLT-3]
   b. Explain the combustion in SI engines with a p-theta diagram, discuss detonation. [4][CO2] [BLT-3]
2. a. Explain the various factors affecting the diesel knock. [4] [CO3] [BLT-3]
   b. Discuss the desirable features of the combustion chamber used in IC engines and briefly describe the commonly used combustion chamber types. [4] [CO3] [BLT-4]
3. a. Why do we need a supercharger in an IC engine? Explain the working of a supercharger with a properly labelled diagram. [4] [CO5] [BLT-5]
   b. Explain the utility of GDI and CRDI in IC Engines, also describe their advantages [4] [CO4] [BLT-5]
4. a. Explain the modifications required to convert a CI engine for CNG operation. Discuss its advantages and limitations. [4] [CO5] [BLT-3]
   b. Explain the process for emissions testing of an IC Engines and discuss various equipment's required for it. [4] [CO5] [BLT-3]
5. a. Explain the desired properties of engine lubricants and discuss various methods of lubrication. [5] [CO5] [BLT-3]

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b. A 4 cylinder 4stroke SI engine running at 1400 rpm delivers 20kW. The average torque when one cylinder was cut is 120Nm. Find the indicated thermal efficiency, if the calorific value of the fuel is 44MJ/kg and the engine uses 300 grams of petrol per kWh. [4] [CO5] [BLT-4]

6. Write short notes on the following: (ANY FOUR)

i. Engine cooling controls ii) EFI engines iii) Ignition delay

iv) Fuel knock ratings v) Glow Plug vi) Fuel Pump

[2x4][CO1-5] [BLT 2-5]

Total No. of Pages: 02

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FOURTH SEMESTER

Roll No.....

B.Tech. [AE]

END TERM EXAMINATION

May 2025

PAPER CODE: AE 208 ENGG. MATERIAL & METALLURGY

Time: 3 Hours.

Max. Marks: 40

Note: Answer any FIVE questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 a) Define atomic packing factor (APF). Describe how API is calculated for different structures such as face centered cubic (FCC), body centered cubic (BCC), and hexagonal close packed (HCP). [4][CO – 1] [BTL5]

b) Construct Directions for the hexagonal crystal system, [0001], [1100], and [1120]. And Draw plane for the (0001), (1011), and (1010). [4][CO – 1] [BTL6]

Q.2 [a] Draw Fe-C phase diagram. Label all the phases and temperatures properly. Describe the phase changes during solidification of Fe – 0.45% C alloy. [4][CO – 2] [BTL6]

[b] What do you mean by corrosion? Name different types of Corrosion. Explain the methods of protection from corrosion. [4][CO – 2] [BTL5]

Q.3 [a] Draw a schematic TTT curve for a 0.8% plain carbon steel. Label all phase regions. [4][CO – 3] [BTL4]

[b] What is Heat treatment in metals? Name all the Heat treatments used in metals. Explain or interpret case hardening treatment of low carbon steel. [4][CO – 3][BTL3]

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Q.4 (a) What is Brittle and Ductile fracture? What are design considerations? Draw/sketch stress and strain diagrams, and explain it. [4][CO – 4] [BTL3]

(b) Compare thermal stress and creep? Draw creep curve and explain its salient points. [4][CO – 4] [BTL4]

Q.5 [a] Classify the composite materials on the based of the Reinforcement. Write theirs Characteristics and application. [4][CO – 5] [BTL2]

(b) Define Glass reinforced and Carbon fibers. Theirs uses and advantages when used as reinforced. [4][CO – 5] [BTL1]

Q.6 (a) What are bio hydro metallurgy and the biological fundamentals? Explain flotation concentrates and recovery of valuable metals. [4][CO – 6] [BTL2]

(b) State recovery base metal from minerals also explain Bioleaching microbiology? [4][CO – 6] [BTL1]

Total no. of pages :2 Roll No._____

FOURTH SEMESTER B.Tech (AE)

END SEMESTER EXAMINATION MAY 2025

AE-210 MECHANICS OF SOLIDS

Time : 3 hours **Max. Marks: 40**

Note: Attempt any FIVE questions in full. Assume missing data, if any. Draw the relevant diagrams wherever it is necessary.

1a. With a suitable diagram explain Stress- Strain diagram for ductile material and brittle material and also explain the terms toughness, resilience and proof resilience of the material. 04[CO1] [BTL1]

1b. A metallic bar of 200 mm x20 mm x 15 mm is subjected to axial loads of 25 kN (Tensile); 20 kN (Tensile) and 15 kN (Compressive) along three mutually perpendicular directions. If the modulus of elasticity is $2x10^5$ N/mm^2 and the Poisson's ratio is 0.30; find the change in the dimensions, Change in volume and the value of Modulus of rigidity of the material. 04[CO2][BTL 3]

2a. By analytically or graphically, find the value of maximum and Minimum values of Principal Stresses and their location for a specimen subjected to 50kN/mm^2 (Tensile), 20kN/mm^2 along two mutually perpendicular directions and a complementary shear stress of 10Kn/mm^2. Also find the Maximum shear stress and the position of the corresponding plane. 04 [CO4][BLT02]

2b. A circular rod of 45 mm diameter and 2.5m long hangs vertically and a collar is mounted at the bottom. Find the maximum stress induced, when a weight of 3Kn falls from 2m height; 50 cm height. Assume the value of Young's modulus to be $2x10^5$ N/mm^2, Find the strain and change in the length of the bar under the above two conditions. 04[CO4][BTL4]

3a. A thin cylinder of 5m length, 1m diameter and 10mm thickness is subjected to an internal pressure of 2.5kN/mm^2, the Young's modulus is 2x105 N/mm^2. Find the value of Circumferential stress, Longitudinal stress, Change in length, Change in diameter and change in volume, if the Poisson's ratio is 0.25.

04[CO4][BTL03]

3b. A compound cylinder is made by shrinking a cylinder of external diameter 350 mm and internal diameter 275 mm over another cylinder of external diameter 275 mm. The radial pressure at the junction after shrinking is 10 N/mm^2. Find the final stress set up across the cross section, when the compound cylinder is subjected to an internal pressure of 100 N/mm^2 04[CO5][BTL4]

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4a. A hollow circular shaft transmits a power of 20 kW at 360 rpm. The internal diameter is 0.6 times the external diameter. If the permissible shear stress is 60 N/mm^2 and modulus of rigidity as 0.8 N/mm^2, find the internal and external diameters. What would be the angle of twist per meter under the above condition.

04[CO4][BTL3]

4b. A solid stepped shaft has three steps made of the same material is subjected to a torque of 50 kN-m at the free end. The dimensions of the steps are as tabulated below.

Step no	1	2	3
Diameter	45 mm	30mm	25mm
Length	1.5m	1.2m	0.80m

Find the value of shear stress in each of the steps. Find the total angle of twist if the bigger diameter step is offering resistance to the turning moment.

04[CO3][BTL4]

5a. A top and bottom web section of a T- section is 30mm x 5 mm and the flange section is 50 mmx10 mm. The T section has a span of 3 m and carries a UDL of 1.2 kN/m and a central point load of 5 kN. Find the value of maximum and minimum stresses in the beam

04[CO2] [BTL2]

5b. A rectangular long column has a cross section of 20 mm x 40 mm is subjected to an axial load of 20 kN. If the length of the column is 5 m and Young's modulus is 2x105 N/mm^2.Find the stress induced in the column for both the ends hinged, one end is fixed and the other end is free, both the ends fixed and one end is fixed and the other end is hinged, treat the column as Eulerian column. 04[CO3][BTL2]

6a. A close coiled helical spring of 15 cm mean diameter made of 12 mm diameter wire has 18 turns. The spring carries an axial load of 500 N. Determine the shear stress induced. Assume the value of modulus of rigidity as 8.4 x $10^4 N/mm^2$. Determine the deflection under this load and stiffness of the spring.

04 [CO2][BTL2]

6b. Write a brief note on theory of long columns. Compare Eulerian column with Rankine's column.

04[CO2][BTL1]

-----End-----

Total No. of Pages: 02 Roll no.....

IV SEMESTER

B.Tech. Mechanical (Automobiles) Old Schme

END TERM EXAMINATION ***May-2025***

AE-211 HEAT TRANSFER

Time: 3 Hours. ***Max. Marks : 70***

Not:.Attempt any Five Questions. Each question carry equal marks.

Assume any suitable data if missing

Q-1(a): Explain followings with physical significance

(i) Biot Number(ii) Fourier Number(iii) Geometrical Number

(ii) (iv) Thermal Diffusivity (4) (CO-1)

(b):A performance is found dead at 5.PM in a room where temperature is 20°C. The temperature of the body is measured to be 25°C. when found and heat transfer coefficient is estimated to be 10 W/m^{2}K. Consider a healthy human body a 30cm diameter, 1.80m long cylinder. Calculate actual time of death of the person Take thermo-physical properties of the human body

(i) Thermal conductivity=6.08W/mK (iii) specific heat=4200 J/kgK

(iii)Density=900kg/m^3 (10) (CO-1)

Q-2 Derived the expression for critical thickness of insulation in

(i)cylinder and (ii) sphere (7+7) (CO-1)

Q-3 (a) What are the methods for finding convective heat transfer coefficient. Why Colcburn analogy is used. Explain Colcburn analogy and Reynolds analogy and. Under what condition these two analogies becomes the same (7) (CO-2)

(b) Using dimensional analysis prove that Nusselt number is a function of Reynold number and Prandtl Number in forced convection mode. (7) (CO-2)

OR

(b) Using dimensional analysis prove that Shear wood number is a function of Reynold number and Schmid Number in forced convection mass transfer.

(7) (CO-6)

Q-4(a): Explain followings with physical significance.

(i) Nusselt Number (ii) Prandtl Number (iii) Grashof Number

(iv)Stanton Number,(v)Shearwood Number (vi) SchmidNumber

(12) (CO-2, CO-5)

(b) Explain film wise and drop wise condensation. How you can find out Reynold number in drop wise condensation for finding rate of heat transfer. (2) (CO-3)

Q-5(a) Explain the following terms with physical significance

(i) Intensity of Radiation (ii)Emissive Power (2) (CO-4)

(b) Why LMTD is used in Heat exchanger. Define NTU and its Utility . Also Derive the expression for LMTD of in Parallel Flow and Counter flow heat exchangers (2+5+5) (CO-5)

Q-6: Define fin efficiency and Fin effectiveness. Derive the expression for temperature distribution and rate of heat transfer when (i)fin is well insulated and (ii) fin is too long (6) (CO-1)

(b) Define Heat exchanger Efficiency. Derive the expression for effectiveness of heat exchanger in Counter flow heat exchanger. (8) (CO-5)

Q-7: (a)Derive the expression for overall heat transfer coefficient for (i)three layered composite cylinder and (ii) three layered composite sphere (5+5) (CO-1)

(b) Discus in detail the various regimes of boiling (4) (CO-3)

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Total No. of Pages: 01 *Roll No:* .....

B. Tech. SIXTH SEMESTER [AE]

END TERM EXAMINATION May 2025

AE 302 DESIGN OF MACHINE ELEMENTS

Time: 3 Hours Max. Marks: 40

Note: Attempt any *FIVE* questions.

All questions carry equal marks.

Assume suitable missing data, if any.

Use of Design Data Handbook is permitted.

1. (a) Explain the significance of 'Factor of Safety' in designing a machine element. [CO#1] 4

(b) How is the concept of 'fits and tolerances' useful in design. Explain with an example. [CO#1] 4

2. Design a triple riveted (zigzag type) double strap butt joint with unequal straps for joining 16 mm thick medium carbon steel plates. [CO#2] 8

3. Design a protected type flange coupling for connecting two shafts 70 mm in diameter running at 1200 rpm while transmitting 20 kW power. [CO#3] 8

4. Design a power screw of 50 kN capacity for a maximum lift of 350 mm. The ground clearance should be as small as possible. [CO#4]8

5. Design a pair of cast teeth helical gears with 20° full depth system to transmit 60 kW at 1000 rpm of the pinion with a velocity ratio of 3. [CO#5] 8

6. Design a differential band brake having an operating lever 230 mm long. The ends of the brake band are attached so that their operating arms are 45 mm and 135 mm long. The brake drum diameter is 0.5 m and the arc of contact is 300°. The coefficient of friction may be taken as 0.25. [CO#6] 8

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Total No. of Pages: 2 *Roll No. .....*

VIth SEMESTER

B.Tech. (Automobile)

END SEMESTER EXAMINATION May-2025

AE304 Internal Combustion Engines

Time: 3 Hours *Max. Marks: 50*

Note: 1. Attempt all questions by selecting any two parts from each question

2. Assume suitable missing data, if any.

1	(a)	Differentiate between SI and CI Engines	[CO2][L1][5]
	(b)	Discuss the need of Valve Timing and Port Timing Diagram	[CO2,3][L2][5]
	(c)	Describe the valve timing diagram of four stroke Diesel engine	[CO1,3][L2][5]
2	(a)	With the help of a simple diagram, explain the essential features of combustion phenomenon in SI engine	[CO2,3][L3][5]
	(b)	Explain the Pre ignition and abnormal combustion phenomenon in SI engines	[CO3,4][L3][5]
	(c)	Describe the theory of detonation and possible remedial measures.	[CO4][L3][5]
3	(a)	Discuss the various operating variables which effect the combustion phenomenon in CI engine	[CO3,4][L4][5]
	(b)	How do you determine the chemically correct air fuel ratio? Explain and specify how it varies with load variation.	[CO3,4][L4][5]
	(c)	What is meant by Diesel knock? Discuss the methods to control the Diesel knock	[CO3,4][L4][5]
4	(a)	Define and explain the functions and working of multipoint fuel injection system in I C Engines	[CO3,4][L4][5]
	(b)	How supercharging is carried out and what are the limits of supercharging? Explain	[CO4,5][L5][5]

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	(c)	List the methods to measure Power of IC engines and explain any one of them in detail	[CO3,4][L5][5]
5.	(a)	Classify Petroleum based fuels specifying their properties	[CO2,4][L3][5]
	(b)	Describe the working of lubricating system or cooling system in IC Engines	[CO3,4][L5,6] [5]
	(c)	Discuss the need of alternative fuels for I C Engines. Specify your answer based upon usage/knock rating/pollution control	[CO4,5][L5,L6] [5]

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VI SEMESTER
B.Tech [Automotive]

END-TERM EXAMINATION *May-2025*

AE-306 **Alternative Fuels & Energy Systems**

Time: 3:00 Hours *Max. Marks: 40*

Note: Attempt any FIVE questions (Out of EIGHT questions).
All questions carry equal marks.
Start the new question or part thereof on a new page.
Attempt all parts of a question in one place
Assume suitably missing data, if any.

Q.1	(a)	Compare and contrast primary, secondary, commercial, non-commercial, renewable, and non-renewable energy sources. How does the choice of an energy source impact a country's energy policy?	10 marks (5+5)	CO-1
	(b)	Explain Hubbert's Peak Oil Theory and critically analyze its relevance in predicting global peak oil production. Based on historical trends and current data, when do you think peak oil may have occurred or is expected to occur? Discuss the potential socio-economic implications of declining petroleum reserves on global industries, economies, and energy security.		
Q.2	(a)	Explain the influence of fuel volatility on SI engine performance, including cold starting, knock resistance, and fuel-air mixture formation. Discuss the role of oxygen content in alternative fuels like ethanol and methanol, and analyze their impact on combustion efficiency and emission characteristics.	10 marks (5+5)	CO-2
	(b)	Evaluate the suitability of ethanol as a fuel for compression-ignition (CI) engines. What are the key challenges associated with ethanol-diesel blending? Discuss the necessary engine modifications and the feasibility of ethanol-diesel blends as an alternative fuel in CI engines, considering combustion characteristics, emissions, and efficiency.		

Please turn over for the remaining six questions

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Q.3	(a)	Trace the evolution of dual-fuel engines, highlighting key technological advancements and the challenges faced in their development and widespread adoption.	10 marks (5+5)	CO-3
	(b)	Compare the advantages and disadvantages of surface ignition engines, assessing their performance, emissions, and suitability for various applications.		
Q.4	(a)	Evaluate the advantages and disadvantages of gaseous fuels for IC engines, considering factors such as energy density, emissions, storage, and operational feasibility.	10 marks (5+5)	CO-4
	(b)	Explain the various hydrogen production mechanisms, comparing their efficiency, environmental impact, and feasibility for large-scale industrial applications. Additionally, discuss the challenges associated with hydrogen storage.		
Q.5	(a)	Analyze the potential of biomass as a sustainable energy source. Classify the different types of biomass based on their origin and composition. Explain and compare various biomass conversion technologies in the context of energy production.	10 marks (5+5)	CO-5
	(b)	Explain the transesterification process with the help of neat sketches. What key operating parameters influence reaction efficiency, yield, and fuel quality in biodiesel production?		
Q.6	(a)	Provide an introduction to electric vehicles, discussing their evolution, significance in modern transportation, and impact on sustainability.	10 marks (5+5)	CO-6
	(b)	Evaluate the advantages and challenges associated with hybrid vehicles, considering fuel efficiency, emissions, and technological complexity.		
Q.7		***Provide an in-depth critical analysis of the following topics, discussing key aspects and insights in detail.*** a) Desirable properties of fuels used in internal combustion (IC) engines and their influence on engine performance, emissions, and combustion characteristics b) Emulsified fuels for use in CI Engines with a detailed formation mechanism of these fuels	10 marks (5+5)	CO-1, 2
Q.8		***Write brief explanatory notes on any two of the following topics.*** a) CNG Fuel System b) Biodiesel quality standards c) High-energy and power-density batteries	10 marks (5+5)	CO-4, 5, 6

Total No. of Pages 2 *Roll No.*--------

VI/VII SEMESTER B TECH

END SEMESTER EXAMINATION May 2025

AE-308 Measurements and Instrumentation (Elective)

Time: 3 Hours **Max. Marks: 50**

Note: *1.Answer ANY FIVE questions.*

2. Answer to each question (or its Parts/Subparts) must start on a fresh page.

3. Draw properly labeled diagrams wherever required.

4. All questions carry EQUAL MARKS.

1. A. Discuss the requirements of a measurement systems and briefly give the classification of commonly used measurement systems. [5][CO1] [BLT-5]

B. What do you mean by standards and calibration? Explain the difference between accuracy and precision. [5][CO1] [BLT-4]

2 A. What is the working principle of a strain gauge? Discuss various methods to use strain gauges for higher accuracy. [5][CO2] [BLT-3]

B. What are the various dynamic performance characteristics of a measuring instrument? Describe in brief. [5][CO2] [BLT-3]

3 A. Why signal conditioning is required in a measurement system? Describe in brief about the working principle and applications of an Op-amp. [5][CO2][BLT-5]

B. Describe in brief about the working principle and applications of: i Nozzle flapper ii Piezoelectric [5][CO2] [BLT-3]

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4. A. Discuss the concept and utility of line, end and wavelength standards, give their uses. [5][CO3] [BLT-4]

B. What are various gear tooth forms? Explain the Principle and working of a Parkinson's gear tester. [5][CO5] [BLT-4]

5. A. What is the working principle of a bevel protractor? Discuss various methods to use it for the angular measurement. [5][CO2] [BLT-4]

B. What are the different screw threads forms? Briefly discuss the common errors of screw threads. [5][CO5] [BLT-4]

6. Describe in brief about the working principle and applications of the following: (ANY FOUR)

i) Slip Gauges

ii) Tool Makers Microscope

iii) Closed loop control

iv) Bourdon tube

v) Photo Voltaic

vi) Extensometer

[2.5x4][CO1-5] [BLT-2-5]

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Total no. of pages: 2 *Roll No.*_____

SIXTH SEMESTER B. Tech

END SEMESTER EXAMINATION MAY- 2025

AE-310 ADVANCED MANUFACTURING TECHNOLOGY

Time: 3 Hours Max. Marks: 50

Note: Attempt any five questions.
Assume missing data , if any

1 (a) What do you understand by transducer and magnetostriction effect in Ultrasonic machining (USM) process. Explain the effect of amplitude and frequency of vibration, grit size and abrasive concentration on material removal rate (MRR). [CO2][BTL2]

(b) Describe the working principle of USM with neat sketch. Explain the function of slurry, horn and oscillator in USM [CO3] [BTL2]

2 (a) Explain the production of laser beam and working principle of laser beam machining (LBM) with neat sketch. Also discuss the effect of 'focussing' on the performance of LBM. [CO3] [BTL2]

(b) Describe the working principle of electron beam machining (EBM) process with necessary sketch. How a complex shape can be cut using EBM process? [CO4] [BTL3]

3 (a) Briefly discuss the working principle of plasma arc machining (PAM) with neat sketch. Can you machine electrically non-conducting materials by PAM? Write its specific applications. [CO4] [BTL3]

(b) Write the differences in water jet machining, abrasive jet machining and abrasive water jet machining for working principle, applications and limitations. [CO3] [BTL3]

M6

4 (a) Explain the working principle of wire cut electric discharge machining (EDM) process with neat sketch. Also explain how the stratified wire works? [CO5] [BTL3]

(b) Describe the mechanism of material removal rate in electric discharge diamond grinding (EDDG) with neat diagram. [CO4] [BTL4]

5(a) Briefly discuss the mechanics of material removal in electrochemical machining (ECM). Explain the effect of process parameters on material removal rate. [CO3] [BTL4]

(b) Why there is no need to have short circuit protection device in electro-chemical grinding (ECG) system? Explain the mechanism of material removal during ECG. [CO5] [BTL4]

6. Write short notes on any four of the following: [CO1] [BTL1]

(a) Ion beam machining

(b) Fabrication of micro devices

(c) Chemical machining

(d) Microfabrication technology

(e) LIGA process

Total no. of Pages:

Roll no.....

6th SEMESTER

M.Tech

END TERM EXAMINATION

May-2025

COURSE CODE: AE-312

COURSE TITLE: Quality Management and Six Sigma Applications

Time: 03:00 Hours

Max. Marks: 50

Note : Answer any FIVE questions
All questions carry equal marks.
Assume suitable missing data, if any.
Use of Statistical Table is Allowed

Q.1 (a) Discuss six basic concepts of Total Quality Management.
(b) Compare appraisal and failure costs. [5×2][CO1][BTL2]

Q.2 Samples of size n=6 items are taken from a manufacturing process at regular intervals. After 50 samples $\sum\bar{x}$=1000 and ΣS=75. The quality characteristics is normally distributed.
(a) compute control limits for X-bar and S charts.
(b) If the specification limits are 19±4.0, determine whether the process meets the specification.
(c) If the item exceeds the USL, it can be reworked and if it falla below the LSL, it must be scraped, What percentage of scrap and rework is produced. [3+3+4][CO2][BTL3]

Q.3 (a) Define Defects, fraction defectives, and number defectives.
(b) In a manufacturing unit, 15 lots of size 400 units each are subjected to 100% inspection. The number of defectives found in each lot are given below. Compute 3-sigma trial control limits for np-chart and revise them if necessary. [4+6][CO3][BTL2]

Lot number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. of defectives	2	5	0	14	3	0	1	0	18	6	6	0	3	0	6

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Q.4 (a) Find the Average Sample Number for 2% process average Double Sampling Plan N=5000, n1=200, c1=3, r1=6, n2=300, c2=6, r2=7.

(b) Find the Average total Inspection for 3% process average Single Sampling Plan N=5000, n1=200, c1=2, r1=3. **[5+5][CO4][BTL3]**

Q.5 (a) Discuss the bath tub curve, Mean time to failure, mean time between failure.

(b) What do you mean by redundancy to enhance the reliability of a system. Discuss the various kinds of redundancy and other methods to improve the reliability. **[5+5][CO5][BTL2]**

Q. 6 Write short Notes on **[4×2.5][CO1][BTL1?2]**

(a) Quality Circle

(b) Deming Wheel

(c) Steps or Implementation of ISO 9000

(d) Six-Sigma application

Total no. of Pages: 2

Roll no.....

VII SEMESTER

B.Tech.

END TERM EXAMINATION *May-2025*

AE 416 Renewable Sources of Energy

Time: 03:00 Hours *Max. Marks: 50*

Note : All questions carry equal marks.
Assume suitable missing data, if any.
Answer any two from each question

Q.1(a) If a country continues to rely heavily on fossil fuels despite having abundant renewable energy resources, what could be the possible reasons behind this choice? Discuss with respect to economic, technological, and policy-related factors. [5][CO1][BTL5,6]

(b) Give a neat diagram of central tower receiver power plant and explain its operation. Give the details of an operational plant if such a plant exists anywhere in the world. [5][CO2][BTL1]

(c) A PV system feeds a dc motor to produce 1 hp power at the shaft. Motor efficiency is 85%. Each module has 36 multicrystalline silicon solar cells arranged in 9 × 4 matrix. The cell size is 125mm × 125mm and cell efficiency is 12%. Calculate the number of modules required in the PV array. Assume global radiation incident normally to the panel as 1 kW/m^2. [5][CO2][BTL3]

Q.2 (a) Using Betz model of a wind turbine, derive the expression for power extracted from wind. What is the maximum theoretical power that can be extracted and under what condition? [M][CO3][BTL1,4]

(b) What are the different types of biogas plants? Compare their relative merits and demerits. [5][CO3][BTL1,3]

(c) Aero-generator generates output of 1200 W at wind speed of 5 m/s at one atmospheric pressure and temperature of 20 °C. What will be output, if same aero-generator is installed on top of hill where the

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temperature is 10 °C, pressure is 0.85 atmospheric and wind speed is 6 m/s? [5][CO3][BTL3]

Q.3 (a) Explain the process of gasification of solid bio-fuels? What is general composition of gas produced and what is its heating value? What are its main applications? [5][CO3][BTL1]

(b) Discuss the various factors for selecting a site for hydro power plants. With the help of neat diagram explain the layout of a typical micro hydro plant. [5][CO4][BTL1,2,3]

(c) Following data is available from the investigation of hydro-site: Available head = 60m, catchment area = 70 sq. km, rainfall = 1600 mm per year, turbine efficiency = 85%, generator efficiency = 90%, penstock efficiency = 78%. 80% of the rainfall can be utilized. Calculate the suitable capacity of a turbo generator. [5][CO4][BTL3]

Q.4 (a) Discuss general simplified structure of hydrothermal resource and also explain TS diagram of dry steam hydrothermal system. [M][CO4][BTL1,2]

(b) Explain working principle of single-basin tidal power plant and also discuss key factors affecting energy generation, limitations and challenges in achieving high efficiency in tidal power generation. [5][CO4][BTL2]

(c) What is a Closed-Cycle OTEC system? Explain its working with a proper layout. Why is a low-boiling-point fluid used in Closed-Cycle OTEC systems? Name one commonly used working fluid. [5][CO5][BTL1]

Q.5 (a) Compare and contrast batteries, supercapacitors, and fuel cells with respect to energy density, power density, efficiency, and typical applications. [5][CO5][BTL5]

(b) Explain working principle of hydrogen fuel cell with neat diagram. What are its major components and their functions? [5][CO5][BTL1,2]

(c) Highlight the benefits, challenges, and potential applications of hybrid systems in rural and urban settings in context of energy security and environmental sustainability. [5][CO5][BTL5,6]

VIII SEMESTER

S1

B.Tech [Auto/Other Branches]

END-TERM EXAMINATION *May-2025*

AE-420 **Vehicle Safety Engineering**

Time: 3:00 Hours *Max. Marks: 50*

Note: Attempt any FIVE questions (Out of EIGHT questions).
All questions carry equal marks.
Start the new question or part thereof on a new page.
Attempt all parts of a question in one place
Assume suitably missing data, if any.

Q.1	(a)	Evaluate the effectiveness of traffic enforcement mechanisms in Delhi, such as e-challans and speed cameras, in addressing traffic violations. Identify the major causes of violations and propose strategies for improvement.	10 marks (5+5)	CO-1
	(b)	Explain the impact of driving under the influence (DUI) on road safety, highlighting its legal and social consequences in India. Additionally, discuss its historical perspectives and the evolution of enforcement measures.		
Q.2	(a)	Explain the working principle of the Anti-lock Braking System (ABS) and its function in preventing wheel lock-up during emergency braking. Assess the effectiveness of ABS in reducing stopping distance and maintaining vehicle stability under varying road conditions.	10 marks (5+5)	CO-2
	(b)	Explain the standard procedures for seat belt anchorage testing as per international safety regulations, emphasizing their importance in ensuring occupant protection and compliance with global safety standards.		
Q.3	(a)	Describe the procedure of a standard frontal crash test. Identify and interpret the key performance parameters assessed during the test.	10 marks (5+5)	CO-3
	(b)	Explain the working principles of a Collision Warning and Avoidance System. How do technologies such as radar, LiDAR, and AI contribute to preventing accidents?		

Please turn over for the remaining five questions

Q.4	(a)	Explain the various types of vehicle emissions and their environmental and health impacts. How do these emissions contribute to air pollution and public health concerns?	10 marks (5+5)	CO-4
	(b)	Explain the Pass-by Noise Test procedure. How does it evaluate noise pollution from vehicles, and what are the key regulatory parameters assessed during the test?		
Q.5	(a)	Define vehicle gradeability and explain how it is measured. Analyze its significance in determining vehicle performance, especially on inclined terrains, in terms of traction, braking efficiency, and rollover risk.	10 marks (5+5)	CO-5
	(b)	Using a schematic diagram, describe how a Common Rail Direct Injection (CRDi) system works. How does it enhance fuel atomization and engine efficiency in diesel-powered vehicles?		
Q.6	(a)	Explain the latest updates in the Motor Vehicles Act, including the proposed 2024 amendments. How do they address modern transport challenges and promote road safety and legal compliance?	10 marks (5+5)	CO-6
	(b)	List and explain the categories of road traffic signs as per the Motor Vehicle Act. Provide examples and explain how they ensure efficient and safe traffic flow.		
Q.7		***Provide an in-depth critical analysis of the following topics, discussing key aspects and insights in detail.*** a) The role of modern Head-Up Displays (HUDs) in improving driver attention and road safety, with a comparative assessment across Europe. b) The impact of Adaptive Cruise Control (ACC) on vehicle autonomy, safety, and driving efficiency, analyzing its implementation and challenges within European countries.	10 marks (5+5)	CO-1, 2
Q.8		***Write brief explanatory notes on any two of the following topics.*** a) Vehicle-to-Vehicle (V2V) communication b) Steering Effort Test c) Vehicle fitness certification and fitness checklist	10 marks (5+5)	CO-3, 5, 6

Total no. of Pages:1 Roll no.....

2nd SEMESTER

Stock Biotechnology

END TERM EXAMINATION *May-2025*

COURSE CODE:BT102 Biochemical Engineering Principles

Time: 03:00 Hours *Max. Marks: 50*

Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Write short notes on : [10] [CO 1;2][L3]
(i) Microbial growth kinetics
(ii) Plasmid Instability

Q.2 Explain the following briefly: [10] [CO 1;3][L2,4]
(i) Michaelis-Menten constant and its application in enzyme kinetics
(ii) Principles and mechanism of media sterilization

Q.3(i) Explain briefly the Lineweaver-Burk plot and its application in a homogenous reaction system. [5] [CO 4][L2]
(ii) What do you understand by "bioreactor".Explain the characteristic features of different types of bioreactors. [5] [CO 4][L3,4]

Q.4 Explain any TWO of the following: [10] [CO 2;4;5][L1,3]
(i) Distinguish the configuration of a bioreactor for growth of plant cells with that for growth of animal cells
(ii) The various criteria for scale-up of bioreactors
(iii) Kinetics of substrate utilization and product formation

Q. 5 [10] [CO 5] [L1,2,3,4]
(i) How are the critical bioprocess parameters different from the non-critical bioprocess parameters. Explain
(ii) Describe the various accessories which are used to measure the various bioprocess parameters in a fermenter.

Total no. of Pages:1

Roll no.....

2nd SEMESTER

Btech Biotechnology

END TERM EXAMINATION *May-2025*

COURSE CODE:BT102 **Biochemical Engineering Principles**

Time: 03:00 Hours *Max. Marks: 50*

Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Write short notes on : [10] [CO 1;2][L3]

(i) Microbial growth kinetics

(ii) Plasmid Instability

Q.2 Explain the following briefly: [10] [CO 1;3][L2,4]

(i) Michaelis-Menten constant and its application in enzyme kinetics

(ii) Principles and mechanism of media sterilization

Q.3(i) Explain briefly the Lineweaver-Burk plot and its application in a homogenous reaction system. [5] [CO 4][L2]

(ii) What do you understand by "bioreactor".Explain the characteristic features of different types of bioreactors. [5] [CO 4][L3,4]

Q.4 Explain any TWO of the following: [10] [CO 2;4;5][L1,3]

(i) Distinguish the configuration of a bioreactor for growth of plant cells with that for growth of animal cells

(ii) The various criteria for scale-up of bioreactors

(iii) Kinetics of substrate utilization and product formation

Q. 5 [10] [CO 5] [L1,2,3,4]

(i) How are the critical bioprocess parameters different from the non-critical bioprocess parameters. Explain

(ii) Describe the various accessories which are used to measure the various bioprocess parameters in a fermenter.

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Total Number of Pages: 2

Roll No.....

2nd Semester
B. Tech Biotechnology

END-TERM EXAMINATION
BT 104 Introduction to Biotechnology

Time: 3 Hours **MAY-JUNE 2025**

Max. Marks: 50

Note: Answer ALL questions. All questions carry equal Marks
Assume suitable missing data, if any.

1 [a] Answer the following **[2.5+2.5] [CO1] [BTL 1,2]**

i. **Describe** the scope of biotechnology in modern science.
ii. **Explain** how biotechnology helps in improving crop yield.

[b] Demonstrate how biotechnology tools are used in different sectors (agriculture, medicine, industry). **[5] [CO1] [BTL 3]**

2 [a] Answer the following **[2.5+2.5] [CO2] [BTL1,2]**

i. **Explain** the difference between prokaryotic and eukaryotic cells.
ii. **Explain** the role of the nucleus in a eukaryotic cell.

[b] Demonstrate the function of major organelles within a eukaryotic cell. **[5] [CO2] [BTL 3]**

3 [a] Attempt any TWO of the following **[2.5+2.5] [CO3] [BTL 1,3,4,4]**

i. **Describe** the four major classes of biomolecules and their general functions in living organisms.
ii. **Outline** the structure of DNA and RNA and their classification as nucleic acids.
iii. **Outline** the basis of classification of enzymes and their role as biomolecules.
iv. **Describe** how biomolecules interact in metabolic pathways.

[b] Apply your understanding of microbial classification to explain how viruses differ from other microbes. **[5] [CO3] [BTL 3]**

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4 [a] Attempt **any TWO** of the following [2.5+2.5] [CO4] [BTL 1,2,3,4]

i. **Describe** the structure and function of a gene.

ii. **Describe** how gel electrophoresis is used to analyze DNA.

iii. **Describe** the basic steps involved in recombinant DNA technology.

iv. **Outline** the stages of gene expression from DNA to protein.

[b] **Apply** the central dogma of molecular biology to describe how genetic information flows within a cell. [5] [CO4] [BTL 3]

5 [a] **Answer the following** [2.5+2.5] [CO5] [BTL1,2]

i. **Define** stationary and mobile phases in chromatography and explain their functions in the separation process.

ii. **Define** centrifugation and explain its principle.

[b] **Demonstrate** the principle behind gel electrophoresis and how it separates molecules with the help of a diagram? [5] [CO5] [BTL3]

Roll No. .....

Total No. of Pages: 3

FOURTH SEMESTER

B. Tech. (BT)

May-2025

END SEMESTER EXAMINATION

BT 202 Molecular Biology

Time: 3.00 Hours *Max. Marks: 40*

Note: All questions are compulsory.
Assume suitable missing data, if any.

Q.1 Answer the following [2+2+4 marks] [CO 1, 2, 3] [BTL 1, 2, 4]

[A] Analyze the structure of *ori* C with respect to DnaA binding, DNA unwinding, and DNA bending during prokaryotic replication

[B] Attempt **any ONE** of the following

(i) Analyze the structure of guide RNA catalyzing insertional editing

(ii) Give an analysis of RNA sequences leading to intrinsic hairpin termination of prokaryotic transcription

[C] Give a descriptive account of initiation factors involved in eukaryotic translation. How does mRNA circularization occur and what is its significance?

Q.2 Answer the following [4+4 marks] [CO 2] [BTL 2, 4, 5]

[A] Attempt **any TWO** of the following

(i) Eukaryotic transcription termination is coordinated with cleavage and polyadenylation. Explain the steps with details of enzymes / proteins involved

(ii) Give an analysis of RNA Pol II CTD tail phosphorylation both in transcription and post-transcriptional processing

(iii) Compare and contrast 'open clamp' and 'closed clamp' conformations of bacterial RNA Pol

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P.T.O.

[B] Discuss the structures and functions / mechanisms of action of <u>any two</u> of the following proteins / RNAs

(i) Endonuclease catalyzing splicing of tRNA introns

(ii) snoRNA catalyzing methylation of eukaryotic pre-rRNA

(iii) Uracil rich snRNPs forming catalytic center during spliceosomal splicing of GU-AG intron

Q.3 Answer the following [4+4 marks] [CO 3] [BTL 1, 2, 4]

[A] Attempt <u>any TWO</u> of the following

(i) Give an analysis of the cyclization and rearrangement steps of intein splicing

(ii) In the process of prokaryotic translation describe how the direct localization of initiator tRNA at the P site of ribosome achieved

(iii) Give a detailed account of post-translational modification of preproinsulin. Discuss the roles of pre- and pro-sequences

[B] With a well-labelled diagram, discuss the acquisition of hybrid states during the elongation phase of prokaryotic translation. Also explain the conformations of elongation factor involved in translocation step

Q.4 Answer the following [4+4 marks] [CO 4] [BTL 2, 3, 5, 6]

[A] Attempt <u>any TWO</u> of the following

(i) Explain the structure of lac repressor (LacR) and its mechanism of action in controlling *lac* operon. How does inducer binding alter the structure of LacR?

(ii) How can antisense oligonucleotides be designed for nuclear and cytoplasmic inhibition of gene expression?

(iii) Compare and contrast siRNAs and miRNAs with respect to their generation and complementarity to target mRNA

[B] Design a trans-acting hammer-headed ribozyme assuming a sequence of target mRNA. Examine its catalytic residues in facilitating in-line nucleophilic attack

P.T.O.

Q.5 Answer the following [4+4 marks] [CO 5] [BTL 1, 2, 4, 5]

[A] Attempt <u>any TWO</u> of the following

(i) Give a flowsheet representation of Sanger's method of DNA sequencing. Assuming a sequence of template DNA, explain how is DNA sequence read from autoradiogram?

(ii) What are forward and reverse PCR primer pairs? Also explain any four factors affecting PCR primer designing

(iii) Giving suitable examples, compare and contrast sticky end and blunt end restriction endonucleases used in gene cloning

(iv) Give a descriptive account of base specific modification and cleavage reagents used in Maxam and Gilbert DNA sequencing

[B] Give an analysis of <u>any two</u> of the following with respect to Southern hybridization

(i) Basis of selection of membrane

(ii) Detection of hybridization

(iii) Immobilization of DNA on membrane

* END *

5-8

Total no. of Pages: 2

Roll no.....

IV SEMESTER

B.Tech

END TERM EXAMINATION *May-2025*

COURSE CODE BT 204 COURSE TITLE *Data Structure & Algorithm*

Time: 03:00 Hours *Max. Marks: 40*

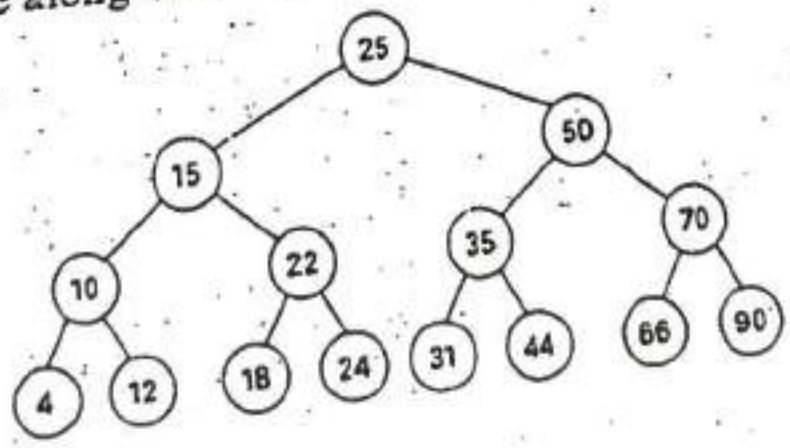
Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 a) Create an algorithm to insert an element in a circular queue. Justify with the help of real-life scenarios where circular queue is better than a queue. [5][CO1][BTL5, 6]

b) Develop an algorithm to reverse a singly linked list, Additionally, analyse the time and space complexity of your algorithm. [5][CO2][BTL4,6]

Q.2 a) Construct an AVL tree from the given list of elements: 5, 12, 10, 9, 8, 14, 23, 29, 28, 17. Also identify the nodes where rotations occurred and specify the type of each rotation. [5][CO3][BTL1,6]

b) Find the pre-order, post-order and In-order traversal of the following Binary tree along their recursive code: [5][CO3][BTL3,4]



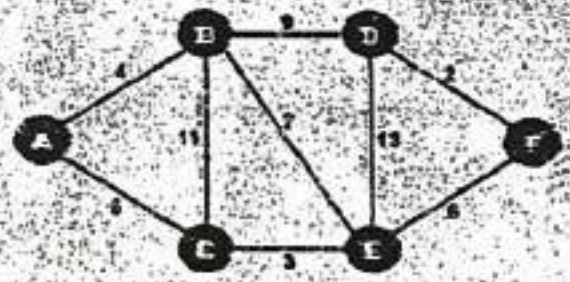
Q.3 a) Apply the Quick Sort algorithm to arrange the following list of elements in sorted order: [5][CO4][BTL3]

Q, U, I, C, K, S, O, R, T, E, X, A, M, P, L, E.

b) Identify the need of hashing in real world scenarios. Also discuss various collision resolution techniques along with their advantages and disadvantages. [5][CO4][BTL1,2]

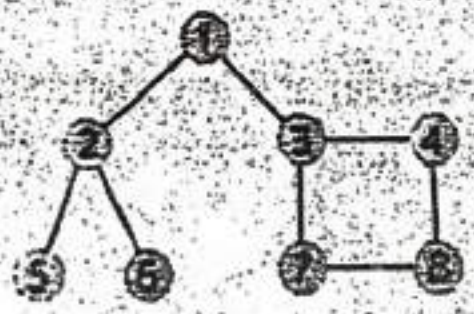
Q.4 a) Analyse the limitations of Dijkstra's algorithm when dealing with graphs that contain negative weight edges. What consequences can arise if it is still used? [5][CO5][BTL4,1]

b) Apply Dijkstra's algorithm to determine the single-source shortest paths from vertex 'A' in the given graph: [5][CO5][BTL3]



OR

b) Apply Depth First search on the graph given below. Show proper steps starting with Node 1. [5][CO5][BTL3]



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Total No. of Pages 02

Roll No. .....

FOURTH SEMESTER

B.Tech [BT]

END TERM EXAMINATION MAY-2025

BT 206: Microbiology

Time: 03:00 Hours Max. Marks: 40

Note: ALL questions carry equal marks.
Assume suitable missing data, if any.

Q.1 (a) Explain culture techniques required for isolation of different microorganisms. [4] [CO1] [L1,2]

(b) Define del factor. Discuss how microbial preservation occurs by overlaying culture with mineral oil. [2+2=4] [CO1, CO2] [L6]

Q.2 (a) Calculate the sterilization time period for the bacteria whose specific death rate at 121°C was found to be 1.62 min^{-1}, if del factor for heating, cooling and overall are respectively 10, 9, 29.2. Write the mode of transportation involved in Sodium-glucose pump in a bacterial cell. [3+1=4] [CO2] [L3,5]

(b) Distinguish any 2 of the following: [2+2=4] [CO2, CO3] [L4]

(i) Facilitated and Active Transport

(ii) Cell wall of gram-positive and gram-negative bacteria

(iii) Tropophase and Idiophase

Q.3 (a) Explain how antimicrobial agents work against bacteria. [4] [CO3] [L1,2]

(b) Differentiate *any two* of the following: [2+2=4] [CO3, CO4] [L4]

(i) Bacteriostatic and Bactericidal agent

(ii) Nitrogen Mineralization and Nitrogen Immobilization

(iii) Bergey's Manual of Determinative and Systematic Bacteriology

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Q.4 (a) Discuss any two molecular methods of Identifying and classifying microorganisms. [4] [CO4] [L6]

(b) Explain Phylogenetic and Phenetic system of classification. Write a short note on Prion. [2+2=4] [CO4, CO5] [L5]

Q.5 (a) What is an infection? Explain the Port of entry of pathogens into a host cell. [1+3=4] [CO5] [L2]

(b) Describe the mechanism of microbial pathogenesis in humans. [4][CO5][L5]

Or

Elaborate how interaction between plant and microbe take place. [4] [CO5] [L6]

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Total No. of Pages: 02

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IV SEMESTER

B.Tech. (Biotechnology)

END TERM EXAMINATION

May- 2025

BT208 Advances in Computational Biology

Time: 3:00 Hours *Max. Marks: 40*

Note: Attempt any 5 questions.
All questions carry equal marks.
Assume suitable missing data, if any

1) (a) Define the Protein Mutation Database (PMD). Outline it's key components and explain how it helps in understanding the functional effects of protein mutations.

(b) Explain how visualization tools linked to PDB and MMDB help in understanding the structure-function relationship of proteins.

[4+4] [CO# BT-208.2] [BTL#2]

2) (a) Discuss the three primary types of machine learning- supervised, unsupervised, and reinforcement learning.

(b) AI is used in recommendation systems like Netflix or Amazon. What type of machine learning helps these systems work, and how does it personalize suggestions? How would you improve the accuracy of such a recommendation model?

[4+4] [CO# BT-208.5] [BTL#6]

3) (a) What are genetic variations? Explain the major types of genetic variations commonly observed in human populations.

(b) Discuss the importance of the COSMIC database in identifying cancer associated mutations. Provide an overview of it's key features and data types.

[4+4] [CO# BT-208.1] [BTL#4]

4) (a) Pharmacogenomics focuses on how genetic variations affect individual responses to drug. Which bioinformatics databases would you use to gather data on gene-drug interactions? Explain the type of information each database provides.

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(b) The concept of personalized medicine moves beyond the 'one-size-fits-all' approach in treatment. How does leveraging genomic information lead to better disease prevention, diagnosis, and treatment compared to conventional healthcare approaches?

[4+4] [CO# BT-208.3] [BTL#3]

5) (a) Describe the key steps involved in constructing a phylogenetic tree. How is this process used for predicting evolutionary lineages?

(b) Discuss the applications of phylogenetic prediction in fields such as drug discovery, epidemiology, and conservation biology.

[4+4] [CO# BT-208.4] [BTL#1]

6) (a) You are developing a model to detect fake accounts on a social media site. Which machine learning method would be suitable for this classification problem? Draw a flowchart outlining the steps from collecting data to making predictions.

(b) Describe how machine learning is applied across various sectors such as healthcare, finance, and agriculture. Provide examples to illustrate it's impact in each domain.

[4+4] [CO# BT-208.5] [BTL#5]

Total no. of Pages:2 *Roll no.....*

IVth SEMESTER

B.Tech. (BIOTECHNOLOGY)

May-2025

END TERM EXAMINATION

BT210 Biochemistry

Time: 03:00 Hours *Max. Marks: 40*

Note: Question No. 1 is compulsory. Attempt FIVE questions in all. Assume suitable missing data, if any.

Q.1 Answer the following questions in brief: [12][CO#1,2,3,4,5][BTL#L2]

[a] Why TCA cycle is amphibolic in nature?
[b] Why saturated FA have high melting point than their corresponding unsaturated fatty acids with same number of carbons?
[c] Why HDL is known as good cholesterol while LDL is bad?
[d] Why diet excessively rich in proteins cause gout?
[e] What is the clinical significance of SGPT/SGOT levels?
[f] Draw the structure of Glycine that will predominate at pH 1.5 (given its pI=6.0).

Q.2 Answer the following questions:

[a] Who is the father of Biochemistry? Enlist different types non-covalent interactions found in biomolecules. [3][CO#1][BTL#L1, L2]

[b] What are chemical buffers? Why maintaining constant internal pH is important for a cell/ living organism? [4][CO#1][BTL#L3]

Q.3 Answer the following questions:

[a] Give the postulates of Watson and Crick model of B-DNA. [3][CO#2][BTL# L3]

[b] Draw the structure of the following biomolecules: [4][CO#2][BTL#L5]
(i) 20:4 ($\Delta^{5,8,11,14}$) fatty acid.
(ii) α-D Glucose

Q.4 Answer the following questions:

[a] What is criss-cross regulation of metabolism? Explain with the example of Glycolysis and gluconeogenesis.
[3][CO#4][BTL#L4]

[b] Give sequence of ETC in case of humans diagrammatically.
[4][CO#3][BTL#L6]

Q.5 Answer the following questions:

[a] What are ketone bodies? Elaborate their clinical significance.
[3][CO#4][BTL#L1]

[b] Write the steps of β-oxidation of palmitic acid.
[4][CO#3][BTL#L6]

Q.6 Answer the following questions:

[a] Explain the process of oxidative deamination? [3][CO#5][BTL#L2]

[b] Summarize the steps of de novo synthesis of AMP.
[4][CO#5][BTL#L5]

Total no. of Pages: 02 Roll no.....

VIthSEMESTER

B.Tech. Biotechnology

ENDTERM EXAMINATION *May-2025*

COURSE CODE- BT302 COURSE – Plant Biotechnology

Time: 03:00Hours *Max.Marks:40*

Note: All questions carry equal marks. Attempt any 5 questions Assume suitable missing data, if any.

Q.1 a) Explain mature and immature embryo culture with applications.
b) Compare and contrast the advantages and problems associated with micropropagation. [2×4][CO1][L1,4]

Q.2 a) Explain different steps in cryopreservation with the help of a labelled diagram.
b) What is the role of cryoprotectants in the process of cryopreservation? [2×4][CO2][L2]

Q.3a) Explain the process of direct DNA transfer by different methods. Also discuss the limitations of this method
b) Explain gene transfer by Ti plasmid based vector. Explain the construct of Ti plasmid. 2x4][CO3][L3,6]

Q.4 a) Define the term transgenic. Describe an overview of transgenic plant development.
b) How has the CpTi gene been used in the development of insect-resistant transgenic crops [2×4] [CO5,4][L3,4]

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Q.5 a) Give an overview of gene cloning. Discuss Type I, Type II and Type III restriction enzymes

b) How are linkers and adaptors used for blunt end modification?
[2×4] [CO 4][L4,5]

Q6. a) What are pathogenesis-related (PR) proteins and how do they help in disease resistance

b) What are phytoalexins? Explain their role with the help of an example in providing disease resistance. [2×4][CO4,5][L2,3]

Total No. of pages-2

Roll No.....

SIXTH SEMESTER
B.TECH. (BIOTECHNOLOGY)
END SEMESTER EXAMINATION MAY-2025
BT 304: ANIMAL BIOTECHNOLOGY

Time: 3.00 Hours Max. Marks: 40

Note: Answer *All* questions.
Assume suitable missing data, if any.

Q1. Write short notes on following [4×2=8] [CO-3, 4][BTL 1,2]

a) Conjugate vaccine
b) Induced pluripotent stem cells
c) SARS-CoV-2
d) Fever and its type

Q2. Answer all questions [2×4=8] [CO-3, 4][BTL 1,2]

a) Define Transgenic Animals. Explain in brief the three modes of gene transfer employed to generate Transgenic Animals.
b) Demonstrate the significance of Transgenesis, how the Transgenic Animal study could benefit society, explain with examples.

Q3. Answer all questions [2×4=8] [CO-3, 4][BTL 2,4]

a) Describe infectious agents. Demonstrate the clinical features of infectious disease.
b) Explain the biochemical manifestation methods of infectious diseases.

Q4. Answer all questions [2×4=8] [CO-2, 4][BTL 3,4]

(a) Describe gene knockout technology, and how gene knockout Animals are produced.
(b) Discuss the applications of gene knockout animals models of human genetic disorders.

P.T.O.

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Q5. Answer all questions [2×4=8] [CO-1, 5][BTL 3,4]

a) Describe mABs technology, outline the process of mABs development and testing Methods

b) Classify the different types of mABs, explain the diagnostic and therapeutic applications

OR

a) Compare the significant features of apoptosis and necrosis, state the major differences and the mechanisms involved, State the two methods applied for apoptosis assay for cytotoxicity evaluation

b) Illustrate the methods for producing genetically engineered antibodies. Outline the significance of producing genetically engineered mAbs over mouse-raised mAbs.

-END-

Total No. of Pages: 3 Roll No. .....

SIXTH SEMESTER

B. Tech. IBT)

END SEMESTER EXAMINATION ***May-2025***

BT 306 Genomics & Proteomics

Time: 3.00 Hours ***Max. Marks: 40***

Note: All questions are compulsory
Assume suitable missing data, if any

Q.1 Answer the following [4+4 marks] [CO 1, 2] [BTL 1, 2, 5, 6]

[A] Attempt **any TWO** of the following

(i) Discuss in detail any one strategy for contig assembly

(ii) Explain the reactions involved in pyrosequencing and analyze the significance of using α-thio ATP in the process

(iii) Design SMRTBell template and explain its advantage

(iv) Write a note of fluorescent dyes used in automated DNA sequencing

[B] Design a strategy for transposon mutagenesis using heterologous Ac/Ds transposon in *Arabidopsis*. Also give an analysis of positive and negative selections in the procedure

Q.2 Answer the following [4+4 marks] [CO 2] [BTL 1, 2, 3, 5]

[A] Attempt **any TWO** of the following

(i) Explain the term 'conserved synteny' and explain its advantages in grass family

(ii) Compare and contrast cladogram and phylogram

(iii) Comment on SNPs with respect to drug response and disease susceptibility

(iv) Discuss the principle of TOGA protocol

P.T.O.

[B] Discuss the properties and application of linkers, restriction enzymes and tags used in original SAGE protocol

Q.3 Answer the following [2+2+4 marks] [CO 3, 5] [BTL 1, 2, 3]

[A] Attempt <u>any ONE</u> of the following

(i) Explain the principle of 2-D electrophoresis. How is it used in protein identification?

(ii) Give a descriptive account of ion source and mass analyzer used in MALDI-ToF

[B] Discuss the properties and advantages of TAP tag

[C] What is Edman's reagent? How is it applied in protein sequence determination? Explain the procedure and reactions involved

Q.4 Answer the following [4+4 marks] [CO 4, 5] [BTL 1, 2, 3, 6]

[A] Attempt <u>any TWO</u> of the following

(i) Devise a strategy for DNA-protein interactomics analysis based on antibody-antigen interactions. How does it differ from coimmunoprecipitation?

(ii) Comment on interactomics giving structure of basic leucine zipper (bZIP)

(iii) Discuss immobilization techniques and capture molecules used in protein microarray

[B] Demonstrate DNA-protein interactions using DNase I footprinting with a well-labelled diagram. Explain the principle and procedure involved in detail

Q.5 Answer the following [4+4 marks] [CO 5] [BTL 1, 2, 3, 6]

[A] Attempt <u>any TWO</u> of the following

(i) Design a strategy to analyze protein-protein interactions during apoptosis using GFP tagging. Explain the principle involved

(ii) Apply yeast three hybrid system in analyzing molecular interactions. Explain with well-labelled diagram

P.T.O.

(iii) Comment on robustness and buffering systems of cell

(iv) Explain the principle of phage display in protein-protein interaction analysis

[B] Devise a strategy for generation of yeast knock out library. Also give a detailed account of yeast genome wide interaction analysis giving the principle and procedure of Synthetic Lethal Analysis by Microarray (SLAM)

*** END ***

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Total No. of Pages: 2 Roll No. .....

SIXTH SEMESTER

B.Tech.

END-SEMESTER EXAMINATION ***MAY 2025***

BT320 GENOMICS IN MEDICINE

Time: 3 Hours *Max. Marks: 50*

Note: Attempt 5 Questions(Question 1 is compulsory)
Attempt any 4 questions from the remaining questions
Assume suitable missing data, if any.

Q1. Define the Following Terms:
(a) Molecular Epidemiology
(b) Transcriptomics
(c) Pathogenicity
(d) Genetic Disorders
(e) Cardiovascular Disorders
[2*5=10marks] [CO# 2,3,4,5,6] [BTL#1]

Q2. (a)What is genomics? Write two ways in which genomics has helped improve medicine. Give examples.
(b)What was the Human Genome Project (HGP)? Write any three important goals or achievements of the HGP.
[5+5marks] [CO#1, 2] [BTL#1,2]

Q3. (a) Explain the cause and symptoms of Down syndrome. Explain briefly any two therapeutic approaches for treating single-gene disorders.
(b) Compare and contrast radiological methods and immunohistochemistry techniques used in cancer diagnosis.
[5+5 marks] [CO# 4,5] [BTL#2,4]

Q4. (a) Explain Comparative Genomics and mention any two applications.
(b) Explain the role of oncogenes and tumor suppressor genes in cancer development.
[5+5 marks] [CO# 2,5][BTL#,2,3]

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Q5. (a)Name the causative microbes and symptoms of the following infectic diseases.

1. Tuberculosis
2. HIV/AIDS
3. Typhoid
4. Malaria
5. Cholera

(b) Describe how nutrition and lifestyle influence a person's resistance tc infections

(c) Explain the structural abnormalities in chromosomes with diagram.

[2.5+2.5+5 marks] [CO# 3,4][BTL#1,2

Q6. (a) Explain polygenic disorders. Explain with one example and menti the therapies for treating the polygenic disorder.

(b) What is host resistance to infection? Name two components of inn immunity that help prevent infection.

[5+5 marks] [CO# 6,3][BTL-1

END

Why genetic sequences are stored in special file formats instead of word document, explain using 2 specific file formats names with their detailed advantage and disadvantages.

or

Explain in depth about genetic maps models and structural properties of genotype-phenotype maps.

5. Discuss in brief (with 2 examples)
[2x5=10] (CO#3, 4, 5, 6) (BTL 1, 3, 4)

a. API and web interface
b. Denovo sequence assembly
c. Need of prediction tools
d. Sequence based identification of molecular structure (DNA and protein)
e. Indels and related softwares
f. Biological database interface (BDI)
g. Assigning homologous and paralogous function based on structure alignment

Total no. of pages: 4 *Roll No. .....*

IV/VI/VIII SEMESTER
B.Tech (elective course)
End Term Examination **May 2025**
BT328 Bioinformatics Approach in Complex Disorders

Time: 3:00 Hours **Max. Marks: 50**

Note: Answer all questions. Assume suitable missing data, if any.

1. Write Short note on following (any 6, with 2 examples each)
[2.5x6= *15 marks*] (CO#1, 3, 4, 5) (BTL 1, 2)

a. Lifestyle disorders
b. Protein databases
c. NoSQL
d. Multiple sequence alignment
e. Profile
f. Conserved domains databases
g. Cloud based storage
h. Polygenic inheritance

2. Answer the following: [2x5= *10 marks*] (CO# 4, 6) (BTL 5, 6)

a. In a bioinformatics study, a logistic regression model is used to predict whether a patient will develop a complex disorder based on the presence of a genetic marker (SNP1). The logistic regression model is trained, and you are provided with the following information:

Why genetic sequences are stored in special file formats instead of word document, explain using 2 specific file formats names with their detailed advantage and disadvantages.

or

Explain in depth about genetic maps models and structural properties of genotype-phenotype maps.

5. Discuss in brief (with 2 examples)

[2x5=10] (CO#3, 4, 5, 6) (BTL 1, 3, 4)

a. API and web interface
b. Denovo sequence assembly
c. Need of prediction tools
d. Sequence based identification of molecular structure (DNA and protein)
e. Indels and related softwares
f. Biological database interface (BDI)
g. Assigning homologous and paralogous function based on structure alignment

Total no. of pages: 4

Roll No. .....

IV/VI/VIII SEMESTER

B.Tech (elective course)

End Term Examination **May 2025**

BT328 Bioinformatics Approach in Complex Disorders

Time: 3:00 Hours **Max. Marks: 50**

Note: Answer all questions. Assume suitable missing data, if any.

1. Write Short note on following (any 6, with 2 examples each)

[2.5x6= *15 marks*] (CO#1, 3, 4, 5) (BTL 1, 2)

a. Lifestyle disorders
b. Protein databases
c. NoSQL
d. Multiple sequence alignment
e. Profile
f. Conserved domains databases
g. Cloud based storage
h. Polygenic inheritance

2. Answer the following: [2x5= *10 marks*] (CO# 4, 6) (BTL 5, 6)

a. In a bioinformatics study, a logistic regression model is used to predict whether a patient will develop a complex disorder based on the presence of a genetic marker (SNP1). The logistic regression model is trained, and you are provided with the following information:

The coefficient for SNP1 (β_1) = 2.3.

The intercept (β_0) = -1.2.

For a patient who carries the SNP1 genetic marker (i.e., SNP1 = 1), calculate the probability that the patient will develop the disorder.

Or

A bioinformatics study is using logistic regression to predict the likelihood of a patient developing Type 2 Diabetes based on two genetic markers, SNP1 and SNP2. The logistic regression equation is as follows:

Intercept (β_0) = -2.8, Coefficient for SNP1 (β_1) = 1.9

Coefficient for SNP2 (β_2) = -0.5

For a patient who has the following genetic information:

SNP1 = 1 (present)

SNP2 = 0 (absent)

Calculate the probability of the patient developing Type 2 Diabetes.

b. Write SQL query for following (any five):

1. to find the gene with the smallest start position in the Gene table.
2. to retrieve the gene with the highest end position in the Gene table.
3. to find the average start position of the genes in the Gene table.
4. to count the total number of genes present in the Gene table.
5. to retrieve all gene names and their corresponding protein names, ensuring that even genes without associated proteins are included in the result.
6. to select only the first 2 genes from the Gene table.
7. to retrieve all the columns from the Gene table.

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3. Answer the following (any 2)

[2x5=10] (CO#4, 5, 6) (BTL 2, 3, 5)

a. What are intrinsic properties and how does they play important role in individual survival and evolution, explain using at least two suitable examples.

b. In the context of a bioinformatics database system designed to manage and analyze large-scale datasets including genomic sequences, protein structures, gene expression data, and biological pathways, justify the selection of appropriate data models for each of these biological entities. Additionally, elaborate on how indexing strategies can be employed to optimize query performance, particularly in the retrieval of genes based on their genomic location (e.g., start and end positions on chromosomes).

c. Why do users need unsupervised learning in ML techniques, explain using examples and key algorithms used in this technique.

4. Write the details explanation of the following question

[1x5=5] (CO#2, 4) (BTL 3, 5)

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Total No. of Pages :02

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8th SEMESTER

B.TECH. (Biotechnology)

END SEMESTER EXAMINATION (May 2025)

BT-408 Bioethics and Intellectual Property Rights

Time: 3hour Max. Marks: 50

Note:- Answer any 5 Questions. Each question carries 10 marks
Assume suitable missing data, if any.

1) a) Describe the process of patent filing and grant of patent in India. Comment on how Indian patent regulations need to be amended, giving suitable justifications. Explain what is meant by a PCT application and how is it beneficial to the applicant.

b) Explain in detail the controversy surrounding the patenting of haldi or neem extract and how is it an infringement of traditional knowledge as defended by India? How can we further ensure that traditional knowledge is protected? [CO2] [L1,4]

2) a) What are genetically modified crops? Elucidate the advantages and disadvantages in using such crops.

b) Describe the 4 basic principles of ethics and how are they relevant in a biological context? [CO1, 4][L2,6]

3) a) Discuss the ELSI relevant to Human Genome Project. Describe using a suitable case study, how bioethics is relevant in drug development.

b) Using a suitable case study, (giving specifics of the case) discuss how bioethical violation relevant to environmental issues have been litigated and judgment dispensed. [CO3,5][L3,5]

4) a) What are cross-sectional and longitudinal studies? How is prevalence and incidence important in identifying sporadic, chronic, pandemic and endemic diseases? In case a disease has high rate of infectivity and high mortality rates, how will the prevalence and incidence of the disease be reflected? Can such a disease be a chronic disease?

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b) What are the different phases of clinical trials? Why are they important? What do you understand by cohort and how is a cohort selected? [CO5][L4,5]

5) Write short notes on the following: [CO1,2,3,4][L1,2]
   a) Trademarks
   b) Retrospective clinical trials
   c) Triple packaging
   d) Bio-piracy
   e) Paris Convention in Indian context

6) a) What are the regulations in different Biosafety facilities and how are they important in protecting the users?
   b) Describe ethical issues related to healthcare using a specific case study, highlighting the controversies of the case and its litigation. How are copyrights and patents different in protecting the IPR of an individual? Comment on how affordable healthcare may be a controversial dilemma with IPR protectionism. [CO3, 5][L1,6]

Total no of pages 02

Roll No.....

VIII – SEMESTER

B.Tech.

END SEMESTER EXAMINATION MAY2025

BT426:-Environmental Biotechnology

Time: 3 Hours Max. Marks: 50

Note: Answer all questions. Assume suitable missing data, if any.

Q1 Answers all questions. [3x5][CO# 1,2,6][L1,2]

a) Define environmental pollution and describe its different types.?

b) What is ozone depletion, and how does it affect the environment?

c) Explain the greenhouse effect and its role in global warming.

d) Describe the formation of acid rain. What are its main environmental impacts?

e) Define aerosols and What is the role of aerosols in air pollution?

Q2. Answers all questions. [2x4][CO# 3,4,5][L1]

a) What is biogas and What are the main components of biogas

b) What is composting? Write the chemical reaction involved in it?

c) What do you mean by activated sludge?.

d) What are degradative plasmids? Give two examples of degradative plasmids?

3 Answers all questions. [3x3] [CO# 1,3,4,5][L1,2,4]

a) What are xenobiotics? Discuss the environmental factors influencing their microbial degradation?

b) What is vermicomposting? Discuss the benefits of vermicomposting.

c) What do you mean by water pollution? Describe the physical and chemical contaminants commonly found in polluted water.

Q4. Answers all questions. [2x4] [CO# 3,5][L2,5]

a) What is anaerobic digestion? Explain the different stages of anaerobic digestion in waste water treatment?

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b) What is bioremediation, Compare and contrast in-situ and ex-situ bioremediation methods.

Q5. Answers any two. **[2x5] [CO# 3,5][L2]**

a) Describe chemical and biological treatment methods used in wastewater treatment.

b) What do you mean by biopesticides and its types? Explain the microbial biopesticides in detail by giving the example.

c) Explain the process of composting in detail?

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Total no. of Pages:2 Roll no.....

2nd SEMESTER

B.Tech.

END TERM EXAMINATION *May-2025*

CH102: *Mechanical Engg. Concepts for Chemical Engineers*

Note: Answer any 5 questions. Assume suitable missing data, if any.

Time: 03:00 Hours *Max. Marks: 40*

Q.1 (a) Explain mechanical, chemical and thermal equilibrium.[3] [CO1]

(b) What is an ideal gas? What is the difference between the universal gas constant and characteristic gas constant? [3] [CO1]

(c) What do you understand by path function and point function? Give one example of each. [2] [CO1]

Q.2 (a) In a steam power station, steam flows steadily through a 0.2 m diameter pipeline from the boiler to the turbine. At the boiler end, the steam conditions are found to be: $p = 4$ MPa, $t = 400^0$C, $h = 3213.5$ kJ/kg, and $v = 0.073$ m^3/kg. At the turbine end, the conditions are found to be: $p = 3.5$ MPa, $t = 392^0$C, $h = 3202.5$ kJ/kg and $v = 0.084$ m^3/kg. There is a heat loss of 8.5 kJ/kg from the pipeline. Calculate the steam flow rate. [3] [CO2]

(b) What is a Carnot cycle? Draw its P-V and T-S diagrams explaining the various processes of the cycle. [3] [CO2]

(c) A heat engine receives half of its heat supply at 1000 K and half at 500 K while rejecting heat to the sink at 300 K. What is the maximum thermal efficiency of the heat engine? [2] [CO2]

Q.3 [a] What is Newton's law of viscosity? What are its units in SI and CGS, how are they related? [3] [CO3]

[b] State and prove Pascal's law. [3] [CO3]

[c] A pump discharges a liquid into a drum at the rate of 0.032 m^3/s. The drum, 1.5 m in diameter and 4.20 m in length, can hold 3000 kg of the liquid. Find the density of the liquid handled by the pump. [2] [CO3]

Q.4 [a] What are the four basic components of a thermal power plant? Draw a suitable diagram and explain the functions of various components. [4] [CO3]

[b] Show that the efficiency of an Otto cycle depends only on the compression ratio [2] [CO3]

[c] Briefly explain the function of a moderator and a control rod used in nuclear power plant. [2] [CO4]

Q.5 [a] Discuss the effects of following alloying elements on steel:
[i] Nickel [ii] Chromium [iii] tungsten [iv] Cobalt [4] [CO4]

[b] Name any four non-ferrous metals. Give their properties and uses. [2] [CO4]

[c] Differentiate between brass and bronze. Mention any two mechanical properties of each. [2] [CO4]

Q. 6 [a] Explain the following sheet metal operations.
(i) Shearing (ii) piercing (iii) Nibbling and (iv) blanking [4] [CO5]

[b] Differentiate between an AC and a DC arc welding [2] [CO5]

[c] Explain the following casting defects:
(i) Blow holes (ii) Porosity (iii) shrinkage (iv) Hot tears. [2] [CO5]

Q.7 [a] What are line and end standards? Briefly explain. [3] [CO6]

[b] Explain the followings [i] Wire Guage [ii] Micrometer
(iii) Dial Indicators [3] [CO6]

[c] Differentiate between drilling and boring operations [2] [CO6]

Total no. of Pages:02 Roll no.....

SECOND SEMESTER

B.Tech.

END TERM EXAMINATION *May-2025*

CH104 INTRODUCTION TO CHEMICAL ENGINEERING

Time: 03:00 Hours *Max. Marks: 50*

Note: All questions are compulsory.
Assume suitable missing data, if any

Q.1 a) What are the various job options for a Chemical Engineering graduate. Explain the various work activities of a Chemical Development Engineer in a Chemical Industry. [5+5] [CO4, CO3] [BTL1]

b) Name the raw materials used for the manufacturing of Paint. How is it produced?

Q.2 a) Explain the process for producing C from A and B in Lab scale and an automated industrial process with the help of neat diagram. [5+5] [CO1, CO2] [BTL2, BTL3]

b) Identify among the unit operations and unit processes from the following and mention their names:

(i) $R = R' + H_2 \longrightarrow RH - HR'$

(ii)



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(iii)



(iv) $CaO + H_2O \longrightarrow Ca(OH)_2$

$H_2C{:}CH_2 + H_2O \longrightarrow CH_3CH_2OH$

(v) $ROH + H_2SO_4 \longrightarrow RHSO_4 + H_2O$

$ROH + R'COOH \longrightarrow R'COOR + H_2O$

Q.3 a) Justify with the help of atleast two examples that new energy-efficient unit operations are superior than the traditional ones. [5+5] [CO5, CO3] [BTL5, BTL1]

b) What do you mean by Process control and Automation? Explain Briefly.

OR

b) Define Evaporation process with its principle. Name the various evaporation equipment used in Industries.

Q.4 a) What do you mean by Process Flow Diagrams? Explain with the help of Example and a neat flow diagram. [5+5] [CO3, CO5]

b) Compare petroleum-based materials with biomass-based materials. [BTL2, BTL4]

Q.5 a) Build the symbols of the following used in process flow diagram. [5+5] [CO2, CO1] [BTL3, BTL2]

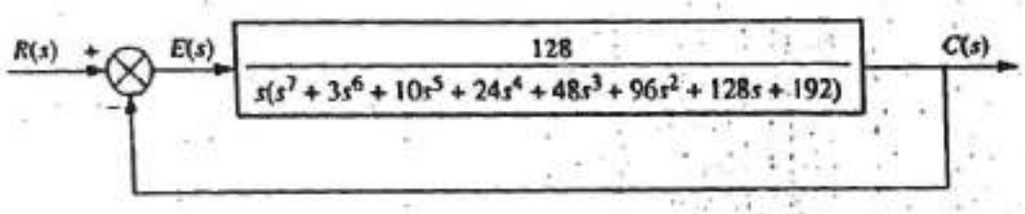
(i)	Control valve	(vi)	Coil in tank
(ii)	Open tank	(vii)	Rotary dryer
(iii)	Spray condenser	(viii)	Centrifugal pump
(iv)	Bin for solids	(ix)	Membrane separator
(v)	Tray dryer	(x)	Open vessel with agitator

b) Explain with examples how Chemical Engineering is used in daily life.

Q3. Sketch root locus plot for the following transfer function. Show all steps used to sketch the plot. Also find range of 'K' for which the system is stable. **[8][CO3][BTL4,5]**

$$G(s) = \frac{K(s-2)(s-4)}{(s^2+6s+25)}$$

Q4. Find the number of poles in the left half-plane, the right half-plane, and on the jω-axis for the system of figure given below. Draw conclusions about the stability of the closed-loop system. **[8][CO3][BTL5]**



Q5. Find analytical expressions for magnitude and phase responses of following transfer function. Also make a polar plot of given transfer function. **[8][CO4][BTL2,3]**

$$G(s) = \frac{1}{(s+2)(s+6)}$$

Q6. Design a lead compensator for the system given as G(s) to meet the following specifications: %OS = 20%, t_s = 0.2s and K_V = 50. **[8][CO5][BTL6]**

$$G(s) = \frac{K}{s(s+50)(s+120)}$$

Q7. Explain (in detail) with help of diagrams various capacitive methods used for measurement of liquid level. **[8][CO1][BTL1,2]**

Total No. of Pages: 04 Roll No. .....

FOURTH SEMESTER **B.Tech.**

END TERM EXAMINATION **(MAY 2025)**

CH-202n / EE-282a: Instrumentation and Process Control

Time: 3 hours ***Max. Marks: 40***

Note: First question is compulsory. Attempt any four from other six questions. Assume suitable missing data, if any. All questions carry equal marks. No graph/semi-log graph will be provided.

Q1. Mark the correct answers for all questions which form the subparts of this question: **[8][CO1,2,3][BTL1,2,3,4]**

(a). For input x(t) = sin(2t), find the amplitude and phase angle of y(t), given that the impulse response has a transfer function H(s) = s/(s-1).

i. Amplitude = 1, phase = 0 degrees
ii. Amplitude = √5, phase = -24.56 degrees
iii. Amplitude = 2/√5, phase = -26.56 degrees
iv. Amplitude = √5/2, phase = -36.8 degrees

(b). Which of the following is ***incorrect***?

i. There is no pressure drop in electromagnetic flow meter since there is no obstruction.
ii. Thermistors can be used as temperature compensators.
iii. Analog instruments are used to detect and read discrete waveforms.
iv. Ammeter is an example of indicating instrument.

(c). Which of the following statement is ***true*** about integral part of controller.

i. It produces steady state error
ii. It may produce overshoot
iii. Its action is of anticipatory type
iv. All of the above

(d). Hot wire anemometer has a resistance of 50 ohm. The current flowing through the wire is 0.5 amp. Find the rate of flow if the

density of liquid is 0.5 kg/m^3. a and b are constants depending upon the dimensions and properties of wire and fluid. Assume the values of a = 1 and b = 100.

i. 28 m/s ii. 56 m/s iii. 112 m/s iv. 14 m/s

(e). Real poles with zero imaginary part of transfer function:

i. constitutes exponential term only in the output response
ii. constitutes both the forced and natural components in the output response
iii. constitutes only the forced part in the output response
iv. sinusoidal term of the output response

(f). If amplitude of input is 10 units and that of output is 30 units then the magnitude of transfer function is:

i. 1/3 ii. 3 iii. 1.5 iv. 2

(g). Find peak time for unit step response of given transfer function $T(s) = 14.45/[(s^2+1.204s+2.829)(s+50)]$

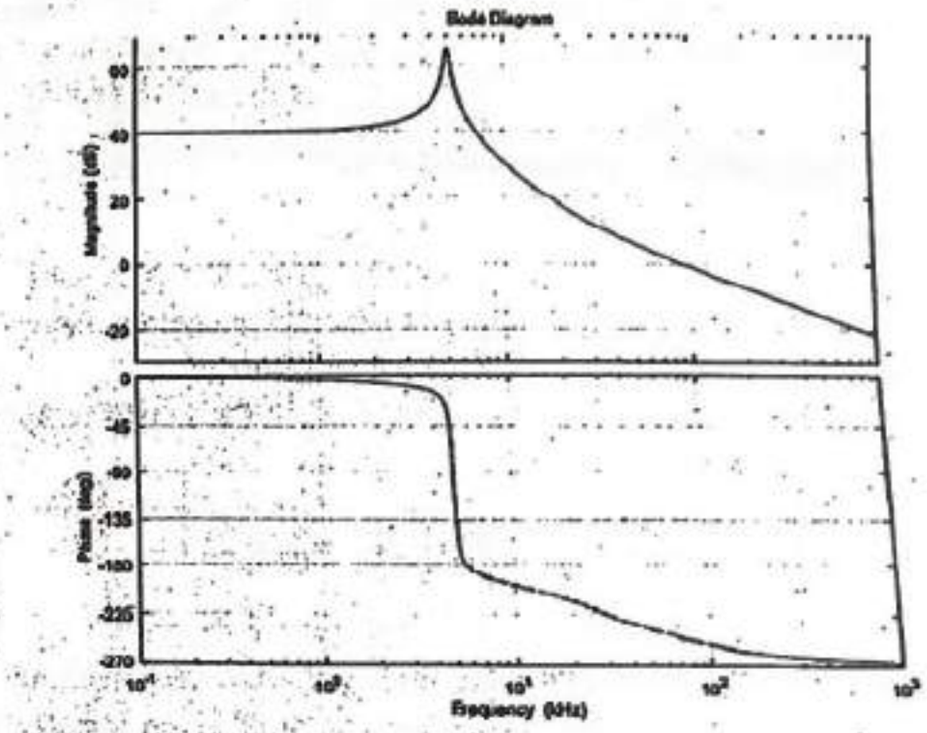
i. 1 sec ii. 2 sec iii. 3 sec iv. 4 sec

(h). The transfer function G(s)*H(s) = K/[(s+2)(s-1)] is given. Find 'K' for which the closed loop system has both the poles coinciding at a single point of real axis.

i. 2.25 ii. 0.44 iii. 5.5 iv. 0.88

Q2. In an exam, the following question was asked. The solution by one of the students is provided below. Assert whether the student did it correctly or not. If the student has done it incorrectly, provide the correct answer. [8][CO4][BTL4,5]

Question: From the following bode diagram, identify the location of poles and zeros of the transfer function. Write down the transfer function in normalized form.



Answer by student:

Q2.

Here are

a) ~~on the conjugate pole pair~~

a) second order pole with $\omega_1 = 5000$ r/s

From figure $20\log Q = 66$ dB

$\therefore Q = 10^{\wedge}(\frac{66}{20}) = 1995$

$\therefore$ poles $\frac{1}{(\frac{s}{\omega_1})^2 + \frac{s}{Q\omega_1} + 1} = \frac{1}{(\frac{s}{5000})^2 + \frac{s}{9975000} + 1}$

b) There is a zero at $\omega_2 = 30000$ r/s.

$\therefore$ zero $(1 + \frac{s}{30000})$

$\therefore TF = \frac{(1+\frac{s}{30000})}{(\frac{s}{5000})^2 + \frac{s}{9975000} + 1}$ (Ans)

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Total no. of Pages: 02 *Roll no.....*

4th SEMESTER **B.Tech (Chemical Engineering)**

END TERM EXAMINATION *May-2025*

CH204: Chemical Reaction Engineering-I

Time: 03:00 Hours *Max. Marks: 40*

Note : All questions carry equal marks.
Use pencil to draw diagram (s)
Use of graph papers is permitted
Assume suitable missing data, if any.

Q1(a) What is the mechanism of a reaction? Why the studies of reaction mechanism are important? Identify the different types of intermediates formed during a non-elementary reaction. [4] [CO2] [L1, L2]

(b) A polymerization reaction occurs at constant temperature in a homogeneous phase. For initial monomer concentrations of 0.3, 0.5 and 0.9 moles/lit, 30% of the monomer reacts in 40 minutes. Find the reaction rate. [3] [CO1] [L3]

Q2(a) Draw a neat diagram of Mixed Flow reactor and label its parts. [3] [CO4] [L4]

(b) Following gas phase reaction takes place at 500°C

$4PH_3(g) \rightarrow P_4(g) + 6H_2$ with $rPH_3 = 85h^{-1}CPH_3$.

Find the volume of plug flow reactor operating at this temperature and 5.5 atm, giving 80% conversion for a feed of 2.5 kg moles PH_3 per hour. (R= 0.08205 L atm/ mole K). [3] [CO4] [L3]

Q3 What is space time? What do you understand by "space time of 8 minutes"?

Prove that for an ideal C.S.T.R., $\tau = \frac{(CA0 - CA)}{-rA}$. [5] [CO4] [L1, L2, L5]

(b) 'N' plug flow reactors in series with a total volume 'V' gives the same conversion as a single plug flow reactor of volume 'V' for _____ order reactions. [1] [CO4][L4]

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Q4 (a) A constant volume batch reactor was operated at 10^0C. The following data was found at different intervals of time for a gas:

TIME (in min)	0	4	8	12	16
Partial Pressure (mm Hg)	760	475	320	240	150

Using the above data, find out the reaction rate constant. [3] [CO3][L4]

(b) Decomposition of a gas is of second order. When initial concentration of gas is 5×10^{-4} moles/lit. It is 40% decomposed in 50 minutes. Evaluate the value of the rate constant. [3] [CO3][L5]

Q5 (a) Why there is deviation from ideal flow patterns in case of real reactors. [2] [CO5] [L2]

(b) What is Residence Time Distribution (RTD). How RTD is determined? [3] [CO5] [L1, L6]

(c) What should be the characteristics of a material to act as a Tracer? [3] [CO5] [L5]

Q6 (a) Investigate the $\in_A$ value for the reaction, $N_2O \rightarrow N_2 + \frac{1}{2}O_2$. [1] [CO1][L6]

(b) For a chemical reaction A→B, the initial concentration of A is 2.7 moles/lit. The concentration of A After 4 hours is 1.3 moles/lit. What is the average rate of reaction? [2] [CO1] [L3]

(c) Investigate the value of $C_{R(max)}$ for a series reaction of type: A→R→S, where k_1 and k_2 are the rate constants for step 1 and step 2 respectively. [4] [CO2] [L6]

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Total No. of pages 03 Roll No.....

IV SEMESTER

B.Tech

END TERM EXAMINATION May-2025

CH206: Mechanical Operations

Time 3:00 Hours **Max. Marks: 40**

Note: All questions are compulsory
Graph Paper is required .
Assume suitable Missing data, if any

Q.No.		M	BTL	CO
1 [a]	Why do we add filter aid in slummy slurry? If filter cake is an important product, what method is used to add the filter aid and why?	2	L2	1
[b]	Discuss the batch sedimentation test. Correlates its zone with industrial scale thickener.	3	L2,4	2
2 [a]	Why does vortex formation take place in agitation vessels? Discuss the methods to prevent the vortex.	2	L1,2	1
[b]	2 tonnes of galena are to be reduced to fine powder by passing through a crusher and a grinder in succession, drawing power from the same drive. Screen analysis of feed, product from the crusher and product from the grinder indicated surface areas of 3, 114, and 900 m^2/Kg respectively. If the power required by the drive to run the crusher-grinder assembly is 18kW and efficiency of the crusher is 25%, find the efficiency of the grinder. Rittenger's number of galena is 95.7 m^2/kJ.	3	L3	3
3 [a]	Discuss the mechanism of screening operation in terms of stratification and separation probability.	2	L2	1

[b]	Discuss the factors which affect the solid solid mixing in tumbler mixer. For a particular bakery operation, it was desired to mix 95 kg of wheat powder with 5 kg of yeast. After 5 minutes, the mixing index was observed 0.247. How long should the mixing continue so that sample composition variance reaches as 0.01?	3	L2,3	1,3
4 [a]	A pilot plant vessel 0.6 m in diameter is agitated by a six blade turbine impeller 0.2 m diameter. At Reynolds number is 10^4, the blending time of two miscible liquids is found to be 20 sec. The power required is 0.8 kW/m^3 of liquid. What power input will be required to give the same blending time in a vessel of 2.4 m in diameter.	2	L3	3
[b]	Discuss the working principle of rotatory drum filtration process with help of neat diagram.	3	L2	2
5 [a]	The mixture of quartz (specific gravity 2.65) and galena (specific gravity 7.5) is to be separated using water in a hydraulic classifier. The ore particles have a size range of 0.0002 cm to 0.001 cm. Assuming the flow to be laminar and neglecting and wall effect, estimate the size range of quartz and galena in pure products.	3	L3	5
[b]	Data for laboratory filtration of $CaCO_3$ slurry in water at 20°C are reported as follows at a constant pressure of 338kN/m^2, the filer area of plate and frame press was 0.04329 m^2, slurry concentration was 23.4 kg/m^3, Viscosity of water at 20°C is $1x10^{-3}$ Pa s. Calculate the specific cake resistance and filter medium resistance from the experimental data given	4	L3	4

Time (s)	Filtrate volume (V m^3) x 10^{-3}
4.4	0.498
9.5	1
16.3	1.5
24.6	2
34.7	2.5
46.1	3

6 [a]	Differentiate between (i)cake filtration and depth filtration. (ii) Clarification and thickening (iii) axial flow and radial flow impeller	3	L4	
[b]	Differentiate between free settling and hindered settling. A concentrate suspension of galena particles in water settle under gravity in a settling tank. If the density of particles is 7500 kg/m^3 and particle diameter is 0.0002 m. find the hindered settling velocity of the particles. The porosity of suspension is 0.5 and Richardson zaki index is 4.5. Density of water 1000 kg/m^3, Viscosity of water 0.001Kg/m. s.	4	L3,4	5
7[a]	Define (i) angle of repose (ii) coefficient of flowability, if a powder has angle of repose 65°, comment on its flow characteristic.	2	L1	
[b]	What are the major advantages and limitations of hydraulic transportation system? Fine sand (Specific Gravity= 1850 Kg/m^3) contains 85 % particles of size 0.6 mm. If the sand is transported hydraulically through a 0.2m diameter horizontal pipe to a distance 10 kilometer in the form of a homogeneous slurry containing 30% by weight of solids, estimate the minimum conveying velocity that is to be maintained. Consider Viscosity of water is 0.001 Kg/m-s.	4	L3	

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Total no. of Pages: 02 *Roll no.....*

4th Semester

B.Tech

END TERM EXAMINATION **MAY 2025**

COURSE CODE: CH208 **COURSE TITLE: HEAT TRANSFER**

Time: 3 Hours **Max. Marks: 40**

Note: Attempt any 5 Questions.
All the questions carry equal marks.
Assume suitable missing data, in any.

Q.1 a) Define heat transfer and their mode of transfer. What are the importance of heat transfer in the industries? [2][CO1] [L1]

b) What are the different laws of heat transfer? Explain each of them. [4][CO1] [L1,3]

c) A hollow cylindrical pipe made of steel has inner diameter 50mm and out diameter 100mm. The inside temperature of the pipe is 375 K and the outside is 315 K. If the thermal conductivity of the steel pipe is 42 W /m. K, calculate the heat loss per meter length of the pipe. [2][CO2] [L5]

Q.2 a) Define convection of heat transfer with suitable example. Explain the concept and application of individual heat transfer coefficient and over all heat transfer coefficient. [3][CO3] [L1,3]

b) Define dimensionless group and dimensional analysis and its importance in heat transfer operation. List the dimensionless group in heat transfer process and explain the physical significance of any three. [3][CO3] [L3,4]

c) Estimate the total heat loss by convection and radiation from unlagged steam pipe 50 mm O.D at 130°C to surrounding air 25 °C. $\acute{\varepsilon}$ =0.9. [2][CO4] [L5]

Q.3 a) Define phase change with suitable example. Define the boiling concept of liquid. Explain in detail the characteristic curve of heat transfer to boiling liquid. [6][CO3] [L2,4]

b) A saturated vapor at 325 K condenses on the outside of a [2][CO3]

pack of 16 horizontal tube arranged in 4x4 array. Estimate the rate of condensation per meter length of array, if the tube surface is maintained at 315 K. D_0 = 12.5mm, λ = 133 kJ/Kg, ρ = 1150 kg/meter cube, $\mu = 0.26 \times 10^{-3}$ Kg/m.s, k = 0.071W/m.K. [L5]

Q.4 a) Define evaporator and classify it. Write down the principal and industrial applications of any two. [5][CO5] [L3]

b) Explain in detail the factor affecting the evaporation process. [3][CO5] [L2]

Q.5 a) Define temperature gradient. Explain the concept of co-current and counter current temperature gradient with example. [2][CO5] [L1,3]

b) What is Log mean Temperature Difference (LMTD). Derive the equation for LMTD and application. Explain why and when LMTD correction factor required to be used. [6][CO5] [L5,6]

Q.6 a) Define condensation. Explain the factors affecting the condensing heat transfer. Differentiate film wise and drop wise condensation. [5][CO3] [L2,3]

b) A 6.5 m long insulated steam pipe crosses a room. The outer diameter of the pipe is 450mm and the outer surface temperature is 410 K. The heat transfer rate from the pipe is 113kW. Calculate the convective heat transfer coefficient of air if the room temperature is 295 K. [3][CO3] [L5]

Q.7 Write explanatory note in any three on the following: [8][CO2, 3,4,5]

a) Thermal conductivity [L2,4]

b) Film wise condensation

c) Circulation evaporator

d) Shell and tube Heat Exchanger

e) Radiation shields

Total no. of Pages: 03 Roll no.....

SIXTH SEMESTER

B.Tech.

END TERM EXAMINATION ***May-2025***

CH302 CHEMICAL REACTION ENGINEERING-II

Time: 03:00 Hours ***Max. Marks: 40***

Note: All questions are compulsory.
Assume suitable missing data, if any

Q.1 a) What do you mean by bioreactor? Enlist the various types of reactors based on the mode of operation. Explain the various parts of the bioreactor with a well-labelled diagram. [5+5] [CO5, CO1] [BTL1 BTL4]

b) Distinguish between Fixed bed and Fluidized bed reactor.

Q.2 a) Gaseous reactant A diffuses through a gas film to the surface of solid B where it reacts with B according to a reversible first-order rate. [5+5] [CO1, CO2] [BTL3 BTL1]

$$-r''_A = k''''(C_{As} - C_{Ae}), mol/(m^2.s)$$

where C_{Ae} is the concentration of A in equilibrium with the solid surface.
Develop an expression for the rate of reaction A that accounts for both the mass transfer steps and reaction steps.

b) We plan to remove 90% of the reactant A present in a gas stream by adsorption in pure water in a packed tower.
Find the volume of tower required for countercurrent operation.

Data:
For the gas stream:
F_g = 90000 mol/h at $\pi = 10^5$ Pa
p_{Ain} = 1000 Pa, p_{Aout} =100 Pa

For the liquid stream:
F_l = 900000 mol/h

For the packing used:
$k_{Ag}a = 0.36$ mol/(h.m^3.Pa)
$k_{Al}a = 72$ h^{-1}

The molar density of liquid under all conditions is
$C_T = 55556$ mol/m^3
and $H_A = 18$ (Pa.m^3)/mol, $k = 0$ m^3/(mol.h)

Q.3 a) Pure gaseous A (C_{Ao} = 100 mol/m^3) reacts to form R in a packed bed column to achieve 80 % conversion of 1000 m^3/h. Find the amount of catalyst required. [5+5] [CO3, CO4] [BTL1 BTL2]

(i) $A \longrightarrow R$

$$-r'_A = \frac{50\,C_A}{1+0.02\,C_A}\,\frac{mol}{(h.kg\ cat)}$$

(ii) $A \longrightarrow R$

$$-r'_A = 8\,C_A^2\,\frac{mol}{(h.kg\ cat)}$$

b) Explain the Shrinking core model with the help of a neat diagram.

OR

b) Spherical solid particles containing B are roasted at constant temperature in an oven by gas of constant composition. Solids are converted to give a firm non-flaking product according to the shrinking-core model (SCM). From the following conversion data find the rate controlling mechanism for the transformation of solid.

Data:

dp, cm	X_B	t, s
0.1	0.5	3
0.1	1	6

Q.4 a) Gaseous A absorbs and reacts with B in liquid according to [5+5] [CO2, CO4] [BTL1, BTL3]

$$A\,(g \rightarrow l) + B\,(l) \rightarrow R\,(l),$$
$$-r_{Al} = kC_AC_B$$

in a packed bed. Calculate
(i) the rate of reaction in mol/(h.m^3 of reactor)
(ii) Find the location of the major resistance (gas film, liquid film and bulk liquid) and behaviour in the liquid film (pseudo first order reaction, instantaneous etc.) at a point in the reactor where p_A = 100 Pa and C_B = 100 mol/m^3 liquid.

Data: k = 10^8 m^{3}liquid/(mol.h)
H_A= 1.0 (Pa.m^{3}liquid)/mol
$k_{Ag}a$ = 0.10 mol/(h.m^3 of reactor. Pa)
$k_{Al}a$ = 100 m^3 liquid/(m^3 reactor. h)
f_l = 0.01 m^{3}liquid/m^3 reactor
a = 100 m^2/m^3 reactor
$D_{Al} = D_{Bl} = 10^{-6}$ m^2/h

b) Construct the various types of concentration profiles for mass transfer with chemical reaction.

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Total no. of Pages: 02 *Roll no.....*

6th SEMESTER B.Tech (Chemical Engineering)

END TERM EXAMINATION *May-2025*

CH304: Mass Transfer-II

Time: 03:00 Hours *Max. Marks: 40*

Note : All questions carry equal marks.
Use pencil to draw diagram (s)
Use of graph papers is permitted
Assume suitable missing data, if any.

Q1 (a) What is the effect of impurities on the crystal formation? [2] [CO4] [L2]

(b) With neat and clean diagram, explain the working of Oslo/Krystal Evaporative crystallizer [3] [CO4] [L2, L4]

(c) What are the factors which limit the rate of solid-liquid extraction? Explain. [3] [CO4] [L2]

Q 2 In how many ways feeds can be introduced in rectifying column? What is the effect of feed conditions on liquid and vapour flow rates in rectifying and in stripping column. Explain with the help of suitable diagrams. [5] [CO1, CO2] [L1, L5, L6]

Q3 (a) What are the criteria for the selection of the solvent for Liquid- Liquid Extraction? [3] [CO3] [L2]

(b) The picric acid is to be extracted with benzene as extraction solvent. Aqueous solution contains 0.2 mol of picric acid per litre, Calculate the quantity of benzene required to be contacted with 5 litres of aqueous solution in order to form a benzene solution containing 0.02 mol of picric acid per litre. Also calculate the percentage extraction of picric acid. Given that, $K=C_E/C_R=0.505$

Where, C_E=concentration of picric acid in benzene in mol/l

and, C_R= concentration of picric acid in water in mol/l [2] [CO3] [L5]

(c) Represent the following on an equilateral triangular diagram:

i A mixture of components A, B and C containing 40% A, 20% B and 40% C respectively.

ii A mixture of components A and C containing 80% A and 20% C respectively.

[3] [CO3] [L5]

Q4 A rectification column is fed with 100 kmol/h of a mixture containing 50 mole % of hexane and 50 mole% of octane at 101.325k Pa absolute pressure. The feed is at its boiling point. The distillate is to contain 90 mol% hexane and the bottoms 10 mole% hexane. The reflux ratio is 3:1. Calculate the kmol/h distillate and kmol/h bottoms, and number of theoretical plates needed for this separation. The equilibrium data for this system is given below:

Mole fraction of hexane in liquid, x	1.0	0.69	0.4	0.192	0.045	0
Mole fraction of hexane in vapour, y	1.0	0.932	0.78	0.538	0.1775	0

If the efficiency of the column is only 60%, how many trays are required?

[7] [CO2] [L6]

Q5 List the different steps involved in heterogeneous catalytic reaction? Illustrate with the help of neat and labelled diagram. [3][CO5] [L1, L5]

Q6 Differentiate between:

(a) Azeotropic and Extractive Distillation [3] [CO1] [L4]

(b) Distillation and Liquid-Liquid Extraction [3] [CO 3] [L4]

(c) Physical Adsorption and Chemical Adsorption [3] [CO5] [L4]

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VI SEMESTER

B.Tech. Chemical Engineering

END TERM EXAMINATION May-2025

COURSE CODE CH306 CHEMICAL PROCESS TECHNOLOGY

Time: 3 Hours Max. Marks: 40

Note : ATTEMPT ANY FIVE QUESTIONS
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1[A] Which features are included and which are not included in Process Flow Diagram? [3][CO1][L4]

[B] To pressurize liquids and gases as well as to depressurize gases which unit operations you will suggest? [3][CO1][L4]

[C] Write the names of any four reactor units. [2][CO1][L1]

Q.2[A] Explain the manufacture of sulphated fatty alcohol detergents. [4][CO3][L2]

[B] Explain the manufacturing of alcohol with the help of a flow diagram. [4][CO1][L2]

Q.3[A] Comment on the operational parameters i.e. temperature and pressure during Urea manufacture and what will be their effect on the overall system, if not optimized? [4][CO4][L5]

[B] Compare the advantages and disadvantages of the Mercury and Diaphragm processes: [4][CO3][L1]

Q.4[A] Draw the flow diagram for manufacturing Superphosphate and Triple superphosphate fertilizer. [3][CO2][L2]

[B] Comment on the process design modifications with process parameters for the ammonia manufacturing plant. [3][CO3][L6]

[C] Which major industrial chemicals are produced in the Chlor-alkali industries? What is the basic raw material for this industry? [2][CO3][L2]

Q.5 [A] If bagasse to be used for pulp production instead of wood-based material, suggest a modification in the sulfate pulp process. [3][CO4][L6]

[B] Evaluate the current scenario of Paper industry in India. [3][CO5][L5]

[C] Explain the equipment identification method with a suitable example. [2][CO2][L2]

Q.6[A] Enlist the various methods for manufacturing Glycerol. [2][CO3][L1]

[B] Which processes are used for Caustic soda production? [2][CO3][L1]

[C] Why is the Contact process superior to the Chamber process of sulphuric acid manufacturing? [1][CO4] [L4]

[D] Comment on the current scenario of the Indian Chemical industry. [3][CO5] [L5]

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V SEMESTER **B.Tech**

END TERM EXAMINATION ***May-2025***

CH312: POLYMER PROCESSING TECHNIQUES

Time: 03:00 Hours ***Max. Marks: 40***

Note: All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 [a] You have been given three unknown polymer samples: Polypropylene (PP), High-Density Polyethylene (HDPE), and Nylon 66. Describe how you would identify each polymer using the following methods:

(a) Physical appearance (colour, texture, flexibility, etc.)

(b) Floating test in water

(c) Flame test (odour, flame colour, melting behaviour, residue, etc.)

Explain the expected observations for each polymer in each test and how they help distinguish between them. Additionally, link the identification outcomes to appropriate polymer processing techniques commonly used for each material, justifying your choices based on their physical and thermal behavior. [3 marks][CO6][L2,5]

[b] Masterbatch is a concentrated mixture of pigments and/or additives encapsulated during a heat process into a carrier resin, which is then cooled and cut into a granular shape. It is widely used in plastics manufacturing to impart color, UV resistance, flame retardancy, and other properties. Considering the trade-offs in processing, cost, and final product performance, analyze the advantages and disadvantages of using masterbatch over pre-compounded materials or direct addition of raw additives. In your answer, discuss the impact on polymer matrix compatibility, dispersion quality, processing efficiency, recyclability, and environmental sustainability. Justify scenarios where masterbatch use is preferable and where it may be suboptimal. [2 marks][CO1][L5,6]

Q.2 [a] Why are high-shear mixers often used in the compounding of thermoplastics? How would you select a blender for carrying out mixing and compounding a particular polymer? With a simplified sketch of the unit, describe the working of an intensive dry mixer.
[3 marks][CO2][L3,4]

[b] Discuss the plasticization theory in detail. How does the interaction between plasticizers and polymer chains influence polymer properties such as tensile strength, glass transition temperature, and processability? [2 marks][CO1][L2]

Q.3 [a] A billet made of aluminium alloy (average flow stress = 150 MPa) is extruded through a die to reduce its cross-sectional area from 500 mm^2 to 100 mm^2. Calculate the extrusion force, neglecting friction.
[3 marks][CO3][L4]

[b] Define Extrusion. With a simple sketch, show the different elements of a twin screw extruder. [2 marks][CO3][L1,2]

Q.4 [a] How many types of compression moulds do you know? Describe the flash and semi-positive type of compression moulds and explain the significance of mould design. [3 marks][CO4][L2]

[b] A thermosetting resin requires a curing time of 2 minutes at 150°C. If the curing time decreases by 10% for every 10°C increase in temperature, estimate the curing time at 170°C.
[2 marks][CO4][L3]

Q.5 [a] Why is injection moulding considered more suitable for mass production of plastic parts than other shaping processes like compression moulding or machining? Justify your answer with suitable reasoning. List the four main stages of the injection moulding cycle and briefly explain each. [3 marks][CO5][L5]

[b] Draw a neat and labelled diagram of an injection moulding machine. Explain the function of the screw and the clamping unit.
[2 marks][CO5][L3]

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Q.6 [a] Determine whether the following statement is true or false: "Are thermosetting plastics preferred over thermoplastic material in blow moulding processes?" Justify your answer with a valid reason. Sketch each step in the injection stretch blow moulding process.
[3 marks][CO6][L5]

[b] A mold is designed for polymer P, which has a shrinkage rate 0.010 mm/mm. The critical dimension of the molded part is 35 mm. If the same mold is used to produce a part from polymer Q, which has a shrinkage rate of 0.025 mm/mm, what will be the critical dimension of the part made from polymer Q? [2 marks][CO5][L4]

Q.7 [a] What is twin-sheet forming? Describe the process, giving a suitable diagram of the unit. Mention any variation of this process and the purpose for the variation? [3 marks][CO6][L2]

[b] A polymer is extruded at a constant speed of 0.2 m/s, requiring an extrusion force of 50 kN. Calculate the power required for the extrusion process. [2 marks][CO4][L3]

Q.8 [a] Explain the continuous pultrusion process of preparing FRP laminates. Describe the process with an appropriate diagram?
[3 marks][CO3][L2,3]

[b] Describe the slush casting process in detail, and illustrate your explanation with a labelled diagram. [2 marks][CO6][L2]

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Total no. of pages 3 *Roll No.....*

SIXTH & EIGHTH SEMESTER **B.TECH**

END SEMESTER EXAMINATION **May-2025**

CH316 COATINGS AND ADHESIVES

Time: 3 Hours **Max. Marks - 50**

Instructions to the candidates: *Attempt all questions*

Q1. Write answers in one word. (10×1) [BTL1]

(i) The degree of atomization in air spray guns is controlled by the _____ of the coating, air pressure, and the diameter of the _____.

(ii) In electrostatic spraying, an electric charge is impressed on a wire, leading to _____ of the air and charging of coating particles.

(iii) Epoxy amines have the highest saponification resistance than epoxy esters. (True/False)

(iv) In electron beam-based curing, _____ determines how fast into the substrate the needed dose can be delivered.

(v) Oxidative cross-linking in convertible coatings occurs when oxygen reacts with the _____ present in the resin.

(vi) The duration for which a two-pack (Two components) material remains usable after mixing is called its _____.

(vii) Coatings made of _____ are known for their superior flexibility and abrasion resistance, making them ideal for automotive clear coats.

(viii) For a coating to wet a substrate, the surface tension of the coating must be _____ than that of the substrate.

(ix) The toughness and durability of the bond may be improved by using _____ rubber solution adhesives.

Q2. Write a short answer. (5× 2)

i. Why is red oxide primer typically used for steel but not wood? (CO3) [BTL3]

ii. Evaluate the relationship between spraying technique and Transfer efficiency. (CO4) [BTL5]

iii. What are pressure-sensitive adhesives, and how do they adhere to surfaces? (CO1) [BTL1]

iv. Give two advantages of conversion coatings. (CO1) [BTL1]

V Define gelation temperature. (CO2)[BTL1]

Q3. (i) Compare the UV and electron beam-based curing equipment used for coatings. Support your answer with a suitable diagram. (5)(CO3)[BTL4]

(ii) Give an outline of the preparation method of hide glue from its raw form. (4) (CO2) [BTL3]

(iii) Write a chemical reaction for nitration of cellulose. (1) (CO2) [BTL1]

Q4. (i) A Delhi particleboard plant mistakenly heated a batch of soybean meal, intended for adhesive, to 75°C, exceeding the <70°C target. Subsequent quality checks revealed weak bonding in the produced particleboard. As a result, the compromised effectiveness of the glue directly contributed to the structural weakness observed in the particleboard. This incident underscores the critical need for precise temperature control in material processing to maintain desired functional characteristics.

Considering the above case analysis of Delhi particleboard plant and suggest reasons for the following:

a. What specific protein property, vital for its adhesive function, was negatively impacted by the 75°C temperature? [BTL3]

b. Briefly explain why the temperature requirement differs for soybean meal used in food versus adhesive applications, based on the protein's behaviour. (5)(CO2) [BTL4]

(ii) Discuss the mechanism of diffusion adhesion. (3) (CO1) [BTL2]

(iii) How does the contact angle provide information about a surface's wettability? (2) (CO1) [BTL4]

Q5. (i) "Global AutoMCoats" is a leading supplier of coatings to the automotive industry. One of their flagship products is a high-gloss, solvent-based topcoat known for its exceptional durability and finish. However, this topcoat contains several solvents listed as Hazardous Air Pollutants (HAPs). Due to increasingly stringent environmental regulations and growing consumer demand for sustainable products, Global AutoMCoats faces significant pressure to reformulate this topcoat. They need to develop a new formulation that meets or exceeds the performance of the original while significantly reducing or eliminating HAP emissions.

The challenge is significant since the new topcoat must maintain its high gloss, scratch resistance, chemical resistance, and application properties (sprayability, drying time). Failure to do so could result in lost contracts with major automotive manufacturers and damage to the Company's reputation.

Considering the above case analysis suggest appropriate solutions to the following:

a. Beyond HAP solvent substitution, briefly outline two key long-term strategies Global AutoMCoats could adopt to ensure the sustainability of their automotive coating products. [BTL6]

b. Besides the regulatory pressure, what other key driver, mentioned in the case study, is compelling Global AutoMCoats to replace the HAP-containing solvents in their topcoat? Briefly explain this driver. (5) (CO5) [BTL5]

(ii) Explain the purpose of zinc phosphating in industrial applications by briefly outlining the process steps and the key chemical transformation that occurs on the metal surface. Include a simple diagram to visualise the coated layer. (3) (CO1) [BTL2]

(iii) How does applied voltage affect the curing depth in electron beam curing? (2) (CO3) [BTL2]

10.2

Total no of pages 2
SIXTH SEMESTER
END SEMESTER EXAMINATION

Roll No.....
B.TECH[CHE]
May-2025

CH318 Petrochemical Engineering

Time: 3 Hours

Max. Marks - 50

Instructions to the candidates:

1) Attempt all questions

Q.1 Explain the synthetic method of Methanol production with chemical reactions involved, a neat process diagram, the catalyst used, and the operating parameters. (10) [CO1] [BTL3]

Q.2 Explain the Butadiene production from Ethanol with chemical reactions involved, a neat process diagram, the catalyst used, and the operating parameters. (10)[CO2] [BTL3]

Q.3 Explain the Ethylene Oxide with chemical reactions involved, a neat process diagram, the catalyst used, and the operating parameters. (10)[CO3] [BTL3]

Q.4 Write the reactions involved in the following processes

(i) Phenol production from Cumene process
(ii) Phenol Production from Toluene Oxidation
(iii) Chlorobenzene Caustic Process for Phenol Production
(iv) Styrene production from dehydrogenation of Ethylbenzene
(v) Phthalic Anhydride Production from Naphalene oxidation

(10)[CO4][BTL4]

Q.5 (i) Write down the advantages and disadvantages of biodiesel with the five most common crops used in biodiesel production.

(5)[CO5][BTL1]

(ii) Explain the differences between first-generation and second-generation biofuels. (5)[CO5][BTL4]

END

Roll no.....

Total no. of Pages: 2

SIXTH SEMESTER

B.Tech.

May-2025

END TERM EXAMINATION

CH 324 HEAT EXCHANGERS

Time: 03:00 Hours

Max. Marks: 50

Note : Answer All questions.
Assume suitable missing data, if any.

Q.1 i) Derive the velocity distribution within the hydrodynamic boundary layer in the context of boundary layer theory. [10 Marks] [CO1,3][BTL2,3,6]

OR

i) Derive a relationship for the boundary layer thickness at a distance 'x' from the leading edge. [10 Marks][CO#1,3][BTL#2,3,6]

Q.2 i) Derive the fin efficiency and fin effectiveness for a rectangular fin of uniform thickness having insulated tip. [7 Marks] [CO#1,3][BTL#4]

ii) A plate-fin heat exchanger has rectangular fins made of aluminium having thermal conductivity of 237 W/m.°C that are 30 mm high and 0.20 mm thick. The heat transfer coefficient for the air circulation over the fins is 200 W/m^2. Determine the fin efficiency. [3 Marks] [CO#2,3,5][BTL#3,6]

Q.3 i) Describe the various types of bodies in the context of radiation heat transfer. [3 Marks] [CO#4][BTL#1]

ii) Describe the Stefan Boltzmann's law. Derive an expression for the emissive power of the black body. [4 Marks] [CO#1,4][BTL#1,4]

iii) Two black bodies (S_1 and S_2) are exchanging heat only through radiation. The surface area of S_1 and S_2 are 1 m^2 and 5 m^2, respectively. If 50 % of energy emitted by S_1 is received by S_2. Determine the fraction of energy emitted by S_2 and received by S_1. [3 Marks] [CO#4][BTL#3]

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Q.4 i) Describe compact heat exchangers with suitable examples, configurations and applications. [5 Marks] [CO#5][BTL#1]

ii) Air enters the compact heat exchanger at 1 atm and 300 K with a velocity of 15 m/s. Describe the analysis procedure to determine the heat transfer coefficient. [5 Marks] [CO#5][BTL#3,4,6]

Q.5 i) Derive the effectiveness for a co-current (parallel) flow heat exchanger. [7Marks] [CO#1,3,5][BTL#4]

OR

i) Derive the log mean temperature difference (LMTD) for a co-current (parallel) flow heat exchanger. [7 Marks] [CO#1,3,5][BTL#4]

ii) In a co-current shell and tube heat exchanger, water (0.02 m^3/min) enters the tube side at 100 °C and leaves at 60 °C. Cold oil (0.10 m^3/min) of density 900 kg/m^3 and specific heat of 2 kJ/Kg.K enters the exchanger at 15 °C. Determine the log mean temperature difference (LMTD). [3 Marks][CO#5][BTL#1,3,5,6]

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B.Tech (VII Sem)/ M.Sc. (IVth Sem) May 2025

END TERM EXAMINATION

COURSE CODE: CH416

COURSE TITLE: Industrial Waste Management

Time: 3 hrs Max. Marks: 50

Note : Question no. 1 and 6 are compulsory.
Attempt any Three questions from question no 2 to 5.

Q.1 Attempt any Five. (4x5=20) [CO1-4] [BTL1-6]

(a) Are paper bags more environmentally friendly than plastic ones? Justify your answer? [BTL4]

(b) Suggest and explain different steps for Waste reduction/ Waste volume Reduction. [BTL1,2,6]

(c) Define and classify different types of Industries. Give two examples of each type. [BTL1]

(d) What are Management and Treatment Options for Hazardous and Non hazardous waste. Give any wo examples of each. [BTL2]

(e) Discuss the major environmental and health concern related to e-waste. [BTL5]

(g) Elaborate various waste disposal methods used in a pharma industry [BTL3,5]

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Q.2 What are small scale industries SSIs? Discuss various issues related to SSIs. How can industrial waste from SSIs be managed.
[7][CO3] [BTL1,3]

Q.3 What are different types of waste generated in a Pharma Industry. Explain with examples.
[7][CO4] [BTL2]

Q.4 Define E-waste and discuss its sources? What are the responsibilities and role of Industries and citizens to reduce e-waste.
[7][CO4] [BTL2,5]

Q.5 What are different levels of waste generation in a typical industrial setup? Explain in detail the waste generated by any industry and impact of that waste.
[7][CO2] [BTL2,5]

Q.6. Write short notes on any **TWO** of the following:
[2x4.5=9][CO1,3,5] [BTL2,3,4]

(a) Reverse osmosis (process, application, advantages and disadvantages)
(b) Recycling of E-waste and its advantages.
(c) Various processes in a Textile industry and the waste generated.

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Total no. Pages: 02

VIII SEMESTER

B.Tech. Chemical Engineering

END TERM EXAMINATION *MAY-2025*

CH 424 SAFETY AND HAZARD IN CHEMICAL INDUSTRY

Time: 3 Hours *Max. Marks: 50*

Note: ATTEMPT ANY FIVE QUESTIONS
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1[A] Differentiate between Occupational Injury and Occupational Illness with examples. [2][CO1][L1]

[B] Comment on the common methodologies used for hazard identification in chemical processes? [3][CO5][L2]

[C] Identify the 3-Step Accident Process in the following Accident scenario:
Due to a wellhead seal failure, an uncontrolled release of high-pressure hydrocarbons (oil and gas) occurred from the drilling well, forming a substantial plume. The potential ignition of this plume posed a significant fire hazard to the rig platform, necessitating the activation of emergency shutdown procedures to isolate the well and facilitate firefighting efforts in containing the subsequent blaze. [3][CO1][L4]

[D] Justify why the inherent safety planning of the chemical plant is greatest at the earliest stages of Process development. [2][CO3][L5]

Q.2[A] A Plant employs 1500 full-time workers in a Process with a FAR of 5. How many industrial-related deaths are expected each year? [3][CO2][L3]

[B] Define Material Safety Data Sheet (MSDS). Furthermore, identify the primary categories of information provided within this document that are crucial for effective response during a chemical emergency. [5][CO4][L1,4]

[C] Categorize the following techniques to appropriate inherently safer process designs categories (i.e., Minimize, Substitute, Moderate and Simplify): [2][CO3][L3]

i. Use chemicals with higher flash points, boiling points.
ii. Use vacuum to reduce boiling point.

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iii. Reduce storage inventory of raw materials.
iv. Design plants for easy and safe maintenance

Q.3[A] During the Evaluation phase in Industrial hygiene, why is special attention given to small leaks of toxic gases? [3][CO3][L5]

[B] List down the any six types of Personal Protective Equipment usually worn by the worker. [3][CO8][L1]

[C] Which Four Major Legislations in India cover occupational safety and health at the workplace? [4][CO7][L1]

Q.4[A] How the Bhopal Accident could have been prevented? [3][CO3][L5]

[B] How is Safety training accomplished? [3][CO8][L2]

[C] Which Parameters significantly affect the behavior of explosions? [3][CO2][L2]

[D] Which legal Act in India ensures that employees receive compensation for injuries resulting from accidents at work? [1][CO7][L2]

Q.5[A] What is a Safety audit? What purposes does it serve? [4][CO6][L1]

[B] If you are an Audit Team member, what steps will you follow to conduct an Effective Safety Audit in a plant? [3][[CO6][L6]

[C] How is post-incident analysis conducted to identify root causes and implement corrective actions following an emergency in a chemical plant? [3][CO5][L6]

Q.6[A] How is the Nuclear Hazard Assessment in nuclear industries carried out? [3][CO2][L2]

[B] Suggest the Control measures implemented to prevent fires and explosions in the Chemical industry. [2][CO3][L5]

[C] What are the advantages of transporting chemicals by road? [2][CO4][L1]

[D] What are the Advantages and Disadvantages of Fault Tree Analysis? [3][CO3][L1]

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VIII & VI Semester
B.Tech

ENDTERM EXAMINATION **May 2025**

CH426 Biofuel Engineering

Time: 3:00 Hours ***Max. Marks: 50***

Note: Be brief. Attempt only **Five Questions** out of which Question No. 1 is compulsory. In addition to Question 1, answer any **Four** questions from the rest of the questions.

1. Write your Name & Roll Number clearly. What are biofuels? Mention the 1st to 4th generation of biofuels. What are biomass, bioenergy, and bio-power? What are the social, economic, and environmental impacts of bioenergy?
(1+9 Marks) (CO-1)(L1)

2. What is the difference between diesel and biodiesel? How can you produce biodiesel, the benefits & drawbacks of biodiesel? Your thoughts on Biodiesel & jobs, biodiesel emission and health effects and sustainability.
(10 Marks) (CO-2)(L2)

3. How much greenhouse gases (%) are emitted by China, the USA, the EU, and the rest of the world? What is the global oil use per day, and which country is the solar power leader in the world? Explain greenhouse gases and the greenhouse effect.
(10 Marks) (CO-1 & 2)(L1,2)

4. How to convert biomass to Syngas and ethanol using the hydrothermal liquefaction (HTL) method. What are the advantages of HTL? Which international company has the technology to convert carbon monoxide to ethanol?
(10 Marks) (CO-2)(L2)

5. How long (years) will the oil and gas resources are going to last in the world? How can you produce bioethanol from sugarcane or corn? What are the concerns about using food-based feedstocks for fuel/biofuel production?
(10 Marks) (CO-3)(L1)

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6. Our city of Delhi generates how much municipal solid waste (MSW) per day, and how much is used as landfill, and how much is used for energy generation. Mention the process that you think is used to generate bioenergy from these wastes for energy plants. **(10 Marks) (CO-4)(L1,3)**

7. What are advanced biofuels? What are the advantages and advanced biofuels, and what are the critical hurdles in the production of these advanced biofuels? How can you think needs to be done to overcome these hurdles? **(10 Marks) (CO-5)(L1,3)**

8. What is Life Cycle Assessment (LCA)? How do you see the scenario for transportation biofuels by the year 2060? **(10 Marks) (CO-3 &4)(L1,3)**

GOOD LUCK

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Roll No. .....

econd SEM

B.Tech.

ND SEMESTER EXAMINATION

May 2025

CO-102 Programming Fundamentals

me: 3:00 Hours

Max. Marks: 40

Note: Answer any five. All questions carry equal marks.
Give suitable example/code wherever needed
Assume suitable missing data, if any.

1 (a) What is union? How it is different from structure? Create a union and structure for storing student data. 4[CO3,L1,2]

(b) Write a program to apply 6 bitwise operators on the following values and analyse the operator and output.

int a= 21, b = 34; 4[CO2,L4,6]

2. (a) Classify different operators and discuss their types, precedence and associativity? Illustrate by example of one operator of each type. 4[CO2,L3,4]

(b) Write a program to implement strlength, strcompare in C without using library functions. 4[CO4,5,L6]

3. (a) Differentiate between call by value and call by reference with examples . 4[CO3,4,L2]

(b) Explain the two way selection (if, if-else, nested if-else, cascaded if-else) in C language with syntax . 4[CO2,L2]

4. (a) Evaluate the relationship between formal arguments and actual arguments with the help of suitable code. 4[CO3,L5]

(b) Write a C program to create two int arrays **a[5] and b[5]**, add each element of array b to the corresponding element of a to a using function call by reference to function "add" and print the resultant array a. 4[CO4,5,L3,6]

Q5. (a) Write algorithm for selection sort and apply algorithm on b[10] = {5,3,65,21,45,11,8,23,89,4} and show each step/iteration outcome. 4[CO1,4,L1,3]

(b) Summarize the difference between (i) pointer variable (ii) address of integer k (iii) address of array a[10] (iv) . Give an example. 4[CO4,L5]

Q6. (a) Define the terms keywords, identifier, strings, token. With example. 4[CO1,L1]

(b) Show the errors with justification (where int j, a[5], *ptr;) 4[CO2,4,L3,5]

(i) a = 15 (ii) ptr = a[4] (iii) &j = a (iv) j+2 = 23 (v) a= ptr
(vi) *ptr = a+2 (vii). a[3] = ptr+3 (viii) *ptr = &j

Q7. Write short notes (any two) with example 8[CO1,2,L1,2]

(a) Difference between C and C++
(b) File I/O operations, statements and steps
(c) I/O functions

Total no. of Pages:03 Roll no.....

B.Tech. 4th SEMESTER

END TERM EXAMINATION ***May-2025***

COURSE CODE: CO 204 [Old Scheme]

COURSE TITLE: OPERATING SYSTEM DESIGN

Time: 03:00 Hours *Max. Marks: 40*

Note : All questions carry equal marks.
Attempt all five questions.
Assume suitable missing data, if any.

Q.1 Attempt any two:

(a) In what ways do different operating system structures (monolithic, layered, microkernel, etc.) affect the performance, scalability, and maintainability of the system, and how do these choices influence system protection mechanisms? [4][CO1]

(b) Write a short note on

i. Paging and segmentation
ii. Disk structure
iii. Race condition
iv. Context Switch [4][CO4]

(c) What are the key design considerations in solving classical syn problems (e.g., Dining Philosophers, Bounded Buffer), and how do they apply to real-world concurrent applications like database systems?

[4][CO2]

Q.2)

(a) Consider the situation in which the disk read/write head is currently located at track 45 (of tracks 0-255) and moving in the positive direction. Assume that the following track requests have been made in this order: 40, 67, 11, 240, 87. What is the order in which optimized C-LOOK would service these requests and what is the total head movement? Also, calculate the total head movement in case of shortest seek time first. [4][CO5]

(b) In a system, there are 5 processes (P1 to P5) and 4 resources (R1 to R4), each with only 1 instance. The current resource allocation and requests are as follows:

- P1 is holding R1 and is requesting R2
- P2 is holding R2 and is requesting R3
- P3 is holding R3 and is requesting R4
- P4 is holding R4 and is requesting R1
- P5 is requesting R2 but currently holds no resource.

i) Draw the Resource Allocation Graph (RAG) based on the scenario above.

ii) Determine whether a deadlock exists or not. If a deadlock is present, list the processes involved in the deadlock cycle. [4][CO3]

Q.3 Attempt any two:

(a) Explain how demand paging improves memory efficiency, and discuss how it can lead to thrashing. What strategies can the operating system use to prevent or mitigate thrashing? [4][CO4]

(b) Consider the following page reference and reference time strings for a program: Page reference string: 5, 4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5. Show how pages will be allocated using the LRU and Optimal page replacement policy. Also, calculate the total number of page faults when allocated page blocks are 3 and 4 respectively. [4][CO4]

(c) Estimate Discuss how cache memory organization (direct-mapped, fully associative, and set-associative) affects hit rate and overall system performance. How do these strategies balance speed and hardware complexity? [4][CO4]

Q.4 Attempt any two:

(a) How do different file access mechanisms (such as sequential access, direct access, and indexed access) impact the performance of file systems? Discuss the trade-offs between these mechanisms in terms of data retrieval speed, storage efficiency, and flexibility. [4][CO5]

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(b) Consider a scenario, a file is stored using direct access method in a file system having following conditions:

- The file spans 6 blocks, with each block having a size of 512 bytes.
- The disk access time for reading a single block is 10 ms.
- The average disk seek time is 15 ms, and the rotational latency is ms.

Considering the above situation, calculate the following:

(i) Calculate the total access time required to read the entire file sequentially.

(ii) If the user needs to access block 4 specifically, calculate the average access time for retrieving this block. [4][CO5]

(c) What are the key design issues that an operating system faces when managing I/O devices? How do issues like device independence, buffering, and error handling influence the design and implementation of I/O subsystems in modern operating systems? [4][CO5]

Q.5

(a) **Consider a scenario:** An organization is planning to migrate its data center from a Windows-based server infrastructure to a Linux/Unix-based system. The migration is expected to improve performance, scalability, and reduce licensing costs. However, the company needs to carefully evaluate the strengths and weaknesses of each operating system in terms of system performance, reliability, and security.

Using the above scenario answer the following:

i) Compare Windows, Linux, and Unix in terms of their performance and reliability in enterprise environments. Which OS would be most suitable for different types of tasks (e.g., web servers, database management, file servers)?

ii) Discuss the security features of each operating system and how they impact the overall system architecture. What additional steps should be taken to ensure robust security in each environment? [4][CO6]

(b) What is a race condition? Explain how does a critical section avoid this condition. What are the properties which a data item should possess to implement a critical section? [4][CO1]

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Roll No. .....

FOURTH SEMESTER

B.Tech. (CO)

END TERM EXAMINATION

MAY-2025

CO206 COMPUTER ORGANIZATION AND ARCHITECTURE

Time: 3:00 Hours

Max. Marks: 50

Note: Answer anyfive questions. All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 (a)Construct and explain the working of BUS system design using three state buffers. [5][CO1][BTL1]

(b)A computer uses a memory unit with 128K words of 32 bits each. A binary instruction code is stored in one word of memory. The instruction has four parts: an indirect bit, an operation code, a register code part to specify one of 32 registers, and an address part.

I. How many bits are there in the operation code, the register code part, and the address part?

II. Draw the instruction word format and indicate the number of bits in each part.

III. How many bits are there in the data and address inputs of the memory? [5][CO4][BTL2]

Q.2 (a) What is the difference between a direct and an indirect address instruction? How many references to memory are needed for each type of instruction to bring an operand into a processor register? [5][CO1][BTL1]

(b) How many address lines; data lines and control lines are there in 16M * 32 memory? [5][CO4][BTL3]

Q.3 (a) Draw the block diagram of a basic hardwired control organization with two decoders, a sequence counter and a number of control logic gates? [5][CO2][BTL3]

(b) Design a parallel priority interrupt hardware for a system with 4 interrupt source and explain its working? [5][CO5][BTL4]

11.8

Q.4 (a)What is DMA? Explain the use of DMA and also explain why does DMA have priority over CPU when both request a memory transfer? [5][CO5][BTL4]

(b) Explain Asynchronous data transfer using following control signal in source initiated and destination-initiated mode:

(i) Strobe signal

(ii) Handshaking [5][CO5][BTL1]

Q.5 (a) The following program in a list of instruction in hexadecimal code. The computer executes the instruction starting from address 100. What is the content of AC and the memory word at address 103 when the computer halts? [5][CO3][BTL6]

Location	Instruction
100	5103 BSA
101	7200 CMA
102	7001 HLT
103	0000 AND
104	7800 CLA
105	7020 INC
106	C103 BUN

(b) A digital computer has a common bus system for 16 registers of 32 bits each. The bus is constructed with multiplexers.

(i) How many selection inputs are there in each multiplexer?

(ii) How many multiplexers are there in the bus? [5][CO2][BTL5]

Q.6 Write a short note on any two:

(a) RISC and CISC

(b) Explain the use of interface unit with the peripherals?

(c) Explain First pass and Second pass assembler with flow chart.

[5][CO1,5,1][BTL1]

Total no. of Pages:2 Roll no.....

SIX SEMESTER

B.Tech.

END TERM EXAMINATION ***MAY-2025***

CO208 Algorithm Design and Analysis

Time: 03:00 Hours *Max. Marks: 50*

Note : All questions carry equal marks.
Attempt any five questions.
Assume suitable missing data, if any.

Q.1 Consider the following message:
Aa bbbba bbb ccc ddd eeee ccc ece dd ee .
Find the number of bits required for Huffman encoding of the above message, and also find the average bits required to represent a character.

[L1, L3](CO3)[10]

Q.2 If you have Seven tasks T1, T2, T3, T4, T5, T6, T7 having deadline D1=3, D2=4, D3=4, D4=2, D5=3, D6=1, D7=2 and profit P1=35, P2=30, P3=25, P4=20, P5=15, P6=12, P7=5. Find the maximum profit possible? And write the algorithm of the Job Sequencing deadline problem, with its analysis.

[L1, L2](CO4)[10]

Q.3 Differentiate between;

(a) "Backtracking" and "Branch and Bound" strategies.

(b) 0-1 Knapsack Problem by using greedy and dynamic approach with the help of an example. **[L1,L5](CO2)[10]**

Q.4 A salesman has to visit 4 cities with the following distances between them. Solve the TSP using dynamic programming.

	A	B	C	D
A	0	1	1	3
B	2	0	5	1
C	1	4	0	3
D	4	3	2	0

(a) Find the minimum cost.

(b) Find the tour path starting and ending at A. **[L3, L4](CO4)[10]**

Q.5 Write a short note on

(a) P class

(b) NP class

(c) NP complete class

(d) Reducibility **[L1](CO5)[10]**

Q. 6 The Rod Cutting Problem is a classic optimization problem where you are given a rod of length n and a list of prices that contains the value of a rod piece of length i for i = 1 to n. The objective is to determine the maximum total revenue obtainable by cutting the rod into smaller lengths and selling the pieces.

(a) Formulate the rod cutting problem and express its solution using recurrence relations.

(b) Explain the limitations of the recursive approach in solving this problem.

(c) Describe how dynamic programming can be used to improve the efficiency of the solution. Provide the algorithm and explain its time and space complexity. **[L6](CO4)[10]**

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Total No. of Pages:2 *Roll No.....*

B. Tech.

SIXTH SEMESTER

END-TERM EXAMINATION **May-2025**

CO302(Compiler Design)

Time: 3 Hours *Max. Marks: 40*

Note: Attempt Any Four of the following questions.
Assume suitable missing data, if any.

Q.1 Compute first, follow sets for the following grammer :

E→ TA

A→+TA / ϵ

T→FB

B→ *FB / ϵ , F→(E) / id

Also make the recursive descent parser for the same grammar.

[10][CO-2][BTL 1,2]

Q.2 a What are two different approaches of parsing. Explain ?

[5][CO-1][BTL 1,2]

b. Draw the DAG for expression a+a*(b-c) +(b-c)*d ? Show the steps for constructing the same. **[5][CO-1][BTL 1,2]**

Q.3 write and Explain SDT for infix to postfix conversion?

Or

construct SLR parsing table for the following grammer.

S-→AA

A-→Aa/b

[10][CO-1][BTL 1,2]

Q .4a What is intermediate code. Explain different types of intermediate code representations? [5][CO-1][BTL 1,2]

b. Explain the conflicts occurring in LR parsing? [2][CO-1][BTL 1,2]

c. what are the data structures used for symbol table? [3][CO-5][BTL 1,2]

Q.5 Give SDD for a simple desk calculator and draw the dependency graph for 1*2*3*(4+5)n ?

Or

Give SDD that generates array types. [10][CO-4][BTL 3, 4]

END

Total no. of Pages:03

Roll no.....

VI SEMESTER

B.Tech.

END TERM EXAMINATION

May-2025

COURSE CODE: CO304

COURSE TITLE: ARTIFICIAL INTELLIGENCE

Time: 03:00 Hours *Max. Marks: 50*

Note: Attempt any five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1. a) Differentiate between plateau, ridge and a local maxima.
b) Given the 8-puzzle shown in figure 1, use the hill-climbing algorithm with the Manhattan distance heuristic (or hops) of the misplaced tiles to find a path to the goal state. Would the answer differ in case of Steepest Hill Climbing?

[4+6 M][CO 1,2][BTL 2,3]

1	2	3
4	8	
7	6	5

Initial state

1	2	3
4	5	6
7	8	

Goal state

Figure 1

Q.2.
a) With help of following example, illustrate how knowledge is represented using semantic net. Also write the corresponding property inference procedure.
Tom is a cat. Tom caught a bird. Tom is owned by John. Tom is ginger in colour. Cats like cream. The cat sat on the mat. A cat is a mammal. A bird is an animal. Birds can fly All mammals are animals. Mammals have fur.
b) What are semantic frames. What are the various links used in semantic frames? With the help of above example prove that they are better than semantic nets.
c) Differentiate between PROLOG and LISP with example.

[3+3+4 M][CO 3][BTL 3,4]

Q.3. Consider the following axioms:
1. All hounds howl at night.

2. *Anyone who has any mice does not have any mice.*
3. *Light sleepers do not have anything which howls at night.*
4. *John has either a cat or a hound.*

a) Write the above axioms in first-order predicate logic.
b) Considering the above axioms as facts, prove the following conclusion using the resolution method.
If John is a light sleeper, then John does not have any mice.

[4+6 M][CO 3][BTL 1,3]

Q.4.
a) Differentiate between Supervised learning, Unsupervised learning and Semi-supervised learning with example. [3 M][CO 4][BTL 4]
b) The figure 2 shows a neural network with one hidden layer where h_i's indicate linear combination of the input layer units and z indicates the linear combination of ReLU applied hidden layer units. Assume ReLU activation only for the hidden layer and y' as the output. The loss function used is Mean Squared Error (MSE) loss i.e., $J(y, y') = (y' - y)^2$. Considering single example $x = [3, 5]$, $y = 10$, $w_{ij} = 1$, and $v_j = 0.5$, $\forall i \in \{1, 2\}, j \in \{1, 2, 3\}$.
a) Compute the total number of parameters in the given neural network.
b) Find the updated values of the w_{ij}'s and v_j's using backpropagation. Consider learning rate $\alpha = 1$.

[2+5 M][CO 4][BTL 3,5]

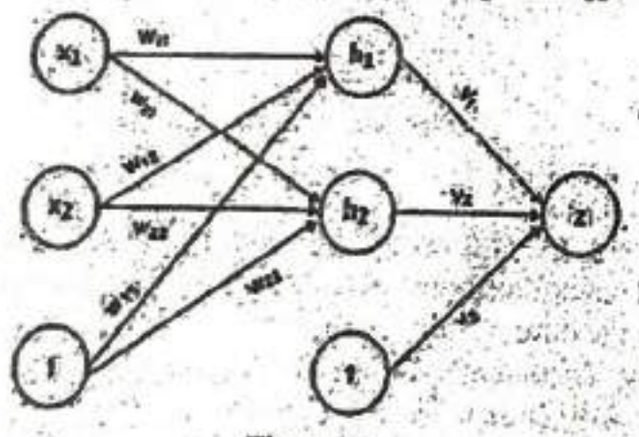

Figure 2

Q.5.
a) What is non-monotonic reasoning? How does it differ from monotonic reasoning? Provide an example where non-monotonic reasoning is necessary.
b) Suppose a genetic algorithm uses chromosomes of the form x = abcdefgh with a fixed length of eight genes. Each gene can be any digit between 0 and 9. Let the fitness of individual x be calculated as: f(x) = (a + b) − (c + d) + (e + f) − (g + h), and let the initial population consist of four individuals with the following chromosomes:

$x_1 = 65413532$
$x_2 = 87126601$
$x_3 = 23921285$
$x_4 = 41852094$

i. Evaluate the fitness of each individual, showing all your workings, and arrange them in order with the fittest first and the least fit last.
ii. Perform the crossover operation: Cross the fittest two individuals using one-point crossover at the middle point.
iii. By looking at the fitness function and considering that genes can only be digits between 0 and 9 find the chromosome representing the optimal solution (i.e. with the maximum fitness). Find the value of the maximum fitness.

[5+5 M][CO 4,5][BTL 5]

Q.6 Write short notes on the following:
a) Different Components of Expert System
b) Syntactic Analysis in NLP
d) Applications of AI in Robotics

[3+3+4 M][CO 5][BTL 4,5]

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B.Tech.(CO)
End-Term Examination

Roll no.....
Sixth Semester
May-2025

CO-306 Computer Networks

Time: 3 Hours *Max. Marks: 40*

Note: Answer all Questions.
Assume suitable missing data, if any.

Q.1 a) How can the suitability of a transmission medium be assessed, and which evaluation criteria should be applied in selecting the appropriate medium for data communication? [2] [CO1] [BTL-3]

b) What is count-to-infinity problem? [2] [CO2] [BTL-1]

c) Given the IP address 180.25.21.172 and the subnet mask 255.255.192.0 what is the subnet address? [2] [CO3] [BTL-4]

d) Explain the concept of congestion and which techniques can be applied to prevent it in a network? [2] [CO4] [BTL-2]

e) Analyze the role of HTTP in web communication and evaluate how it contributes to the functioning of modern websites. [2] [CO5] [BTL-4,5]

Q.2 a) Analyze the OSI and TCP/IP models and evaluate how they differ in their approach to network communication and layer organization. [3] [CO1] [BTL-5]

b) With suitable illustrations, compare baseband and broadband transmission techniques. Which is more suitable for high-speed data transfer and why? [3] [CO1] [BTL-4]

Q.3 a) Evaluate the structure of an IPv4 address and assess the classification of IP addresses into Classes A, B, and C. [3] [CO2] [BTL-5]

b) An ISP has allocated the IP address block 200.10.0.0/20 to a client. The client wants to divide this block into 8 equal-sized subnets.

i) What will be the new subnet prefix for each subnet?

ii) How many hosts can each subnet support?

iii) What is the range of IP addresses (network and broadcast) for the first and last subnet? [3] [CO2] [BTL-4]

OR

c) Explain the operation of the Stop-and-Wait, Go-Back-N, and Selective Repeat ARQ protocols. Compare their efficiency and error recovery mechanisms. [3] [CO2] [BTL-4]

Q.4 a) Evaluate the significance of the Border Gateway Protocol (BGP) in inter-domain routing. Compare and contrast BGP with RIP and OSPF by assessing their purposes, routing decision mechanisms, and scalability in network environments. [3.5] [CO3] [BTL-5]

b) Demonstrate an understanding of congestion control and Quality of Service (QoS) in computer networks. Analyze the key parameters that define QoS and discuss their roles in maintaining effective and reliable network performance. [3.5] [CO3] [BTL-3,4]

Q.5 What is the total delay (latency) for a frame size of 10 million bits that is being set up on link with 15 routers, each having queueing time of 2μs and a processing time of 1μs? The length of link is 3000 km the speed of lights inside the link 2x108 m/sec. the link has bandwidth of 6 Mbps. [5] [CO4] [BTL-5]

Q.6 Demonstrate how SMTP facilitates the transmission of messages and its ability to support multimedia content such as video through extensions. Also discuss the advantages of IMAP4 over POP3 mail access protocols. [6] [CO5] [BTL-4]

OR

Q.7 Discuss the architecture and functioning of MQTT in IoT environments. How does it support lightweight communication and real-time responsiveness? [6] [CO5] [BTL-4]

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Roll No.....

VI Semester

B. Tech

END TERM EXAMINATION

May-2025

CO308 Parallel Algorithm

Time: 3 Hours

Max. Marks: 50

Note: Answer all questions. Assume suitable missing data, if any.

Section A (2 × 5= 10 Marks)

Q1-Attempt all the parts

a) In a small town, a network of roads is being planned to connect various locations. The town has 10 main areas that need to be connected with roads, and the objective is to build a network that connects all areas with the least amount of total road length. The planners aim to create a **Minimum Spanning Tree (MST)** to ensure that the roads are both efficient and cost-effective. As the chief planner, you are tasked with ensuring that the network connects all 10 areas, with no unnecessary extra roads. Your goal is to determine the **minimum number of roads (edges)** that will be required to connect all areas in the most cost-effective way.

How many roads (edges) will be required to construct the minimum spanning tree for a network with 10 areas (vertices)? Explain the reasoning behind your answer. **[2M][CO6][BL2]**

b) What are the challenges in implementing parallel merge sort? Briefly explain. **[2M] [CO4][BL3]**

c) In a small village, the local council is organizing a community event where different groups of people will be assigned to various tasks, such as setting up booths, preparing food, and managing logistics. To help coordinate the teams, they have decided to represent the relationships between the groups using graphs. In the first case, the council is planning a **null graph**, where no groups are connected to each other. Each group operates independently, with no overlapping tasks or dependencies. In another case, the council is considering a **complete graph**, where every group is connected to every

other group, as all tasks are tightly interdependent, and each group needs to collaborate with every other one.Your task as the event coordinator is to determine how many different colors (or task categories) are needed to assign to the groups in both situations, ensuring that no two connected groups are assigned the same task category.

What is the **chromatic number of a null graph and a complete graph?** Explain the reasoning behind your answer in both cases. **[2M][CO3][BL2]**

d) Briefly explain how database query processing can be parallelized.
[2M] [CO1][BL2]

e) Use the given dataset to demonstrate the process of sorting. Show all intermediate steps as the data is sorted using the algorithm, including the creation of **bitonic sequences** and how they are merged.

Data to Sort:
[3, 7, 2, 9, 4, 1, 6, 8] **[2M][CO4][BL3]**

Section B (8 × 5 = 40 Marks)

2. Given the following matrix A, perform its LU Decomposition. Additionally, explain how parallel computing can speed up the LU Decomposition process and provide an example to illustrate this.
[CO1][BL3][8M]

$$A = \begin{bmatrix} 4 & 3 & 2 \\ 3 & 6 & 4 \\ 2 & 4 & 5 \end{bmatrix}$$

3. The following network has 10 vertices:A,B,..,J. The number on each edge represent the distances, in miles, between pairs of vertices. Use Kruskal's algorithm to find the minimum spanning tree for the network.
[CO6][BL3] [8M]

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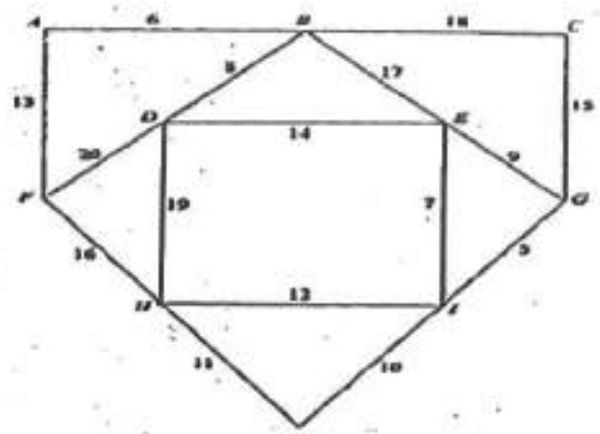
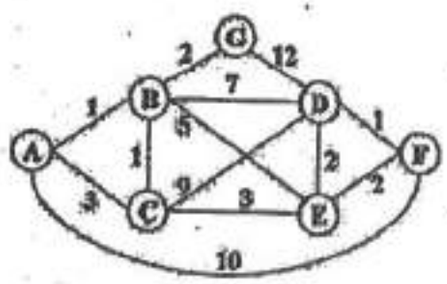


4. Explain the difference between the EREW, CREW, and CRCW models in the context of parallel searching. How does each model affect the performance of searching on a sorted sequence? **[CO1] [BL2][8M]**

5. Consider a random array of 10 integers: [20, 10, 85, 30, 70, 20, 60, 75, 40, 100]. Use the parallel search algorithm (CREW or CRCW model) to search for the number 70. Assume that 5 processors are available, and the array is divided equally among them. Show the steps and results.
[CO5][BL3] [8M]

6. Consider the following weighted graph:



Solve the single source shortest path problem using Dijkstra Algorithm. Assume node 'A' as the source vertex. Show all intermediate steps in tables mentioning the intermediate distance values of all the nodes at each iteration of the algorithm. Finally, produce the shortest-path tree. **[CO6][BL3][8M]**

Roll no.....

Total No. of Pages ___

VI SEMESTER

B.Tech.

END TERM EXAMINATION May-2025

COURSE CODE- CO318

COURSE TITLE- ADVANCED DATABASE MANAGEMENT SYSTEMS

Time: 3:00 Hours Max. Marks : 50

Note : Answer any 5 questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 a) Explain the hybrid merge-join algorithm and its advantage over using only secondary indexes on unsorted relations. Also, describe how the algorithm can be extended when both relations are unsorted but have secondary B+-tree indexes. [5] [CO2] [BLT3]

b) Explain the architecture and key considerations of a remote backup transaction processing system used to achieve high availability. Discuss any three important design issues involved in such systems. [5] [CO3] [BLT2]

Q.2 a) Explain how the following differ: fragmentation transparency, replication transparency, and location transparency. [5] [CO5] [BLT1]

b) Discuss the advantages and disadvantages of the two methods for generating globally unique timestamps. [5] [CO5] [BLT2]

Q.3 a) What are the factors that can work against linear scale up in a transaction processing system? Which of the factors are likely to be the most important in each of the following architectures: shared memory, shared disk, and shared nothing? [5] [CO4] [BLT4]

b) What factors could result in skew when a relation is partitioned on one of its attributes by:

a. Hash partitioning?
b. Range partitioning?

In each case, what can be done to reduce the skew? [5] [CO4] [BLT4]

Q.4 a) Consider the relational schema

Part (part id, name, cost)

Subpart (part id, subpart id, count)

A tuple (p1, p2, 3) in the subpart relation denotes that the part with part-id p2 is a direct subpart of the part with part-id p1, and p1 has 3 copies of p2. Note that p2 may itself have further subparts. Write a recursive SQL query that outputs the names of all subparts of the part with part-id "P-100". [5] [CO1] [BLT3]

b) Suppose that a B+-tree index on (*dept name, building*) is available on relation department. What would be the best way to handle the following selection?

σ (*building* < "Watson") $\wedge$ (*budget* < 55000) $\wedge$ (*dept name* = "Music")(*department*).

[5] [CO2] [BLT3]

Q.5 a) Explain how a TP monitor manages memory and processor resources more effectively than a typical operating system. [5] [CO6] [BLT2]

b) What is the purpose of compensating transactions? Present two examples of their use. [5] [CO6] [BLT1]

Q.6 a) Explain the use of control flow constructs in SQL procedures with examples. [5] [CO1] [BLT2]

b) Differentiate between system-generated, user-generated, and derived references in SQL with appropriate syntax examples. [5] [CO1] [BLT2]

***** END *****

Total No. of Pages: 02

SIXTH SEMESTER

Roll No. .....

B.Tech. (CSE)

END TERM EXAMINATION

May, 2025

CO324 Pattern Recognition

Time: 3:00 Hours

Max. Marks: 40

Note: Answer *ALL* questions.
Assume suitable missing data, if any.
CO# is course outcome(s) related to the question.
BLT# is related order of thinking skill (Bloom's Taxonomy)

1. Attempt any TWO of the following.

[a] How is pattern recognition applied to detect vehicle types and manage traffic lights intelligently? Discuss the implications of real-time processing on design methodologies. **[4] [CO2, 4, 5] [BTL3, 4]**

[b] How does Bayesian decision theory help classify medical images for disease detection? What role does minimum-error-rate classification play in reducing false positives? **[4] [CO2] [BTL2, 3, 4]**

[c] A data point has a missing feature: x [3, ?]. Assume the mean and variance of the missing features for each class are known: C1: $\mu = [3, 5]$, $\sigma^2 = [1, 2]$. Estimate the missing feature using the expected value and classify using MAP. **[4] [CO2] [BTL3, 4]**

2.[a] Given a 2-dimensional data point $x = [3, 4]$, and the direction of the first principal component as the unit vector $v = [0.6, 0.8]$, compute the projection of x onto the principal component axis. **[4] [CO3] [BTL3]**

[b] You are given a dataset x=[2,3]. Assume the data is drawn from a Gaussian distribution with known variance.

i. Compute the Maximum Likelihood Estimate (MLE) of the mean μ.

ii. Assuming a prior distribution $\mu \sim N(0,1)$, compute the Maximum A Posteriori (MAP) estimate of μ.

iii. Compare the MLE and MAP results and explain when the MAP estimate is more reliable than the MLE. **[4] [CO2] [BTL3, 4]**

3. Attempt any TWO of the following.

[a] Consider the data points x = [1, 4, 8], with initial cluster centres $c_1 = 2$ and $c_2 = 7$, and a fuzziness parameter m = 2. Perform a single iteration of the fuzzy K-means clustering algorithm by computing the membership degrees of each point to both clusters, followed by updating the cluster centres based on the calculated memberships. **[4] [CO5] [BTL3, 4]**

[b] Compare and contrast the Parzen-window and K-Nearest Neighbour methods for probability density estimation. Discuss their respective advantages and disadvantages, and identify scenarios where one method may be more suitable than the other. **[4] [CO2] [BTL4]**

[c] Estimate the probability density at x = 2 using Parzen Window Estimation, given the sample points x = [1, 2, 3] and a Gaussian kernel with bandwidth h = 1. **[4] [CO2] [BTL3, 4]**

4. Answer any TWO of the followings.

[a] Consider a perceptron receives an input vector $X = [0.7, -0.3]$, has corresponding weights $W = [0.8, 0.5]$, and a bias term $b = -0.1$. Compute the output of a perceptron using sigmoid activation function and calculate the weighted sum (net input) and the final output of the perceptron. **[4] [CO4] [BTL3, 4]**

[b] Consider a simple neural network that has the following characteristics: One input neuron; One hidden neuron with ReLU activation: ReLU(x) = max(0, x); One output neuron with linear activation: f(x) = x; Weight from input to hidden: $w_1 = 0.5$; Weight from hidden to output: $w_2 = 1.0$; Input value: x = 1; Target output: t=2; Learning rate: η=0.1. Considering Backpropagation in a Simple Neural Network, calculate the following:

i. Perform a forward pass and compute the final output of the network.

ii. Calculate the error using the squared error function:

$$E = \frac{1}{2}(t - y)^2$$ **[4] [CO4] [BTL3, 4]**

[c] Explain the characteristics of ReLU, sigmoid, and tanh activation functions. Compare their mathematical properties, behavior during training (such as vanishing gradients), and typical use cases. In what scenarios is each activation function most suitable? **[4] [CO4] [BTL2, 3]**

5.[a] A logistics company wants to optimize delivery routes across multiple cities, considering time windows and traffic conditions. Traditional algorithms fail due to the complexity of the solution space. Identify the optimization problem in this scenario. Explain how a genetic algorithm can be applied to solve it, briefly describing the roles of initialization, selection, crossover, mutation, and termination. Analyse how each stage helps guide the search toward an optimal or near-optimal route. **[4] [CO5] [BTL4]**

[b] Describe the concept of Boltzmann learning in neural networks, highlighting how it differs from Hebbian learning and backpropagation, and explain the computational challenges associated with Boltzmann machines, along with the impact of their stochastic update mechanism on convergence. **[4] [CO1, 4] [BTL4]**

—Best of Luck—

[b] For vanilla GAN, write down the loss $\mathcal{L}_G^{minmax}$ that you would minimise for the generator G if you followed the game definition literally (no tricks). Explain why $\mathcal{L}_G^{minmax}$ minimax can lead to vanishing gradients early in training **(Use maximun two sentences)**. Derive the alternative non-saturating generator loss $\mathcal{L}_G^{NS}$ used in many modern GANs, and show (mathematically) that minimising it is equivalent to maximising logD(G(z)). **[4] [CO1, CO4]**

[c] A small GAN uses generator G that produces its fake sample according to $x_{fake} = w_G z + b_G$ and a discriminator D, a logistic regression based classifier $D(x) = \sigma(w_D x + b_D)$, where $\sigma(v) = 1/(1 + e^{-v})$. In one training iteration the generator receives the noise value $z = 1.2$ while the single real data example is $x_{real} = 4$. The netwok weights are w_G=1.4, b_G= 0.8, w_D= 0.9, $b_D = -2.1$. Determine the fake sample produced by the generator. Also, find the generator loss $\mathcal{L}_G$ and discriminator loss $\mathcal{L}_D$ with following function: **[4] [CO3, CO4]**

$$\mathcal{L}_D = -\frac{1}{2}\left[\ln D(x_{real}) + \ln(1 - D(x_{fake}))\right]$$

$$\mathcal{L}_G = -\ln D(x_{fake})$$

Use the followings to simplify calculations: $\sigma(1.5) = 0.817, \sigma(0.132) \approx 0.533$, $\ln(0.817) = -0.202, \ln(0.533) \approx -0.629$, $\ln(0.467) \approx -0.762$.

---Best of Luck---

Total No. of Pages :04 *Roll No. .....*

SIXTH SEMESTER

B.Tech. (CSE)

END TERM EXAMINATION ***May, 2025***

CO328 DEEP LEARNING

Time: 3:00 Hours ***Max. Marks: 40***

Note: Answer *ALL* questions.
Assume suitable missing data, if any.
CO# is course outcome(s) related to the question.

1.[a] A manufacturing company is using high-resolution camera systems on its assembly lines to detect defects in metal components. You are part of the data science team responsible for deploying a deep learning–based visual inspection system using a convolutional neural network (CNN). The initial model performs with 98% accuracy on training data but only 82% on real-world production images. After investigating, you discover that the model was trained on clean, well-lit lab images, while production images often have inconsistent lighting, background noise, and slight variations in orientation. Answer the following in **3–4 sentences** each: What is the most likely cause of the performance gap between lab data and production data? What metrics or methods would you use to ensure that the updated model performs reliably under production conditions? **[4] [CO2, CO3]**

[b] Suppose you are training a feedforward neural network with the architecture: Input Layer (3 nodes), Hidden Layer 1 (2 neurons), Hidden Layer 2 (2 neurons), Output. All hidden layers use the sigmoid activation function. During backpropagation for a single training example, you are currently computing the gradients at Hidden Layer 1. At this stage, the upstream gradient from Hidden Layer 2 is $\delta^{[2]}$. The weight matrix from Hidden Layer 1 to Hidden Layer 2 is $W^{[2]}$. The activations from Hidden Layer 1 are $a^{[1]}$ and the sigmoid derivatives at that layer are $\sigma'(z^{[1]})$. The followings values are given: **[4] [CO1]**

[b] For vanilla GAN, write down the loss $\mathcal{L}_G^{minmax}$ that you would minimise for the generator G if you followed the game definition literally (no tricks). Explain why $\mathcal{L}_G^{minmax}$ minimax can lead to vanishing gradients early in training (**Use maximun two sentences**). Derive the alternative non-saturating generator loss $\mathcal{L}_G^{NS}$ used in many modern GANs, and show (mathematically) that minimising it is equivalent to maximising $\log D(G(z))$. **[4] [CO1, CO4]**

[c] A small GAN uses generator G that produces its fake sample according to $x_{fake}' = w_G z + b_G$ and a discriminator D, a logistic regression based classifier $D(x) = \sigma(w_D x + b_D)$, where $\sigma(v) = 1/(1 + e^{-v})$. In one training iteration the generator receives the noise value $z = 1.2$ while the single real data example is $x_{real} = 4$. The netwok weights are w_G=1.4, b_G= 0.8, w_D= 0.9, $b_D = -2.1$. Determine the fake sample produced by the generator. Also, find the generator loss $\mathcal{L}_G$ and discriminator loss $\mathcal{L}_D$ with following function: **[4] [CO3, CO4]**

$$\mathcal{L}_D = -\frac{1}{2}[\ln D(x_{real}) + \ln(1 - D(x_{fake}))]$$

$$\mathcal{L}_G = -\ln D(x_{fake})$$

Use the followings to simplify calculations: $\sigma(1.5) = 0.817, \sigma(0.132) \approx 0.533$, $\ln(0.817) = -0.202, \ln(0.533) \approx -0.629$, $\ln(0.467) \approx -0.762$.

—Best of Luck—

Total No. of Pages :04

Roll No. .....

SIXTH SEMESTER

B.Tech. (CSE)

END TERM EXAMINATION ***May, 2025***

CO328 DEEP LEARNING

Time: 3:00 Hours ***Max. Marks: 40***

Note: Answer *ALL* questions.
Assume suitable missing data, if any.
CO# is course outcome(s) related to the question.

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[b] Suppose you are training a feedforward neural network with the architecture; Input Layer (3 nodes), Hidden Layer 1 (2 neurons), Hidden Layer 2 (2 neurons), Output. All hidden layers use the sigmoid activation function. During backpropagation for a single training example, you are currently computing the gradients at Hidden Layer 1. At this stage, the upstream gradient from Hidden Layer 2 is $\delta^{[2]}$. The weight matrix from Hidden Layer 1 to Hidden Layer 2 is $W^{[2]}$. The activations from Hidden Layer 1 are $a^{[1]}$ and the sigmoid derivatives at that layer are $\sigma'(z^{[1]})$. The followings values are given: **[4] [CO1]**

$\delta^{[2]} = \begin{bmatrix} 0.4 \\ -0.2 \end{bmatrix}$, $W^{[2]} = \begin{bmatrix} 0.6 & -0.1 \\ -0.5 & 0.3 \end{bmatrix}$, $a^{[1]} = \begin{bmatrix} 0.8 \\ 0.5 \end{bmatrix}$, $\sigma'(z^{[1]}) = \begin{bmatrix} 0.16 \\ 0.25 \end{bmatrix}$

Using the information above, compute the gradient vector $\delta^{[1]}$ at Hidden Layer 1. Show all necessary steps and intermediate values clearly.

2.[a] A convolutional layer produces, for a mini-batch of size N = 2, C = 2 channels and a single spatial location (H = W = 2), the following raw activations:

Channel 1: Batch 1: $\begin{bmatrix} 4 & 6 \\ 4 & 6 \end{bmatrix}$, Batch 2: $\begin{bmatrix} 6 & 4 \\ 6 & 4 \end{bmatrix}$

Channel 2: Batch 1: $\begin{bmatrix} 2 & 4 \\ 2 & 4 \end{bmatrix}$, Batch 2: $\begin{bmatrix} 4 & 2 \\ 4 & 2 \end{bmatrix}$

These activations are passed through BatchNorm with scale $\gamma = [1, 2]$, shift $\beta = [0, 1]$ and $\epsilon = 10^{-5}$. Calculate the BatchNorm output for the batch 1, in each channel c at spatial location $h = 1, w = 2$? Also, how many trainable parameters does this BatchNorm layer contain, and what are their shapes? **[4] [CO1]**

[b] You are training a deep learning model for detecting pneumonia from chest X-ray images using a convolutional neural network (CNN). During training, you notice the training loss is decreasing steadily, but the validation loss stops improving early and begins to increase after a few epochs. To address this, you consider implementing the following techniques: Dropout; Data augmentation. Explain how each of these techniques can help mitigate the issue you are facing. Limit your answer to **maximum 5 sentences.** **[4] [CO3]**

3.[a] Consider a CNN that takes as input a single-channel 8×8 image and processes it through four stages: first, a convolutional layer (Conv1) with two 3×3 filters, stride 1 and no padding, followed by a ReLU; next, a 2×2 max-pooling layer with stride 2; then a second convolutional layer (Conv2) with four 3×3 filters, stride 1 and padding 1, followed by a ReLU; and finally a global average-pooling that collapses each feature map to a single scalar. Determine the height×width×channels of the output tensor after each of these four operations, Also calculate how many trainable parameters Conv1 contains and how many Conv2 contains. **[4] [CO2, CO3]**

[b] Illustrate how stacking multiple convolutional (and optionally pooling) layers increases the receptive field of deep activations, and explain why this enables the network to learn hierarchical feature representations. **[4] [CO1]**

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4. Answer any TWO of the followings.

[a] Explain how an RNN's hidden state allows it to "remember" information from earlier in the sequence. Describe two key training difficulties that arise when trying to learn long-term dependencies with a vanilla RNN. For each difficulty, give a **one-sentence intuition** for why it happens. **[4] [CO1]**

[b] Consider a single-layer LSTM processing a sequence of length T = 5 with batch size N = 2. Each input vector has dimensionality D = 3, and the LSTM's hidden state size is H = 4. The LSTM uses the usual formulation with four gates. Assume each gate also has its own bias of size H. How many total trainable parameters does this LSTM contain? If the input tensor has shape (T, N, D) what are the shapes of the output hidden states h and cell states c after processing the full sequence? **[4] [CO1, CO2]**

[c] A single-head decoder self-attention layer (width = 2) receives the three embeddings: $x_1 = [1, 0]^T$, $x_2 = [0, 1]^T$, $x_3 = [1, 1]^T$. Its projection matrices are $W^Q = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, $W^K = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and $W^V = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$. With the causal mask in force, the scaled scores have already been soft-maxed, yielding the attention-weight matrix (rows = queries, columns = keys/values):

$$\alpha = \begin{bmatrix} 1 & 0 & 0 \\ 0.33 & 0.67 & 0 \\ 0.14 & 0.28 & 0.58 \end{bmatrix}$$

Write the query, key and value vectors associated with token 1. Which token supplies the largest contribution to token 2's attention output, and what feature of the key/query interaction explains this preference? **[4] [CO1, CO2]**

5. Answer any TWO of the followings.

[a] Consider a vanilla Generative Adversarial Network (GAN) defined by a two-player minimax game between a generator G and a discriminator D. Give the mathematical expression of the minimax objective, with expectations over real and noise distributions, indicating each player's (G and D) optimization goal **(Use maximum 3 sentences)**. Derive the batch-averaged discriminator loss $\mathcal{L}_D$ that you would actually minimise in code when using mini-batch sizes $m_{real} = m_{fake} = m$ into a plain minimisation problem. **[4] [CO1, CO4]**

Total No. of Pages- 02 *Roll No .....*

VIII Semester
B.Tech.

END TERM EAMINATION May-2025

CO408 - INTELLECTUAL PROPERTY RIGHTS

Time-3:00 Hours Max. Marks-50

Note: 1. Answer all questions.
2. Assume suitable missing data, if any.

Q1. (a) Design a flowchart showing all prosecution steps for a patent application in India.

(b) If the burden of proof in a patent infringement case were reversed, what challenges would arise? [5+5 M][CO1][L1,5]

Q2. (a) Critique the principle that 'Trademark rights are territorial' in a globalized economy.

(b) Frame a hypothetical situation where a work qualifies both for copyright and design protection. [5+5 M] [CO2][L5,6]

Q.3 Answer any two from the followings. [5+5 M] [CO3, CO4][L1,3,4]

(a) Suppose Darjeeling Tea was patented instead of registered as GI — what would have been the implications?

(b) Create a comparative table showing key differences between patent, trademark, copyright, and GI.

(c) Prepare a patent claim for an innovative smartphone feature.

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Q.4 Answer any two from the followings: [5+5 M] [CO3, CO4] [L2,3]

(a) How would you protect a new beverage brand using multiple IPRs simultaneously?

(b) What happens if an unregistered copyright is infringed internationally?

(c) Why are slogans sometimes protectable under trademarks, but not always?

Q5. Write Short note on any two from the followings:
[5+5M] [CO1, CO5] [L1]

(a) Fair Use in Copyright law.
(b) Freedom to Operate (FTO) analysis.
(c) Patent infringement defences.

Total No. of Pages – 4

Roll No. .....

Second Semester

B.Tech. (CSE)

End Term Examination

May–2025

CS102: DISCRETE STRUCTURES

Time: 3:00 Hours **Max. Marks: 50**

Note: Answer any five questions. All questions carry equal marks. Assume suitable missing data, if any.

Q. No. 1 (2 × 5)

A Test the validity of the following argument relating to the students of VIIth and VIIIth Semester of DTU using ***Rules of Inference***: - [CO1] {L5}

(i) There is a student in the VIIth semester who is not eligible to file for nomination to the post of class placement representative but is doing internship at Google.

(ii) If a student has CGPA of at least 9.0, then the student is eligible to file for nomination to the post of class placement representative.

(iii) If a student has CGPA less than 9.0, then the student has to clear the screening test for placement.

(iv) If a student has cleared the screening test for placement, the student is eligible for placement in any company.

Therefore, it can be concluded that a few students are eligible for placement in any company.

B Convert the statement $(x \to (y \wedge w)) \wedge (z \to (y \wedge w))$ into PDNF forms [CO1] {L2}

Q. No. 2 (2 × 5)

A Assume that the computational complexity of the divide and conquer algorithm is determined using recurrence relation given below. What is the big theta (Θ) estimate for the complexity of the algorithms? [CO2] {L3}

$f(n) = 2f(\sqrt[2]{n}) + 1$, where n is a perfect square, $f(1) = 1$

B If $A = \{1,2,3,4,5,6,7,8\}$, $p_1 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 3 & 4 & 1 & 2 & 6 & 5 & 7 & 8 \end{pmatrix}$; [CO3] {L2}

$p_2 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 2 & 3 & 1 & 5 & 4 & 6 & 7 & 8 \end{pmatrix}$; $p_3 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 6 & 3 & 2 & 5 & 4 & 1 & 7 & 8 \end{pmatrix}$.

Outline the expression for $(p_2 \circ p_1) \circ p_3$. Is the resulting permutation odd or even?

Q. No. 3 (2 × 5)

A Let $A = \{a,b,c,d,e\}$, R and S be equivalence relations on A whose matrices are given below. Compute the matrix of the smallest relation [CO3] {L3}

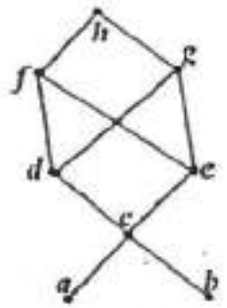
containing R and S (including their properties). Also list the elements of this relation.

$$M_R = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \end{bmatrix}; M_S = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

B If $\Lambda = \{1,2,3,5,6,10,15,30\}$ with the partial order $\leq$ of divisibility on Λ, *i.e* $a \leq b$ if and only if a *divides* b ; and $B = P(S)$, the power set of S, where $S = \{e,f,g\}$; and $(B, \subseteq)$ be a poset, where $\subseteq$ is the partial order of set containment. Analyse if $(\Lambda, \leq)$ and $(B, \subseteq)$ are isomorphic posets. Justify your answer. [CO3] {L4}

Q. No. 4 (2 × 5)

A $(A, \leq)$ is a poset, where $A = \{a,b,c,d,e,f,g,h\}$ and $\leq$ is the partial order on A with Hasse diagram as shown in Figure. If $B = \{a,b\}$ and $C = \{c,d,e\}$ are subsets of A. Interpret what are the following: - [CO3] {L2}



(i) Lower Bounds of subsets B and C.

(ii) Upper Bounds of subsets B and C

(iii) Greatest Lower Bound of subsets B and C

(iv) Least Upper Bound of subsets B and C

B If n is a positive integer, p a prime number and p^2 divides n. Is D_n, the set of positive integers that divides n, a lattice under the relation of divisibility? Prove or disprove that D_n is not a Boolean Algebra. [CO3] {L5}

Q. No. 5

A System specification for a 4-input security system is modelled using the function $f: B_4 \to B_1$, which is defined as given below [CO3] {L3}

$$f(x,y,z,w) = \begin{cases} 1 & \textit{as shown in table} \\ 0 & \textit{otherwise} \end{cases}$$

Use Karnaugh Map to develop a logical circuit diagram with minimum number of logic gates to implement the system specification.

x	y	z	w	f(x,y,z,w)
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	1	1	0	1

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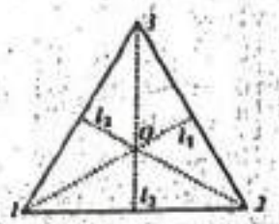
B Consider the equilateral triangle shown opposite. The symmetries of the triangle are: - [CO3] [L5]



Counter-clockwise rotations f_1, f_2, and f_3, about O through 360°, 120° and 240°, respectively; reflections g_1 , g_2 and g_3 about the respective angular bisectors l_1 , l_2 and l_3 respectively. Develop the multiplication table for the operation *, "*followed by*" defined on the set of symmetries of the triangle.

Q. No. 6 (2 × 5)

A Let $A = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7, v_8, v_9, v_{10}\}$ be a set and T be a relation on A, defined as $T = \{(v_2, v_3), (v_2, v_1), (v_4, v_5), (v_4, v_6), (v_5, v_8), (v_6, v_7), (v_4, v_2), (v_7, v_9), (v_7, v_{10})\}$. [CO4] [L2]

Determine if T is a tree. If yes, draw the digraph of the tree and identify the root, the leaves and the height of the tree. In case T is not a tree identify the properties that the relation satisfies.

B A college offers 5 elective subjects (with codes E01 to E05) for 2nd Sem students to choose 2 from these subjects. The data of the number of students registered for $Subject_i$ and $Subject_j$ is tabulated below. [CO4] [L6]

	$Subject_i$	$Subject_j$	#
a)	E01	E02	19
b)	E01	E05	26
c)	E02	E03	18
d)	E02	E04	24

	$Subject_i$	$Subject_j$	#
e)	E02	E05	17
f)	E03	E04	28
g)	E04	E05	35

A clash will occur in the timetable if the examination of two subjects is conducted during the same time-slot, resulting in a student not being able to take the examination of one of the subjects for which the student is registered. Assuming that the number of examinations per day for a given student is not more than one

(i) Apply the principle of graph colouring to find the minimum numbers of days required to conduct the End-Semester Examination for the elective subjects without any clash in the timetable?

(ii) How many different clash-free time-tables can be generated for the conduct of End-Semester Examinations of the elective subjects in the minimum number of days?

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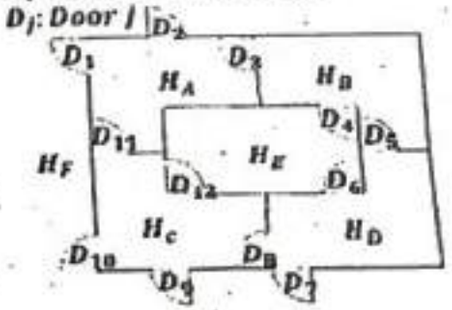
Q. No. 7 (2 × 5)

A An exhibition route map is required to be made for a newly renovated museum with five indoor Exhibit Halls and one outdoor Exhibit Stand. The floor plan of the museum is given in Figure. [CO4] [L3]



Is it possible to plan a route to visit every exhibit hall / stand in the museum by passing through each door exactly once? If it is possible, enumerate the path. Justify your answer, in case it is not possible to plan such a route.

B The representative weighted-graph of the cost of establishing high-speed data connectivity between new branch offices of a multi-national company (MNC) is shown in figure below. The weights mentioned against the edges represent the cost in multiples of ₹100,000/-. The Chief Operations Officer of the MNC intends to find the most economical solution to the problem. [CO5] [L3]

Assuming that the Head-office is located at city A, build a minimal spanning tree (root as city A) with vertices representing various branch offices of the company.

What will be the minimum cost for establishing this data network?

Total No. of Pages 2
IInd SEMESTER
END SEMESTER EXAMINATION

Roll No.....
B.Tech.(CSE)
(May-2025)

CS104: Data Structures

Time: 3:00 Hours **Max. Marks: 40**

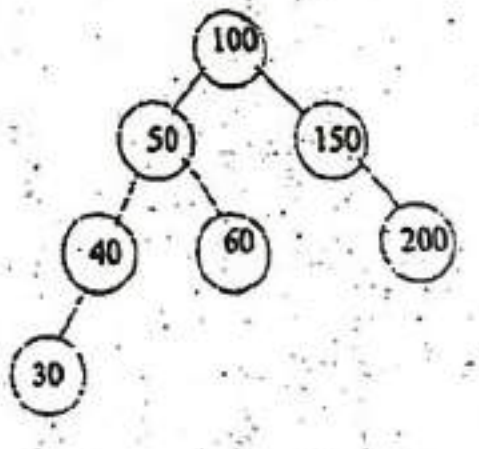
Note: Answer any five questions. Write pseudo codes/C code for explaining algorithms. Assume suitable missing data, if any.

1. A program is to read a long text input having only lowercase alphabets. We need to count frequency of each alphabet and store it in a data structure so that at any point of time we can tell the character with highest frequency.
   (a) Suggest a suitable data structure for this task and write following functions:
   (b) UpdateFrequency(..., chr) to update increase frequency of character chr. This function can take other parameters also if needed.
   (c) PrintHighestFrequency(...) to print character with highest frequency and its frequency count.

   [2+3+3=8 marks]

2. Implement a stack using doubly linked list and write algorithms for following operations: CreateEmptyStack(), Push(), Pop(). Assume suitable return type and passed parameters. **[2+3+3=8 marks]**

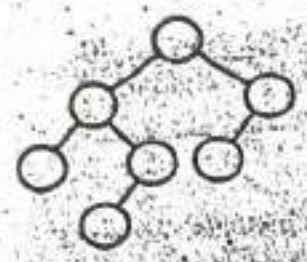
3. Consider following AVL tree:
   (a) Show the AVL tree after inserting 10
   (b) Show the AVL tree after inserting 180
   Consider given AVL tree as beginning point in both questions and show all intermediate trees (if any).



[4+4=8 marks]

4. Given an undirected connected graph G(V,E), write an algorithm to display one path between vertex x to vertex y taking help of DFS graph traversal technique and print the path as $x \rightarrow p \rightarrow q \rightarrow \ldots \rightarrow y$. **[8 marks]**

5. (a) Label each node in the following binary tree with numbers from the set {2, 26, 10, 27, 20, 15, 42} so that it is legal Binary Search Tree.



(b) Construct the binary tree that generated following In-order and Pre-order traversal results: In-order: AQVNBRMSP
Pre-order: BQAVNRSMP

[4+4=8 marks]

6. Consider a hash table consisting of M = 11 slots, and suppose nonnegative integer key values are hashed into the table using the hash function h1() written in C language:

```
int h1 (int key)
{
    int x = (key + 7) * (key + 7);
    x = x / 16;
    x = x + key;
    x = x % 11;
    return x;
}
```

Suppose that collisions are resolved by using linear probing. The integer key values [43, 23, 1, 0, 15, 31, 4, 7, 11, 3] are to be inserted, in the order given. Show the final hash table. [8 marks]

7. (a) Describe the structure of a node in B-tree.
(b) Describe how minimum and maximum number of keys/children in a B-tree node are decided in B-tree structure. [4+4=8 marks]

Total no. of Pages: 02 *Roll no.....*

End Term Examination **May-2025**

Fourth Semester **B.Tech. CSE**

Paper Code: CO 202/CS210n **Database Management Systems**

Duration: 03 Hours **Max Marks: 40**

Note: . All questions are compulsory.
Marks for questions are indicated alongside
Assume suitable missing data, if any.

Q1. Answer the following questions in brief. *(any four)* [8][CO1,2,3,5]

f) What is the purpose of checkpoints? How do they improve recovery performance? [BLT L1,2]

g) Define foreign key with an example. [BLT L1,2]

h) What is the scheme used by the database system to recover from the deadlock state? [BLT L2]

i) What are the different levels of data abstraction in DBMS? [BLT L2]

j) Name different types of relationships in ER modelling. [BLT L2]

Q2. (a) Suppose that the schema R = (A, B, C, D, E) is decomposed into (A, B, C) and (A, D, E). Considering the following set of FDs prove that the decomposition is lossless but not dependency preserving.

$$A \rightarrow BC$$
$$CD \rightarrow E$$
$$B \rightarrow D$$
$$E \rightarrow A$$

[BLT L3,5][4][CO3]

(b) A relation R(A, B, C) has FDs AB→C, C→A. Is R in 3NF or in BCNF? Justify your answer. [BLT L5][2][CO3]

(c) What are the advantages and limitations of Two-Phase Locking (2PL) protocol? [BLT L2,4][2][CO4]

Q3. (a) What do you mean by disjoint constraints of specialisation/ generalisation? Explain with an example. [BLT L2,3][2][CO2]

(b) Design an ER diagram for a University database with Students, Courses, Professors and Enrollments. Mention assumptions clearly. [BLT L6][4][CO2]

(c) What are the benefits of multilevel indexing? [BLT L2][2][CO7]

Q4. (a) If there are three transactions with 1,2,3 operations respectively. Then find: [BLT L3,5][4][CO4]

(iii) Total number of schedules

(iv) Total number of serial and non-serial schedules

(b) Explain timestamp ordering protocol with an example. How does it prevent conflicts? [BLT L1,2][4][CO5]

Q5. (a) Explain the four kinds of Integrity Constraints in a Database Management System with examples. [BLT L1,4][2][CO1]

(b) Check whether the given schedule S is conflict serializable or not. If it is conflict serializable then give all of its topological sorting.

T1	T2	T3	T4
			R(A)
	R(A)		
		R(A)	
W(B)			
	W(A)		
		R(B)	
	W(B)		

[BLT L5,6][3][CO5]

(c) A transaction performs the following operations: read(X), X=X-10, write(X), read(Y), Y=Y+10, write(Y). [BLT L3,5][3][CO6]

(iii) Show the undo and redo log records for this transaction.

(iv) Illustrate how recovery happens in both cases (undo and redo).

END

Total No. of Pages 2
IV-SEMESTER
END TERM EXAMINATION

Roll No.....
B.Tech.(CSE)
May- 2025

CS-204 THEORY OF COMPUTATION

Time: 3:00 Hours **Max. Marks: 50**

Note: Attempt any five questions. Assume suitable missing data, if any

Q.No. 1

A. Construct DFA that accepts string over {0, 1} if and only if the value of the strings interpreted as a binary representation of an integer is 0 mod 5. For example 0101, 1111 representing integer '5' and '15' respectively are to be accepted. *[5] CO1 BTL-3*

B. What is pumping lemma for regular expression? Show that the language **L= {0^n | n is a Perfect Square}** is not regular. *[5] CO1 BTL-1,3*

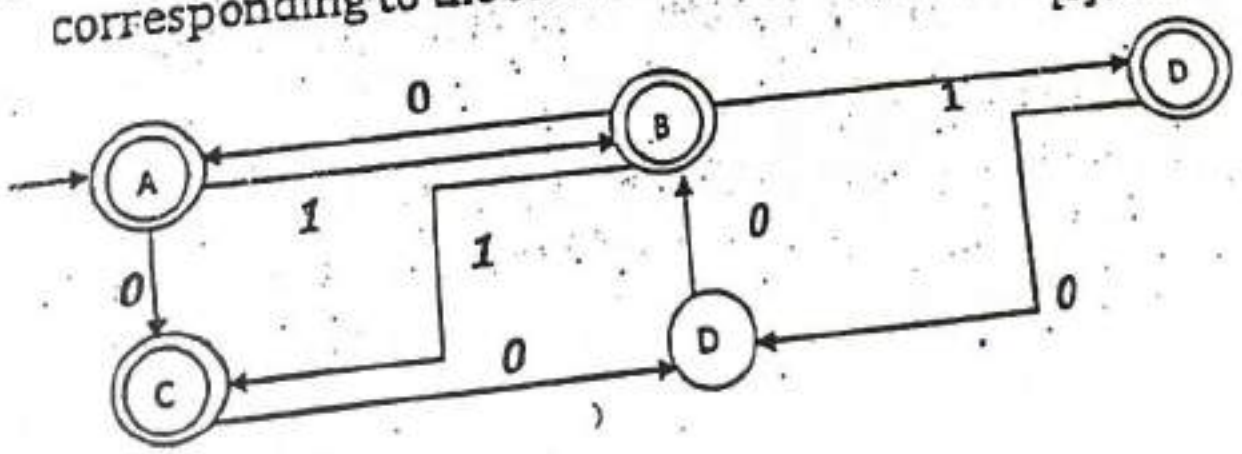
Q.No. 2

A. Design Moore and Mealy machine for binary input sequence if it ends in 1010, output is 'HELLO' if it ends in '1011' output is 'DELHI' , otherwise 'DTU'. *[5] CO3 BTL-3,4*

B. Construct a Context Free Grammar (CFG) for the alphabet {0,1} with number of 0's not equal to number of 1's and also explain chomsky's classification for the grammar. *[5] CO2 BTL-2,3*

Q.No. 3

A. What is Arden's theorem? Find a regular expression (RE) corresponding to the following FA using Arden's theorem. *[5] CO2 BTL-2,4*



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B. Is it possible for every context-free grammar to be converted to both CNF and GNF?

i. Convert the following grammar to CNF [5] CO2 BTL-1,2

$S \rightarrow bA \mid aB$, $A \rightarrow bAA \mid aS \mid a$, $B \rightarrow aBB \mid bS \mid b$

ii. Convert following CFG to GNF

$S \rightarrow AB$, $A \rightarrow BS \mid b$, $B \rightarrow SA \mid a$

Q.No. 4

A. Explain equivalence of two finite Automata (FA) and Construct a DFA to recognize the regular expression $(a+b(b+ab)^*aa)^*$. [5] CO1 BTL-2,3

B. Construct a push down automata for the following Language $L = \{ a^n b^{n+2} \mid n=1, 2, 3, \ldots\ldots\}$. [5] CO4 BTL-5

Q.No. 5

A. What is pumping lemma for context free language? Prove that the language $L = \{ a^n b^n c^n \mid n \geq 0\}$ is not CFL using pumping lemma for context free language (CFL). [5] CO3 BTL-3

B. Why the Universal Turing Machine (UTM) concept is important in the theory of computation? Design a Turing Machine (TM) that accepts all palindromes over the input alphabet {0,1}. [5] CO5 BTL-4,5

Q.No. 6

A. Construct the CFG generating the language accepted by the following PDA: $M=(\{ q_0,q_1\}, \{0,1\},\{Z_0,X\},\delta,q_0, Z_0,\phi)$ where δ is given below: [5] CO4 BTL-5

$\delta(q_0, 1, Z_0) = \{(q_0, XZ_0)\}$
$\delta(q_0, 1, X) = \{(q_0, XX)\}$
$\delta(q_0, 0, X) = \{(q_1, X)\}$
$\delta(q_0, \epsilon, Z_0) = \{(q_0, \epsilon)\}$
$\delta(q_1, 1, X) = \{(q_1, \epsilon)\}$
$\delta(q_1, 0, Z_0) = \{(q_0, Z_0)\}$

B. Explain following with suitable example

i. Halting problem and Church's thesis. [2.5] CO5 BTL-1,2

ii. Post Correspondence Problem (PCP) and Myhill-Nerode Theorem. [2.5] CO4 BTL-1,2

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Total no. of Pages:02 Roll no.....

FOURTH SEMESTER

B.Tech (CSE)

END TERM EXAMINATION May-2025

COURSE CODE: CS206n

COURSE TITLE: Computer System Architecture and Organisation

Time: 03:00 Hours Max. Marks: 50

Note: All questions carry equal marks.
Attempt any FIVE questions.
Assume suitable missing data, if any.

Q.1 (a) Design and explain the 4-bit binary to gray code converter. [5][CO1][BTL2]

(b) Register A holds the 8 bit binary 11011001. Determine the B operand and logic micro operation to be performed in order to change the value in A to (i) 01101101 (ii) 11111101. [5][CO1][BTL2]

Q.2 (a) What is RTL? Draw a block diagram showing the hardware implementation of the following register transfer;

IF(P=0) and Q=1 then R1← R2 else R1←R3 [5][CO2][BTL3]

(b) What do you mean by instruction cycle? Discuss the various phases of instruction cycle with suitable examples. [5][CO2][BTL1]

Q.3 (a) Design a parallel priority interrupt hardware (Priority Encoder) for a system with four interrupt sources. [5][CO3][BTL3]

(b) Why are the read and write control lines in a DMA controller bidirectional? Under what condition and for what purpose are they used as inputs and as outputs? [5][CO3][BTL3]

Q.4 (a) A virtual memory has a page size of 1Kwords. There are eight pages and four blocks. The associative memory page table contains the following entries:

Page	Block
0	3
1	1
4	1
6	0

Make a list of all virtual addresses (In decimal) that will cause a page fault if used by the CPU. [5][CO4][BTL5]

(b) Suppose the system is using a 8-way Set associative mapping in the cache. The cache size is 32 KB, block size is 16 words, word size is 32 bits. The size of main memory is 8GB. What is the number of bits required for cache tag? (Note: memory is word addressable). [5][CO4][BTL5]

Q.5 (a) Design and explain a BCD substractor in details. [5][CO5][BTL6]

(b) Design an array multiplier that multiply two 4-bit numbers. Use AND gates and 4-bit binary adder. [5][CO5][BTL6]

Q.6 Write short note on ANY TWO of the following.

a. Microprogram Sequencer [5][CO2][BTL2]

b. Programmed I/O [5][CO5][BTL2]

c. Match logic for associative memory [5][CO4][BTL2]

All the Best

Total no. of Pages:02

Roll no.....

FOURTH SEMESTER

B.Tech (CSE)

END TERM EXAMINATION ***May-2025***

COURSE CODE: CS206n

COURSE TITLE: Computer System Architecture and Organisation

Time: 03:00 Hours *Max. Marks: 50*

Note: All questions carry equal marks.
Attempt any **FIVE** questions.
Assume suitable missing data, if any.

Q.1 (a) Design and explain the 4-bit binary to gray code converter.

[5][CO1][BTL2]

(b) Register A holds the 8 bit binary 11011001. Determine the B operand and logic micro operation to be performed in order to change the value in A to (i) 01101101 (ii) 11111101. **[5][CO1][BTL2]**

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IF(P=0) and Q=1 then R1← R2 else R1←R3

[5][CO2][BTL3]

(b) What do you mean by instruction cycle? Discuss the various phases of instruction cycle with suitable examples. **[5][CO2][BTL1]**

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Q.5 (a) Design and explain a BCD substractor in details. [5][CO5][BTL6]

(b) Design an array multiplier that multiply two 4-bit numbers. Use AND gates and 4-bit binary adder. [5][CO5][BTL6]

Q.6 Write short note on ANY TWO of the following.

a. Microprogram Sequencer [5][CO2][BTL2]
b. Programmed I/O [5][CO5][BTL2]
c. Match logic for associative memory [5][CO4][BTL2]

----------All the Best----------

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Total no. of Pages: 3

Roll no.....

B.Tech.(CO)

Fourth Semester

End-Term Examination

May-2025

CS-208 Computer Network

Time: 3 Hours

Max. Marks: 40

Note: Answer all Questions.
Assume suitable missing data, if any.

Q.1 a) Compare the twisted pair, co-axial and fiber optic cable. [3] [CO1] [BTL-4]

b) How does RARP differ from ARP in functionality. [3] [CO2] [BTL-3]

c) What is the net mask of the gateway interface in a subnetwork where maximum of 25 hosts exists and IP address of the hosts is192.168.1.1? [3] [CO3] [BTL-5]

d) List all services offered by the session layer in the OSI model. [3] [CO4] [BTL-3]

e) What is SFTP and how is it different from FTP? [3] [CO5] [BTL-1,2]

Q.2 a) A digital signal system is required to operate at 9600 bps, if the signal element encodes a 4-bit word, what is the minimum required bandwidth of the channel? [2.5] [CO1] [BTL-5]

b) Compare the various switching methods with suitable examples. [2.5] [CO1] [BTL-4]

OR

c) With suitable illustrations, compare baseband and broadband transmission techniques. Which is more suitable for high-speed data transfer and why? [2.5] [CO1] [BTL-4]

Q.3 a) Describe the sequence of operations performed by a station in a CSMA/CD network during the phases of transmission initiation, collision detection, and post-collision handling. [2.5] [CO2] [BTL-2]

b) Consider a CSMA/CD networks that transmits data at a rate of 100Mbps (10^8 bits per seconds) over 1km cable with no repeaters. If the minimum frame size required for this network is 1250 bytes. What is the signal speed (km/sec) in the cable? [2.5] [CO2] [BTL-5]

OR

c) Perform the subnetting of the following IP address 160.11.X.X. Original subnet mask 255.255.0.0 and number of subnets 6. [2.5] [CO2] [BTL-5]

Q.4 a) Compare two data link protocols: Go-back-N and selective repeat in terms of flow control, error recovery and packet loss. [2.5] [CO3] [BTL-4]

b) Consider the use of 10K-bit size frames on a 10 Mbps satellite channel with 270 ms delay. What is the link utilization for stop and wait ARQ technique assuming P=10. [2.5] [CO3] [BTL-5]

OR

Q.5 In a network using the RIP (Routing Information Protocol), a router receives three route advertisements for the same destination network from three different neighbors with hop counts of 3, 2, and 5 respectively.
(a) Identify which route the router will prefer and explain why.
(b) If the preferred route becomes unreachable, explain how RIP handles this scenario and how long it may take for the router to converge to a new route. [5] [CO3] [BTL-5]

Q.6 Describe the structure of the TCP header and explain the working principles of the Transmission Control Protocol (TCP). Compare TCP and UDP in terms of functionality and provide a detailed comparison of their respective header formats. [5] [CO4] [BTL-2,4]

Q.7 a) Explain how DNS resolves domain names to IP addresses. What are the different types of name servers involved in this process? Also, describe the format of DNS query and response messages. [3] [CO5] [BTL-3]

b) Describe the following application-layer protocols: ***(Any Two)***

i) SSH
ii)HTTP
iii)MQTT. [2] [CO5] [BTL-2]

Total pages: 03 Roll No. _____

II Semester

B. Tech [Civil Engineering]

END TERM EXAMINATION **May- 2025**

CE102-Statistical Method of Engineering

Time: - 3:00 Hrs. **Max Marks: 50**

Note: All Questions are compulsory.

Assume suitable missing data, if any. End Term

Q.1 Difference between probability sampling and non-probability sampling. 5[CO1][L2]

Q.2 If we toss a coin 30 times and get a head, is the success? What is the mean, standard deviation, and variance of success? 5[CO2][L5]

Q.3 X is a discrete random variable having the following probability mass function 5[CO1][L6]

X:	0	1	2	3	4	5	6	7
P(X=x):	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

Determine the constant k (ii) Find P(X<6)

Q.4 The average number of acres burned by forest and range fires in a large New Mexico county is 4,300 acres per year, with a standard deviation of 750 acres. The distribution of the number of acres burned is normal. i) What is the probability that between 2,500 and 4,200 acres will be burned in any given year? 5[CO2][L3]

Or

Define the measures of central tendency, and what are the measures of central tendency? Also calculate median from the following data: 200, 217, 316, 264, 296, 282, 317 and 299.

Q.5 Define and differentiate between Type I and Type II errors. Describe briefly the level of significance. Also, define and distinguish between one-tailed and two-tailed tests. 5[CO3][L4]

Q.6 A big company uses thousands of CFL lights every year. The brand the company has used in the past has an average life of 1200 hours. A new brand is offered to the company at a price lower than they are paying for the old brand. Consequently, a sample of 100 CFL lights of the new brand is tested, which yields an average life of 1220 hours with a standard deviation of 90 hours. Should the company accept the new brand at a 5% level of significance? 5[CO3][L2]

Q.7 Prove that if X and Y are two independent variables, then the correlation coefficient between X and Y is zero, i.e., 0, 5[CO4][L6]

Or

What is Correlation? And what are the negative correlation, positive correlation and No correlation explain through graph.

Q.8 What is Standard Error? Find the standard error for the sample data: 2, 3, 4, 5, 6. 5 [CO4][L1]

Or

Find the correlation coefficient between price and demand for the following data.

Price	17	18	19	20	22	24	26	28
Demand	40	38	35	30	28	25	22	21

Q.9 The monthly sales for the last one year of a product in thousands of units are given below: 5[CO5][L6]

Month	1	2	3	4	5	6	7	8	9	10	11
Sales	0.5	1.5	2.2	3.0	3.2	3.5	3.5	3.5	3.8	4.0	4.7

Compute the autocorrelation coefficients up to lag 4. What conclusion can be derived from these values regarding a trend in the data?

Or

What is Autoregressive (AR) Model for Time Series Forecasting and how it's work

Determine the seasonal indices by the ratio to the moving average method for August and September,.1985.

Production Data (in thousand units):

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov
1985	7.92	7.81	7.91	7.03	7.25	7.17	5.01	3.90	4.64	7.03	6.88
1986	4.86	4.48	5.26	5.48	6.42	6.82	4.98	2.45	4.51	6.38	6.38

Total No. of Pages: 2
B. Tech (Civil Engineering)
END SEMESTER EXAMINATION
CE 104
TIME: 3 Hours

Roll No.....
2nd SEMESTER
May 2025
MECHANICS OF SOLIDS
Max. Marks: 40

Note: Answer any FIVE Questions. Assume any missing data, if any.

1 (a) Explain Stress Tensor with a neat sketch. M4/ CO1
(b) Discuss generalized Hooke's law with equations. M4/ CO1

2 (a) At a certain point in a material, which is strained, it is found that normal stresses on two orthogonal planes are 60 N/mm^2 and 40 N/mm^2. Both of these normal stresses are tensile in nature. Shear stress, positive on both of these planes, is 20 N//mm^2. Find the values of maximum principal stress and maximum shear stress in the material. M4/CO2

(b) A simply supported beam AB has a span of 6m. At the left hand support 'A' a pin support and at right hand support 'B' a roller support has been provided. At a distance of 2 m from both the end points, inside the beam span, two equal point loads of 10 KN are applied in a downward direction on the beam on the points C (towards A) and on point D (towards B). Mid point of the beam is E. Draw FBD of the portion AE of the beam. M4/ CO2

3 (a) What do you understand by Modulus of Rigidity? Discuss with a neat sketch and expression. M4/ CO3
(b) Draw neat sketches of any three types of supports with reactions which can develop in them. M4/ CO3

4 (a) A simply supported beam AB has a span of 6m. At the left hand support 'A' a pin support and at right hand support 'B' a roller support has been provided. At a distance of 1 m, 3 m and 4 m from Support A, point loads of 4 KN, 10 KN and 8 KN are applied in a downward direction on the beam on the points C, D and E respectively. Draw SFD and BMD for the beam. M4/ CO3
(b) Describe the procedure to draw Mohr's circle. M4/ CO3

5 (a) What are 'condition equations of static equilibrium'? Write the equations and discuss their use with an example. M4/ CO4
(b) Explain differences between a point load and a uniformly distributed load. M4/ CO4

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5 (a) What do you understand by pure bending of beams? Give an example.

(b) Compare stress strain diagrams of mild steel and medium tensile steel with sketches. M4/ CO4

7 (a) A cantilever beam AB has a UDL of 2 KN/m acting on the full 6 m length of the beam in a downward direction. Draw SFD and BMD for the beam. M4/ CO4

(b) Explain how Young's modulus of elasticity of mild steel can be determined from a tension test. M4/ CO5

8 Write detailed notes on any two of the following. M4/ CO5

(a) Properties of ductile materials

(b) Hardness and toughness

(c) Complementary shear stress M8/ CO5

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Total no. of Pages:01 Roll no.....

FOURTH SEMESTER

B.Tech (REGULAR)

END TERM EXAMINATION MAY-2025

CE202 SMART CITY PLANNING AND INTELLIGENT TRANSPORT

Time: 3:00 Hours Max. Marks: 50

Note :. Attempt any five Questions.
Assume suitable missing data, if any.

Q.1 How do Smart cities address the challenges of affordable & efficient Public transportation? [10][CO1][L4]

Q.2 How do smart cities promote inclusivity & accessibility for people with disabilities? [10][CO2][L2]

Q.3 How do smart cities ensure sustainable and efficient water supply & sanitation? [10][CO3][L3]

Q.4 What is the Role of Urban Planning & Design in smart city development? [10][CO5][L6]

Q.5 How do Smart cities address the challenges of air pollution? [10][CO2][L2]

Q.6 How do Smart cities promotes green construction practices and sustainable building material? [10][CO4][L6]

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Total No. of Pages:01

Roll No._____

III Semester (May-2025) END SEMESTER B. Tech [Civil Engineering]

CE-204: Engineering Surveying

Time: - 1:30 hrs Max Marks: 40

Note: Answer all Questions
Assume suitable missing data

Q01:- The area of the plan of an old survey plotted to a scale of 10 metres to 1 cm measures now as 100.2 sq. cm as found by a planimeter. The plan is found to have shrunk so that a line originally 10 cm long now measures 9.7 cm only. Find (i) the shrunk scale (ii) true area of the survey. [5] CO(5)

Q02:- Discuss in brief the principles of surveying. Also differentiate clearly between plane and geodetic surveying. [5] CO(5)

Q03:- (A) Convert the following whole circle bearing to quadrantal bearing: [5] CO(5)

(i)32°30' (ii) 170°22' (iii) 217°54' (iv) 327°24'

(B) Convert the following whole circle bearing to quadrantal bearing:

(i)35°20' (ii) 162°28' (iii) 222°58' (iv) 331°45'

Q04:- What is tacheometry? What are different systems of tacheometric measurement? [5] CO(5)

Q05:- Derive expression for the spacing of the stadia lines to give a multiplying factor K for a given sight distance D if i = stadia interval and S = stadia intercept. [5] CO(5)

Q06:- (a) Describe the procedure of setting out of a two storied building with 200 mm thick load bearing outer wall all round. The foundation width is 750 mm. The building is absolutely rectangular and outside dimensions above plinth level are 12000 mm x 18000 mm. Draw the 'foundation plan' of the outer walls showing all the dimensions (not to scale). In the above plan show the position of different pegs required for setting out of the above building. [5] CO(5)

Or

(b) A railway siding is to be curved through a right angle and in order to avoid buildings. The curve is to be compound, and radii of the two branches are 240 m and 360 m. The distance from the intersection points of the end straight to the tangent point at which the 240 m radius curve leaves the straight is 300 m (Figure 2) Obtain the second tangent length of whole curve.

Q07:- Brief face right and face left observation in theodolite surveying and its purpose. [5] CO(5)

Q08:- The magnetic bearing of a line is 48° 24'. Calculate the true bearing if the magnetic declination is 5° 38' East. [5] CO(5)

Total No. of pages 04 Roll No._____

IV SEMESTER B.Tech. [Civil Engg.]

END SEM EXAMINATION (May 2025)

CE204 ANALYSIS OF STRUCTURES II

Time: **03 Hours** Max. Marks: **40**

Note: Attempt any five questions. Assume suitable missing data if any. If not mentioned take EI = Constant.

Q1. Analyze the fixed beam shown in Figure 1 using the three-moment theorem to determine the fixed-end moments. [8][CO 1][L3]

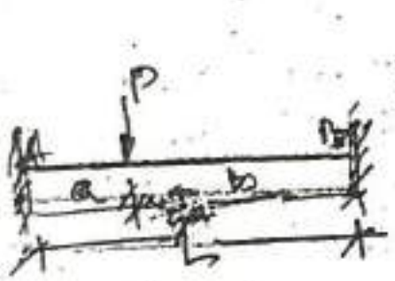
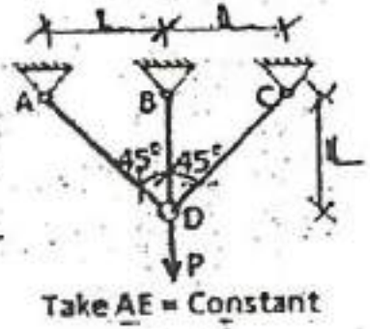


Figure 1



Take AE = Constant

Figure 2

Q2. (a) Explain the theorem of Least Work. [4][CO 1] [L2]

(b) Analyze the truss shown in figure 2 above taking F_{BD} as redundant using method of consistent deformation and find forces in all members of the truss. [4][CO 1] [L4]

Q3. Analyze the symmetric frame shown in figure 3 below using slope deflection method and draw the Bending moment diagram for the frame. [8][CO 2] [L4]

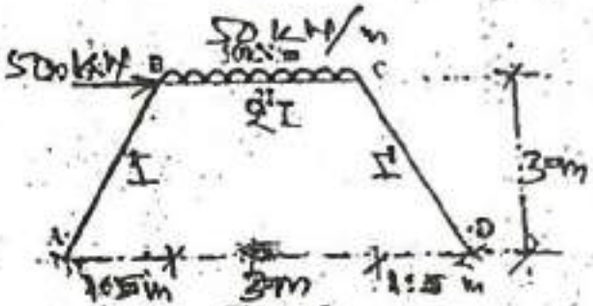


Figure 3

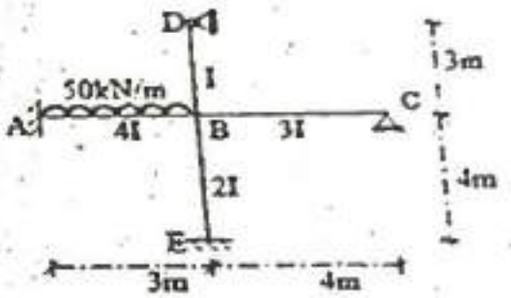


Figure 4

Q4. Analyze the frame shown in figure 4 above using the moment distribution method and draw the bending moment diagram and shear force diagram for the frame. [8][CO 2][L4]

Q5. Analyze the two-span continuous beam shown in Figure 5 below using the stiffness method and draw the bending moment diagram and shear force

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diagram. Take P = 20 kN and L = 4m

[8][CO3][L5]

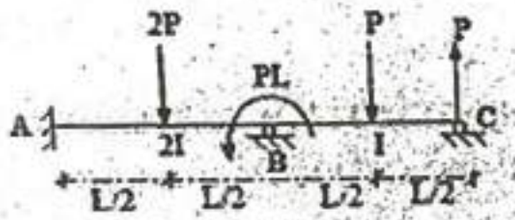

Figure 5

Q6. Analyze the two storey and two bay building frame shown in figure 6 using portal method of approximate analysis and draw the bending moment diagram (BMD).

[8][CO 4][L4]

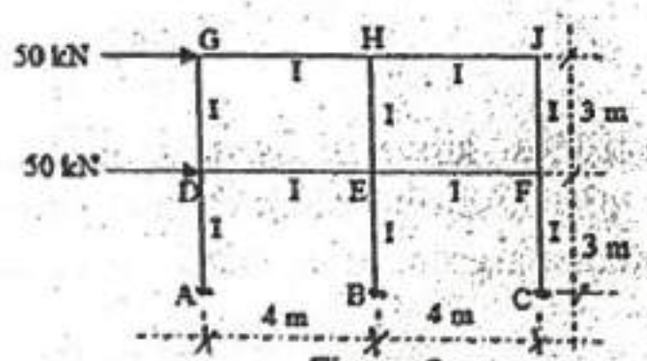

Figure 6

Q7. Explain the Müller-Breslau principle, and using it, draw the influence line diagram for the bending moment at the fixed end of a propped cantilever beam of span L. Obtain the influence coefficients at quarter span points.

[8][CO 4][L5]

Q8. (a) Draw the influence line diagram for the horizontal thrust in the cable of a suspension bridge stiffened by a two-hinged stiffening girder. Also, draw the influence line diagram for the bending moment at a given section of the stiffening girder.

[4][CO 5][L6]

Q8. (b) A symmetric suspension cable of 100 m span has a dip of 10 m. It is stiffened by a two-hinged girder. Total DL is 20 kN/m. Determine the maximum tension in the cable if a point load of 500 kN travels in the girder. Find also the maximum +ve and maximum –ve BM on the girder.

[4][CO 5][L6]

Total no. of Pages: 03

Roll no.....

4TH SEMESTER
B.TECH. CIVIL ENGINEERING
END SEMESTER EXAMINATION **MAY-2025**
CE-206 SOIL MECHANICS

TIME: 3.00 Hr **MAX MARKS: 40**

NOTE: Question No. 1 is compulsory and attempt other questions as per instructions given. Assume specific gravity of the soil as 2.65.

1.Check the validity of the following statements and explain briefly.
a. A soil with higher shrinkage limit will shrink more. CO-2 (2)(L4)
b. Exit gradient will increase when vertical cut-off walls are provided below the hydraulic structures. CO-3 (2)(L3)
c. Consolidated undrained test is performed for the stability of slope of unlined canal with water at FSL. CO-4 (2)(L3)
d. Sand drain is the example of 3-D consolidation. CO-5 (2)(L2)

2. Attempt any two parts-
a. What is the principle of sedimentation analysis? How gradation curve is drawn by hydrometer test? CO-1 (4)(L1)
b. The laboratory tests on a soil sample obtained from a site at Meerut, yielded the following results-
Liquid limit = 55%, Plastic limit = 26%, Natural moisture content = 30% and Percentage finer than 0.002 mm = 19%. Determine
(i)Liquidity index of the soil and comment on its consistency
(ii) Activity of the soil and comment on its nature
(iii) Draw plasticity chart and classify the soil CO-2 (4)(L6)
c. The results of a laboratory Proctor's test are shown below-

Test No.	1	2	3	4	5	6
Weight of mould & soil(kg)	3.53	3.71	3.80	3.91	3.93	3.88
Moisture content (%)	8.32	10.4	12.2	16.2	17.9	20.4

The height and internal diameter of the mould are 12.5 cm and 10.0 cm respectively. The weight of empty mould is 1.90 kg. Draw

(i) Compaction curve and determine optimum moisture content and maximum dry density.
(ii)Zero air void line and 10% air void line. CO-3 (4)(L5)

3. Attempt any two parts-
a. What is the difference between quick sand and quick clay?
A sand sample is 50% saturated and has a bulk density 17.5 kN/cum. Find the critical hydraulic gradient. How the critical hydraulic gradient of the soil will change if the soil is compacted to increase its bulk density by 10%, without any change in its water content? CO-3 (4)(L4)

b. What is flownet?
An earth dam is built on an impervious foundation with a horizontal filter at the base near the toe. The coefficient of permeability in the horizontal and vertical directions are 3.5×10^{-5} and 2.5×10^{-5} m/s respectively. The full reservoir level is 27 m above the base. A flow net constructed for the transformed section of the dam consists of 5 flow channels and 16 equipotential drops. Estimate the seepage loss per meter length of the dam. CO-3 (4)(L4)

c. Prove that the maximum vertical stress on a vertical line at a constant radial distance r from the axis of a vertical load is induced at the point of intersection of the vertical line with a radial line at an angle $39^0 15'$ from the point of application of concentrated load. What will be the value of shear stress at that point? CO-4 (4)(L1)

4. Attempt any two parts-
a. Explain how Westergaard's analysis is different from Boussinesq' s analysis.
A rectangular area 3m x 6m carries a uniform load of 100 kN/sqm at the ground surface. Determine vertical stresses at 5m below the centre and one of the corners of the loaded area. CO-4 (4)(L3)
b. (i) Explain Mohr- Coulomb's failure theory.
(ii) What are the demerits of direct shear test.
CO-4 (2+2)(L1)
c. The results of a triaxial test conducted for a soil in consolidated-undrained conditions are as follows- CO-4 (4)(L5)

Sample No.	1	2	3
Cell Pressure (kN/ sqm)	100	150	200
Deviator stress at failure (kN/ sqm)	202	218	238
Pore pressure at failure (kN/ sqm)	41	62	70

5. Attempt any two parts-
a Define sensitivity of the soil.
A vane shear test was conducted in the field to determine the shearing strength of soft clay. The equivalent torque recorded at the torque head at failure was 418 kg-cm. In order to completely remould the soil, the vane was then rotated very rapidly. It was observed that the remoulded soil can be sheared by applying a torque of 285 kg-cm. Determine the shear strength of the soil in the undisturbed and remoulded states and its sensitivity. The height and diameter of the vane were 10 cm and 8 cm respectively. Also comment on the nature of the clay. CO-4 (4)(L5)

b. What is time factor. Explain square root of time fitting methods for the determination of coefficient of consolidation. CO-5 (4)(L1)

c. The results of a consolidation test on a fully saturated and normally consolidated clay sample were as follows-

Effective stress (kN/sqm)	Void ratio	
50	1.02	
100	0.85	

The test was conducted with two-way drainage condition. The time for 50% consolidation for the effective stress increment from 50 to 100 kN/sqm was 15 min and the average thickness of the sample was 24 mm, Determine the compression index and permeability of the soil.
CO-5 (4)(L4)

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Roll no: _____

End Semester Exam

CE 208 Environmental Engineering-I

Maximum Marks 40 Time Allowed 3 hours

Note: 1) Attempt any 5 questions.
2) Marks are indicative of time distribution. The use of calculator is allowed.
3) Mobile/tablets/programming calculators are not permitted.
4) Assume suitable missing date, if any and clearly state the same.

Q1. A) Explain the term treatment train and draw it for raw water having turbidity of 15 NTU and MPN count of 200. **(Marks 3, CO5)**

B) Design a rapid mix unit for 1200m^3/hr water treatment plant. Assume necessary data and clearly state the same. **(Marks 5, CO5)**

Q2. A) Write the design requirements on 'Water supply for small communities'. **(Marks 3, CO1)**

B) Explain the JAR test. How this test can be used for optimizing various parameters of flocculation and settling. **(Marks 3, CO4)**

C) Explain the following terms and their significance

(i) Surface Loading

(ii) Wier Loading **(Marks 2, CO4)**

Q3. A town with a population of 4 lakhs is to be supplied with water daily at 200 litres per head. The periodic demand of water is as follows:

6 AM to 10 AM	35% of total
10 AM to 02 PM	15% of total
02 PM to 06 PM	15% of total
06 PM to 10 PM	20% of total
10 PM to 06 AM	15% of total

Determine the capacity of the service reservoir assuming pumping to be at a uniform rate and the period of pumping to be from 6 AM to 8 PM. **(Marks 8, CO3)**

Q4. A) Explain with neat sketch the functioning of rapid sand filter. **(Marks 3, CO4)**

B) Prepare a filter sand of effective size of 0.6 mm and uniformity coefficient 1.6 from the stock sand, the sieve analysis for stock sand being given as follows: **(Marks 5, CO4)**

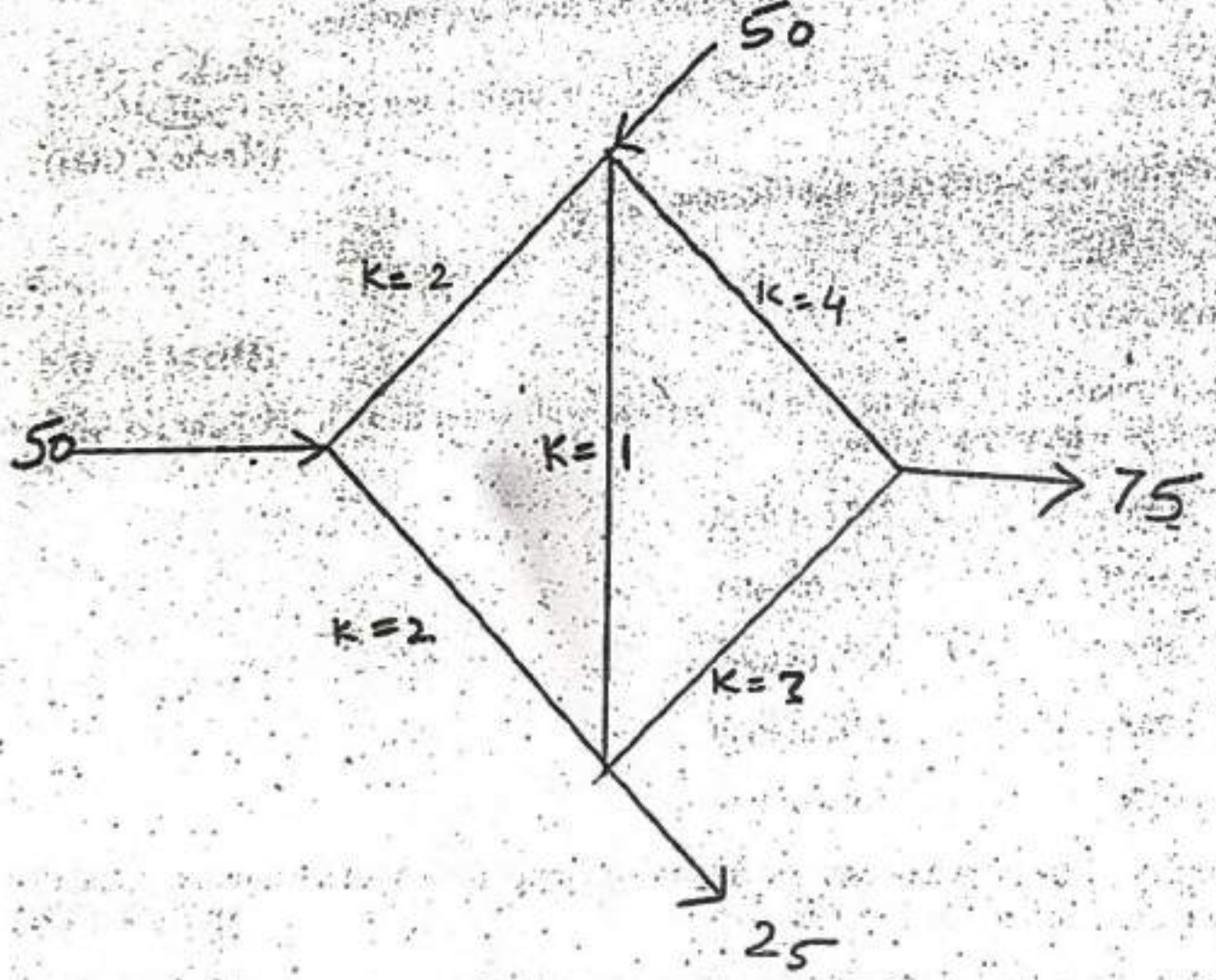
Sand Size, MM	0.21	0.30	0.42	0.84	1.12	1.68	2.38
Cumulative Weight, %	2	10	20	64	75	87	94

Q5. A) Explain and differentiate between Type I and Type II settling. (Marks 2, CO4)

B) A pipe line 4000 m long, 200 mm in diameter and roughness size 0.04 mm conveys water between two reservoirs, the difference in level between which is maintained constant at 40 m. In addition to the entry loss of $0.5 \frac{V2}{2g}$, a valve produces a head loss of $\frac{8V2}{2g}$. Determine the steady discharge between the reservoirs. (Marks 6, CO2)

Q6. A) Determine the distribution of flow in the pipe network shown in figure. The head loss, h may be assumed as KQ^2. The flow is turbulent and pipes are rough. The value of K for each pipe is indicated in the figure. (Marks 6, CO2)

B) Explain the terms 'Break Point Chlorination' and 'Residual Chlorine'. (Marks 2, CO1)



(Figure for Q. No. 6 A)

Pages of No. 03

Roll No.....

IV SEMESTER B. Tech. Civil Engineering

END TERM EXAMINATION

May-2025

COURSE CODE: **CE 210** COURSE TITLE: **Hydraulics and Hydraulic Machines**

Time: 3 Hours

Max. Marks: 40

Note: Attempt any **Five** questions. Marks carried by a question are indicated against it. Assume any missing data suitably.

Q.1 **(a)** An open channel of circular cross-section has a diameter of 4.0 m and is laid at a slope of 1 in 1000. For a most economical section determine the maximum discharge and the corresponding depth of flow. Take Chezy's constant C = 50. **[4] [CO1]**

(b) Water flows at a rate of 12 m^3/s in a rectangular channel 6 m wide at a depth of 40 cm. What is the total energy loss in a hydraulic jump which has occurred from this flow? **[4] [CO2]**

Q.2 Write down the equation for slope of free surface profile in gradually varied flow. Classify the free surface profiles in gradually varied flow; give clear and neat sketches for each surface profile. **[8] [CO3]**

Q.3 **(a)** A laboratory Cippoletti weir having a crest width of 45 cm is used to measure the flow of water in a rectangular channel 0.7 m wide and 0.5 m deep. If the water level in the channel is 25 cm above the weir crest, estimate the discharge in the channel in litres per minute by considering the velocity of approach. Take coefficient of discharge as 0.63. **[4] [CO4]**

(b) Determine the discharge over a broad-crested weir 30 m long with rounded entrance. The measured up-stream level over the crest is 65 cm. the width of the channel of approach is 40 m and its depth below the crest of the weir is 60 cm. Assume $C_d = 0.95$. Take into account the velocity of approach. **[4] [CO4]**

Q.4 (a) The mean bucket speed of a Pelton turbine is 14 m/s. the rate of flow of water supplied by the jet under an effective head of 50 m is 1000 litres/sec. If the jet is deflected by the buckets at an angle of 165°, find the power and efficiency of the turbine. Assume C_v=0.98 [4] [CO5]

(b) A jet of water 7.5 cm in diameter moving with a velocity of 12 m/s strikes a flat vane which is normal to the axis of the jet. (i) find the force exerted by the jet if the vane moves with a velocity of 5 m/s, (ii) determine the force exerted by the jet if instead of one flat vane, there is a series of vanes so arranged that each vane appears successively before the jet in the same position and always moving with a velocity of 5 m/s. [4] [CO5]

Q.5 (a) A standing wave flume is installed in a rectangular channel, conveying water with the object of raising the level of water upstream. The section on the upstream side of the flume is 3 m deep and 12 m wide. The bed of the flume at the throat is a streamlined hump 40 cm high and width at the throat section is 8 m. Determine: (i) the discharge through the flume; (ii) Critical depth of water at the throat; (iii) the height of the standing wave and maximum depth of water downstream. [4] [CO4]

(b) A jet of water having a velocity of 30 m/s strikes a curved vane, which is moving with a velocity of 15 m/s. The jet makes an angle of 25° with the direction of motion of the vane at inlet and leaves at an angle of 120° to the direction of motion of vane at the outlet. (i) Draw the velocity triangles at inlet and outlet and determine the vane angles at inlet and outlet so that the water enters and leaves the vane without shock; (ii) Calculate the work done per unit weight of water striking the vane per second. [4] [CO5]

Q.6 (a) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 rpm works against a total head of 45 m. The velocity of flow through the impeller is constant and equal to 3 m/s. the vanes are set back at an angle of 40° at outlet. If the outer diameter of the impeller is 600 mm and the width at the outlet is 50 mm, determine: (i) Vane angle at the inlet; (ii) work done by impeller on water per second; (iii) Manometric efficiency. [4] [CO6]

(b) A single acting reciprocating pump running at 55 r.p.m., delivers 0.02 m^3/s of water. The diameter of the piston is 200 mm and the stroke length is 400 mm. Determine: (i) the theoretical discharge of the pump (ii) the coefficient of discharge, (iii) Slip, and the percentage slip of the pump. [4] [CO6]

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Total no. of Pages:

Roll no. 161

IV SEMESTER

B.Tech ENE

END TERM EXAMINATION

May-2025

COURSE CODE: CE252 COURSE TITLE: Structural Analysis

Time: 03:00 Hours *Max. Marks: 50*

Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 A horizontal beam of uniform section and 7 meters long is simply supported at its ends. Two vertical concentrated loads of 100 kN and 140 kN act at 1m and 3m respectively from the left hand support. Determine the magnitude of the deflection under the loads and maximum deflection using Macaulay's method. If E = 200GN/m^2 and I=85X10^{-6}m^4 10

Q.2. A beam of length 5 m and of uniform rectangular section is simply supported at its ends. It carries a uniformly distributed load of 9 KN/m run over the entire length. Calculate the width and depth of the beam if permissible bending stress is 7 N/mm2 and central deflection is not to exceed 1 cm. 10

Q3. A symmetrical 3 hinged arch has a span of 16 m & rise to the central hinge of 4 m. It carries a vertical load of 20 kN at 4 m from the left end. Find a) the magnitude of thrust at the springing, b) the reactions at the support, c) bending moment at 6 m from the left hand hinge d) max. positive & negative moment. 10

Q4. Derive the equation of crippling load for the column having one end hinged and other end fixed with usual notation by Euler's theory. Also, explain why Rankine's theory is better than Euler's theory for short columns. 10

Q5 Explain the Betti's Law and Muller Breslau Law with the help of diagram. 10

7. A foot bridge of width 3m and span 50m is carried by two cables of uniform sections. The central dip is 5m and platform load is 5kN/m². The allowable stress is 120N/mm². Calculate the maximum pull in the cables and necessary sectional area. [6] [CO5] [BTL 3]

OR

Analyse the given beam in Fig 9 by Strain Energy Method by taking moment and vertical reaction at A as redundant. [6] [CO1] [BTL 4]

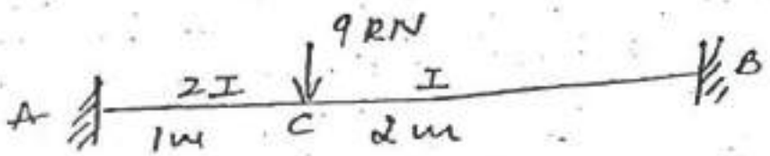

Fig 9

VIth SEMESTER **B.Tech.**

END TERM EXAMINATION ***May-2025***

COURSE CODE: CE 302

COURSE TITLE: ANALYSIS OF INDETERMINATE STRUCTURES

Time: 03:00 Hours ***Max. Marks: 50***

Note : Assume suitable missing data, if any.

Q1 Analyse the continuous beam given in Fig 1 by Stiffness Method if the downward settlement of support B and C in kN-m are 2000/EI and 1000/EI respectively. [8] [CO3] [BTL4]

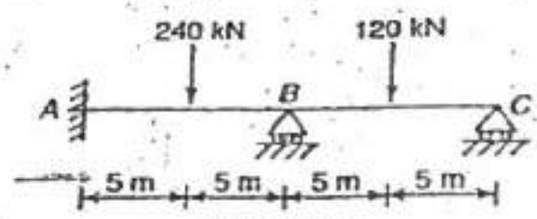

Fig 1

Q2 Analyse the given truss in Fig 2 by Flexibility Method with reference to coordinates 1 and 2. All values in parentheses are cross-sectional area in mm². [8] [CO3] [BTL4]

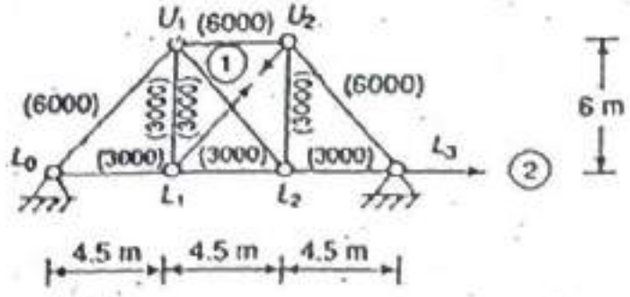

Fig 2

OR

Analyse the given continuous beam in Fig 3 by Flexibility Method



EI is constant

Fig 3

Q3 *Find the plastic moment carrying capacity in the continuous beam shown in Fig 4.* [8] [CO6] [BTL5]

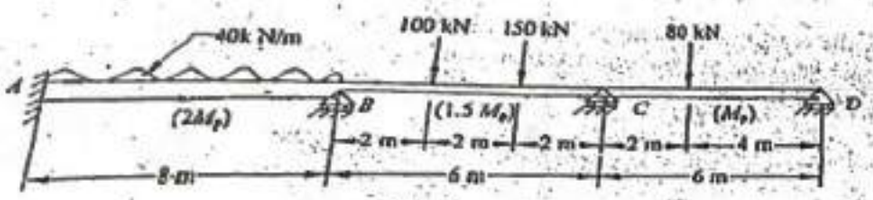

Fig 4

OR

Analyse the frame given in Fig 5 by Slope deflection method [8] [CO2] [BTL 4]

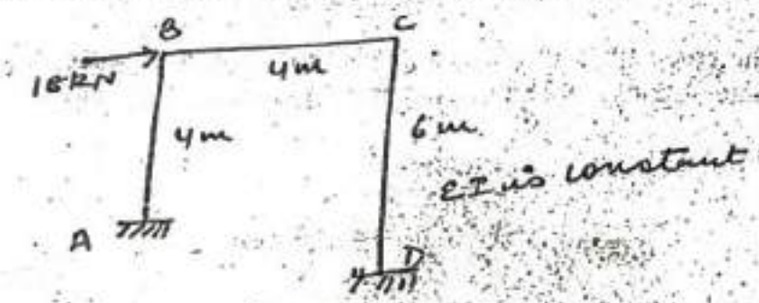

Fig 5

Q4 *Show that shape factor of a triangular cross section is 2.34.* [4] [CO6] [BTL4]

OR

Differentiate between Stiffness and Flexibility Matrix Method. [4]/[CO3] [BTL 3]

Q5 Analyse the given beam in Fig 6 by Moment Distribution Method [8] [CO2] [BTL4]

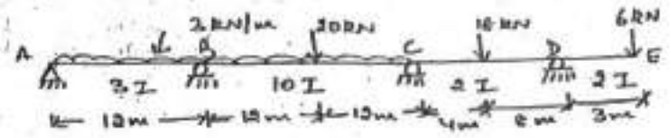

Fig 6

OR

A parabolic two hinged arch has a span of 32m and a rise of 8m. A uniformly distributed load of 1kN/m covers 8m horizontal length of the left side of the Arch. Find the horizontal thrust at hinge and bending moment at 8m from the left hinge. [8] [CO4] [BTL 3]

6 Develop the stiffness matrix w.r.t given coordinates in Fig 7 [6] [CO3] [BTL 3]

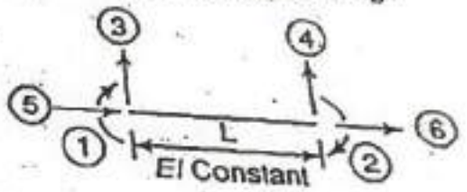

Fig 7

OR

Analyse the given frame in Fig 8 by Moment Distribution Method [6] [CO2] [BTL 4]

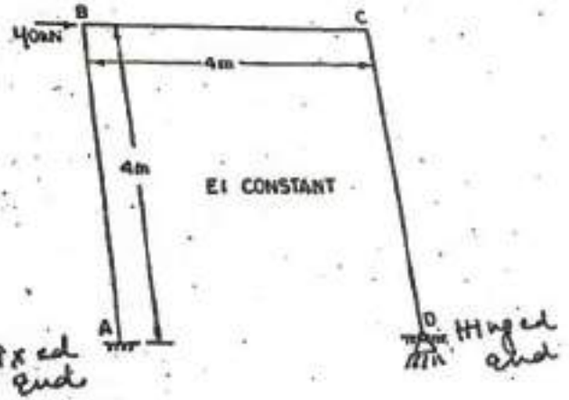

Fig 8

Total no. of pages: 03

Roll no.: .....

VI Semester
B.Tech.

END TERM EXAMINATION

May-2025

Course Code: CE304 **Course Title: Geotechnical Engineering**

Time: 03:00 Hours

Max. Marks: 40

Note: All questions carry marks as assigned
Assume suitable design data and state clearly

Q.1.(a) Bearing capacity factor N_c value is 5.7 in case of shallow foundation, on the hand we use different value of N_c in case of deep foundation. Justify your answer. [CO4], [L3],[2]

Q.1.(b) Among the shape factor of circular, square and strip footing which effect dominates bearing capacity equation, explain with suitable reason. [CO4], [L3],[2]

Q.1.(c) How the formula for maximum achievable group efficiency of a pile group is about 90%? Can we increase the efficiency of pile more than 100% in case of sandy soil? [CO4], [L4],[2]

Q.1.(d) Find out average elastic settlement of flexible foundations on saturated clay soil (Poission's ratio =0.5) using Figure 1a and 1b. Dimensions of rectangular foundation are 10m*5m and depth is 4.5m. Surcharge of 5kN/m^2 is acting on foundation. E= 30Mpa.

[CO4], [L5], [2]

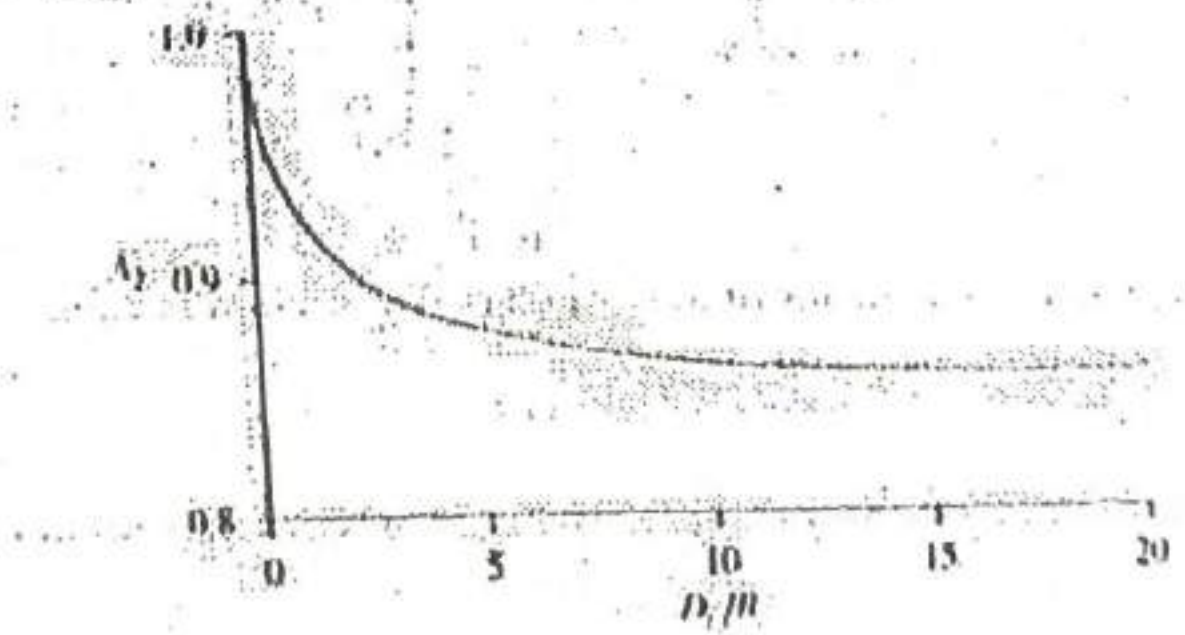

Figure 1a

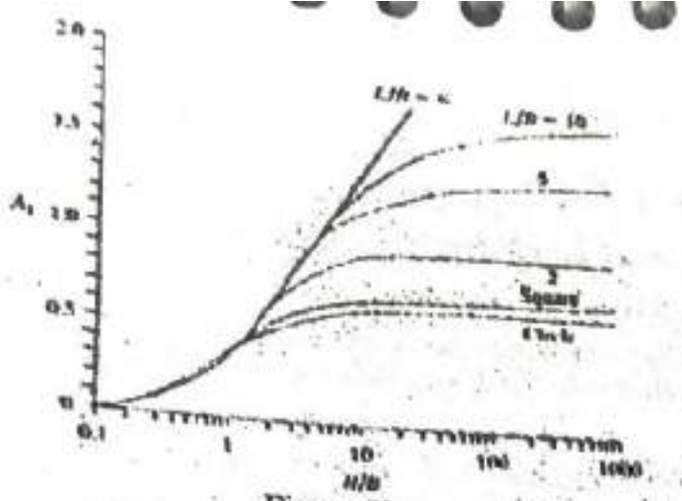

Figure 1b

Q.2.(a) How the conditions of downdrag develop according to the corrected SPT value (N) of soils and is considered significant in design. Explain with a neat dimensional sketch to show downdrag effects the deep foundation? [CO4], [L6],[4]

Q.2.(b) Tabulate guidelines for depth of investigation of:

i. Shallow foundation
ii. Deep foundation
iii. Well foundation
iv. Penetration into rocks [CO5], [L2],[4]

Q.3.(a) Analyse pictorially reasons for factors responsible for variation of influence factors in elastic settlement according to the size of foundation [CO4], [L4],[2]

Q.3.(b) What are factors to be considered for stability of slopes? How analysis of finite slopes is different from infinite slopes? [CO3], [L2],[4]

Q.4.(a) Construct and analyse the active earth pressure diagram and find the total pressure and its line of action from the base of 8m vertical wall. The depth of the water table is 2m from the top of the ground surface. The ground is level, and a surcharge of 15 kN/m is acting uniformly at the surface. The soil unit weight is 15.76 kN/m^3 and submerged unit weight is 9.81 kN/m^3. [CO2], [L4],[4]

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Q.4.(b) Evaluate and compare the lateral earth pressure on unyielding retaining structures under line loading (9kN/m) and strip loading (8kN/m) using Figure 2a and 2b at 1.5m below earth surface. Depth of retaining wall is 8m in both cases (a=0.5, α=21.7°β=23.4°) [CO4], [L5],[4]

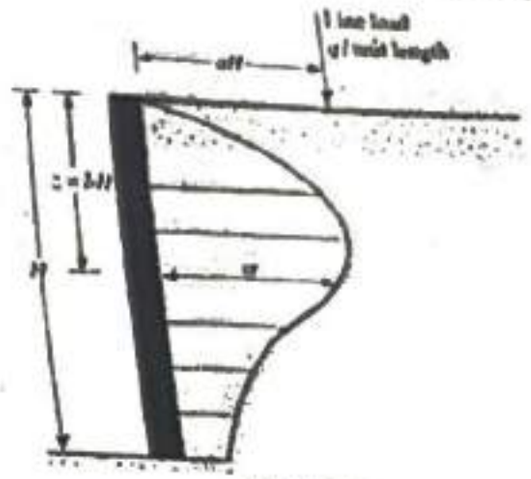

Figure 2a

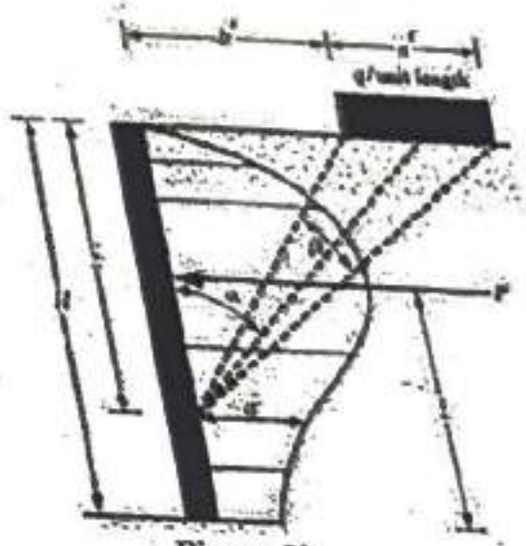

Figure 2b

Q.5.(a) Write short note on:

- Under reamed pile
- Machine foundation

Total No. of Pages: 2 *Roll Number*.....

B.TECH. (CIVIL) **VI SEMESTER**
END TERM EXAMINATION **MAY-2025**

CE306: TRANSPORTATION ENGINEERING

Duration: 3 Hours ***Max. Marks: 40***

Note: Answer any EIGHT questions. All questions carry equal marks. Assume suitable missing data, if any.

Q.1 Draw a typical cross section showing components of flexible pavement. Write the functions of each component. [CO2][5]

Q.2 Describe the lower and upper limits of super elevation. Design the super elevation at a horizontal curve of radius 250 m on National Highway passing through a plain terrain for design speed of 100 km/hr. [CO4][5]

Q.3 Describe the functions of ballast. Determine the thickness of ballast for a broad gauge railway track made of rail sections of 13 m length. Density of 25 cm wide sleepers is given by n + 7. [CO3][5]

Q.4 On a broad gauge railway, a branch line of 6° curve diverges in opposite direction from the main line track having a 3° curve. Design the permissible speed on the main track if the speed is restricted to 35 km/hr on the branch line. [CO4][5]

P.T.O.

Q.5 Design the turnout on a Broad Gauge railway track for the following given data:
Gauge length = 1676 mm
Length of straight arm = 864 mm
Heel divergence = 136 mm
Angle of switch = 1° 34' 27''
Angle of Crossing = 6° 42' 35'' [CO4][5]

Q.6 Mention the thumb rule for open cut. Discuss the advantages and disadvantages of tunnels. [CO3][5]

Q.7 The basic runway length is given as 1400 m. The airport site has an elevation of 400 m and airport reference temperature as 23°C. Maximum difference of elevation of highest point and lowest point on runway is 4 m. Design the runway length. [CO4][5]

Q.8 Classify different types of repair docks and also mention their relative advantages and disadvantages. [CO2][5]

Q.9 Write short notes on **ANY TWO** of the following
a) Minimum Circling Radius
b) Airport Zoning Laws
c) Wind Coverage [CO1][5]

Q.10 Write very short notes on **ANY TWO** of the following.
a) Traffic Signs
b) Passenger Car Unit
c) California Bearing Ratio [CO1][5]

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Total No. of Pages: 02 Roll No.....

VI SEMESTER B.Tech.

END SEMESTER EXAMINATION May-2025

CE308: DISASTER MANAGEMENT

Time: 3:00 Hours Max. Marks : 40

Note : Answer FIVE questions. Question number ONE is compulsory. Assume suitable missing data, if any.

Q.1 Answer the following questions (Any Four) [2x4=8]

[a] Classify the various seismic zones. In which zone does the city of Delhi lie? [CO2][BTL2]

[b] List major Earthquakes in India. [CO1][BTL2]

[c] What is the difference between disaster and vulnerability? [CO1][BTL4]

[d] Draw disaster management cycle. Explain [CO2][BTL3]

[e] How the landslide occurs? [CO4][BTL3]

Q.2 [a] Differentiate between Natural and Man-made disasters. [CO1][BTL2] [2]

[b] What are the causes of Earthquakes? [CO4][BTL3] [2]

[c] Write briefly on guidelines for improving the cyclonic resistance of low-rise houses as per IS15498 :2004 [CO5][BTL5] [4]

Q.3 [a] What are seismic waves? Differentiate between Body waves and Surface waves. [CO4][BTL2] [2]

[b] Explain the role of engineer to reduce the effect of disaster. [CO3][BTL5] [2.5]

[c] Discuss the institutional framework of disaster management in India. [CO2][BTL3] [3.5]

Q.4 [a]Define cyclones. What are the structural and non-structural mitigation for Cyclones? [CO4][BTL3] [4]

[b] What is the difference between Structural and Non-structural mitigation measures. What are the structural and non-structural mitigation for Floods? [CO4][BTL4][4]

Q.5[a] Do's and Don'ts during following disasters [CO5][BTL2] [4]

(i) Eartquake

(ii) Floods

[b] Vulnerability is a crucial aspect for defining the impact of disasters and its threat to people. How and in what ways can vulnerability to disasters be characterized? Explain various types of vulnerabilities with reference to disasters. [CO1][BTL6][4]

Q.6 Write sort notes on the following (Any two) [4x2=8]

(a) Mitigation measures/ strategies for Landslides [CO4][BTL4]

(b) Vulnerability Atlas of India [CO3][BTL3]

(c) Disaster Management Act 2005 [CO3][BTL3]

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Roll no.....

Total No of pages: 02

Sixth Semester

B.Tech. May-25

END TERM EXAMINATION

CE314 TUNNEL, PORT AND HARBOUR

Time:3Hours Max. Marks: 40

Note: Answer any eight questions
All question carry equal marks
Assume suitable missing data,if any

1. Enumerate different causes of accidents in tunnels and how many groups safety measures can be grouped? [5][CO1][L1]

2. What are the objective of tunnel linings: Explain with the help of neat sketches the sequence of tunnel lining. What are the effects of dust inhalation in tunneling? [5][CO2][L1]

3. Discuss briefly the methods deployed to check dust inhalation? [5][CO1][L2]

4. State the natural and meteorological phenomenon which affect the location and size of harbour. What factors are responsible for the formation of seasonal wind pattern. [5][CO2][L3]

5. On what factors the length and height of wave depends. Give relation between height and length of the wave. [5][CO3][L3]

6. Differentiate between the following:
   a) Gross tonnage and Net tonnage
   b) Displacement load and Displacement Height
   c) Cargo tonnage and ballast
   d) Natural road stead and artificial road stead
   e) Port and hinter land

[5][CO4][L5]

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7. How are dock entrances are controlled? Explain with neat sketches the construction of Sliding and Stop Caisson. [5][CO2][L5]

8. On a slip way the biggest vessel to be slipped is a 40 m long with a draught of 4m. if the height of cradle block from the slip way deck is 0.75m the inclination of slip way with horizontal is 4.0 degrees. Find the total length of slip way. [5][CO4][L6]

9. Give reasons for the following:
   a) A jetty face should be provided with a cushion
   b) In long Quary walls expansion joints are necessary
   c) Quay wall designed similar to retaining walls [5][CO5][L4]

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Roll no.....

Total no. of Pages: 02

2nd Semester

B.Tech (Civil)

May-2025

End Semester Examination

CE320 COMPUTATIONAL HYDRAULICS

Time 3 Hours

Max Marks 40

Note : Attempt any five questions. Draw neat and labeled diagrams wherever needed. Assume suitable missing data.

Q.1(a) What are the advantages and limitations of computational approach compared to experimental approach, as far as fluid dynamics is concerned ? [4, CO1, CO2][L1]

Q.1(b) Write down an expressions for continuity in conservative and non conservative form explaining terms. [4, CO1][L3]

Q.2(a) Explain, how partial differential equations are classified with regard to simulation of fluid dynamics problems ? Explain the physical behavior of PDEs [4, CO2, CO3][L2,3]

Q.2(b) Discuss the factors which contribute to errors in finite difference formulation. [4, CO2][L4]

Q.3(a) Discuss the difference between FVM and FDM with suitable example. [4, CO2, CO3][L2,3]

Q.3(b) Discuss various types of boundary conditions used in CFD. [4, CO1, CO2][L2]

Q.4(a) Discuss the rules of discretization. [4, CO1, CO2][L3]

Q.4(b) Discuss the difference between collocated grid and staggered grid and explain their relative merits and de-merits. [4, CO3, CO4][L4]

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Q.5(a) What is checker board arrangement and how staggered grid helps in overcoming this problem ? [4, CO3, CO4][L4]

Q.5(b) Is modeling of turbulence necessary ? if so, give explanation. [4, CO2, CO3][L5]

Q.6(a) Explain Reynold's averaging concept of turbulence. Derive RANS equation. [4, CO1, CO2][L3,4]

Q.6(b) Discuss various turbulence models. [4, CO1][L2]

Q.7(a) Discuss explicit and implicit approach for the computational solution of fluid flow problems. [4, CO2, CO3][L2,3]

Q.7(b) Explain, what is meant by a well posed problem ? [4, CO1, CO2][L3]

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Total No. of Pages:2 Roll Number..... VI SEMESTER

B.TECH. (CIVIL) MAY-2025

END TERM EXAMINATION

CE322: TRAFFIC AND TRANSPORTATION PLANNING

Duration: 3 Hours Max. Marks: 40

Note: Attempt all questions. All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Carry out trip distribution by Furness method for the present O-D trips along with predicted future trips as given in the following table: L3 [CO3][8]

		DESTINATION ZONE				Predicted future trips
		A	B	C	D	
ORIGIN ZONE	A	8	3	16	15	147
	B	6	9	8	5	42
	C	10	8	3	8	32
	D	2	4	7	12	30
Predicted future trips		39	24	68	120	

Q.2 The total trips produced and attracted to the three zones X, Y and Z of a study area in the design year are given in the following table:

Zone	Trips produced	Trips attracted
X	1600	3000
Y	2700	3500
Z	3600	2100

It is known that the trips between two ends are inversely proportional to the second power of travel time between zones, which is uniformly 15 minutes. If the trip interchange between zones Y and Z is known to be 950, develop the trip distribution matrix. L6 [CO4][8]

P.T.O.

Q.3 Discuss the factors that affect modal split? Show all the stages of the modal split in transportation planning process. L2, L4 [CO1][8]

Q.4 A trip distribution matrix is given in the following table:

FROM \ TO →	P	Q	R	S
P		900	400	700
Q	200		700	300
R	600	800		400
S	100	200	500	

Assign the trips on the network connecting the centroids of zones P, Q, R and S as shown below. Figures in italics on network links indicate cost of travel.



L4, L5 [CO4][8]

Q.5 Write short notes on **ANY FOUR** of the following:

a) Objectives of transportation planning
b) Category analysis for trip generation
c) Shortcomings of growth factor methods
d) Capacity restrained assignment technique
e) Impedance factor in trip distribution

L2, L1 [CO2][2×4 = 8]

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Total no. of Pages: 02

B.Tech.

6th SEMESTER

May-2025

END TERM EXAMINATION

CE324 Infrastructure Resilience and Socio-Economic Dynamics

Time: 3:00 Hours

Max. Marks: 50

Note : Answer any FIVE.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 a) Explain the three stages of a disaster — pre-disaster, during-disaster, and post-disaster — with suitable examples. [5][CO1][L1]

b) What is meant by resettlement in a post-disaster scenario? Discuss how multidisciplinary professionals collaborate to facilitate the resettlement process. [5][CO2][L2]

Q.2 a) Examine the ways in which socio-economic factors influence the levels of community preparedness. [5][CO3][L3]

b) Define retrofitting. How does retrofitting contribute to disaster risk reduction during the pre-disaster stage? [5][CO3][L1]

Q.3 a) Differentiate between temporary settlement and permanent settlement in the context of disaster recovery. [5][CO4][L4]

b) Define system-level post-disaster operability. Why is it critical for ensuring community resilience? [5][CO4][L2]

Q.4 a) Distinguish between direct losses and indirect losses in the context of disaster impacts. [5][CO5][L4]

b) Discuss the impact of infrastructure projects on employment and livelihood opportunities, particularly in vulnerable communities. [5][CO5][L4]

Q.5 a) Explore the psychological and behavioural factors that shape individual responses to risk. [5][CO6][L5]

b) Evaluate how urban transformation in India has influenced vulnerability patterns to natural disasters. [5][CO6][L6]

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Q.6 Write short note (any two): [5x2][CO2-CO6][L2-6]

a) Deterministic and probabilistic approaches to disaster risk
b) Resilience planning strategies for disasters
c) HAZUS-MH
d) Situational awareness during disaster

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Total no. of Pages:01

VIII SEMESTER

B.Tech (REGULAR)

END TERM EXAMINATION *MAY 2025*

CE422 VULNERABLITY AND RISK ANALYSIS

Time: 3:00 Hours *Max. Marks: 50*

Note : . Attempt any five Questions.

Assume suitable missing data, if any.

Q.1 Define Vulnerability as a human centric concept. [10][CO1][L3]

Q.2 What are the various factors that contributes to vulnerability? [10[CO2][L5]

Q.3 How Threat and Risks are associated with vulnerability? [10][CO3][L4]

Q.4 What are the various components and categories of vulnerability? [10][CO2][L2]

Q.5 Vulnerability is a crucial aspect for defining the impact of disasters and its threat to people. How and in what ways can vulnerability to disasters be characterized? Explain various types of vulnerabilities with reference to disasters. [10][CO4][L2]

Q.6 What are the various models of vulnerability applied by specialists? [10][CO4][L5]

OLD SCHEME

Total No of pages:3 Roll No:.....

SECOND SEMESTER B.TECH (GROUP B)

END SEMESTER EXAMINATION MAY-2025

EE-102 BASIC ELECTRICAL ENGINEERING

TIME:3HRS MAX. MARKS:40

NOTE: ATTEMPT ANY FIVE QUESTIONS. ASSUME MISSING DATA IF ANY.

1(a) Find Thevenin's equivalent circuit for the network shown in Fig.1 below at the left of terminals x-y. [4] CO2]

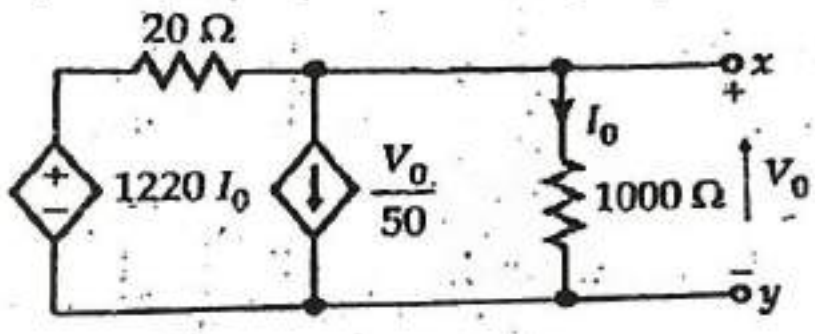


Fig. 1

(b) Using the superposition principle, find the voltage across 40 Ω resistance in Fig. 2 shown below. [4][CO1]

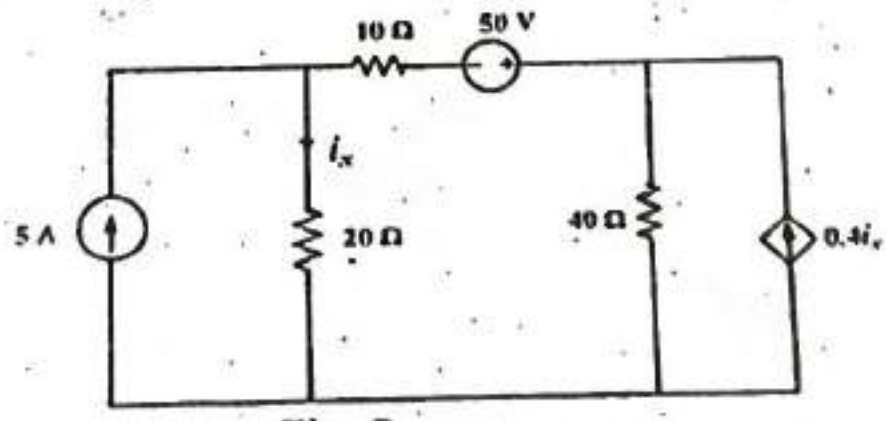


Fig. 2

2(a) State Maximum Power transfer theorem and derive the condition for maximum power transfer for the DC network. [4][CO2]

(b) Find the power across each resistance using the mesh analysis in fig. 3 shown below. [4][CO1]

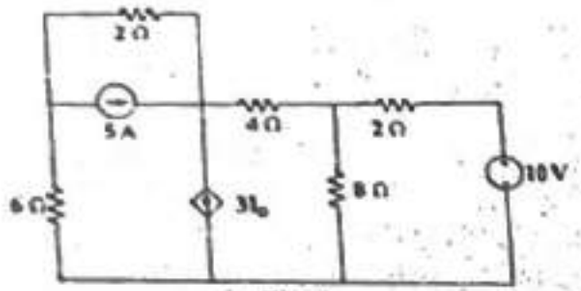


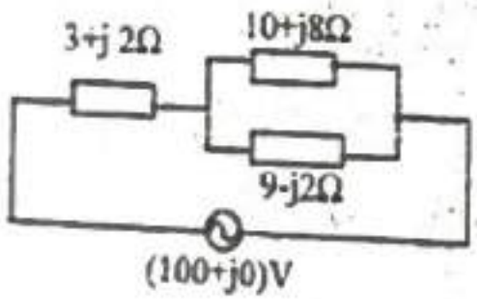
Fig. 3

3(a) A three phase delta connected RYB system with an effective voltage of 400V, has a balanced load with per phase impedances 3+j4 Ω, Calculate the (i) phase currents (ii) line currents and (iii) total power consumed by the load. [4][CO3]

(b) Prove that the power in a three phase balanced circuit can be deduced from the readings of the two wattmeters. Draw the relevant connections and phasor diagram [4][CO3]

4(a) A sine wave of v(t) = 200sin50t is applied to a 10Ω resistor in series with a coil. The reading of a voltmeter across the resistor is 120V and across coil 75 V. Calculate the active power, reactive power in the coil and power factor of the circuit. [4][CO3]

(b) For the circuit shown below, find current in each branch of the network. [4][CO3]



5(a) An iron ring has a mean diameter of 25cm and a cross sectional area of 4cm^2 . It is wound with a coil of 1200 turns. An airgap of 1.5mm width is cut in the ring. Determine the current required in the coil to produce a flux of 0.48 m Wb, in the air gap, if the relative permeability of iron under these condition is 800, Neglect leakage and fringing. [4][CO4]

(b) The total inductance of two coils A and B when connected in series is 0.5H or 0.2 H depending on the relative directions of current in the coils. Coil A, when isolated from coil B has a self inductance of 0.2H, Calculate (i) mutual inductance between the two coils (ii) self inductance of coil B (iii) the coupling factor between the coils and (iv) possible value of induced emf in coil A when current is decreased at 1000A/s in series circuit. [4][CO4]

6(a) Explain principal of operation of Transformer and explain the working of a transformer under no-load and on load conditions. [4][CO5]

(b) A 100 kVA, 3300/200V, 50 HZ single-phase transformer has 40 turns on the secondary, calculate (i) the values of primary and secondary currents, (ii) the number of primary turns, (iii) the maximum value of flux, (iv) If the transformer has to be used on 25 Hz system, calculate the primary voltage, assuming that the flux is increased by 10 per cent . [4][CO5]

7 Write short notes on the following:

(a) RLC series resonance [4][CO5]

(b) Permanent magnet moving iron instrument [4][CO5]

Total No. of Pages - 3

Roll No.....

II SEMESTER

B.Tech. [EE]

END-SEM EXAMINATION

MAY-2025

EE-102n DATA STRUCTURES AND ALGORITHMS

Time: 3:00 Hrs

Max. Marks:40

Note: Question no.1 is compulsory for all.
Attempt any four questions out of the rest.
Assume suitable missing data, if any.

Q1. Answer the following questions. [8 x 1 = 8]

(a) The depth of a complete binary tree with n nodes is [CO4] L2

A. log (n+1) – 1
B. log (n)
C. log(n-1) + 1
D. log (n) + 1

(b) The time complexity of $1^2 + 2^2 + ... + n^2$ is [CO2] L3

A. O(n) B. $O(n^2)$
C. $O(n^3)$ D. O(log n)

(c) The result evaluating the postfix expression 10 5 + 60 6 / * 8 - is [CO3] L5

A. 284 B. 213
C. 142 D. 71

(d) In recursion, the condition for which the function will stop calling itself is called ..... [CO5] L2

(e) Find the output of 3+6*(2*5-4)/10 in Python? [CO6] L4

A. 0 B. 6
C. 3 D. 6.6

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(f) Which data structure is used for DFS traversal _____ property. [CO4] L1

A. Linked list B. Queue

C. Both A & B D. None of the above

(g) What is the time complexity of deleting all the elements from the end in a singly linked list with n elements? [CO1, CO2] L4

A. O(n) B. $O(n^2)$

C. O(1) D. (log n)

(h) Which of the following is not a reserved keyword in Python? [CO6] L1

A. break B. True

C. yield D. start

Q2. (a) How do you create and import a module? [4] [CO6] L1

(b) What is the difference between Python's module, package and library? Explain with suitable examples. [4] [CO6] L2

Q3. (a) Explain data structures and its type briefly. [4] [CO1] L1 L2

(b) What is a file? And, explain why do we need to open and close a file operation. [3] [CO1] L1

Q4. (a) Define stack and write its steps of postfix expression evaluation using stack. Explain the steps with an example. [4] [CO3]L4

(b) Compare PUSH, POP and PEEK operations in the stack. Give examples to demonstrate which is required where. [4] [CO3] L2

Q5. (a) Write the different operations that can be performed in a linked list. [4] [CO1, CO3] L1

(b) Write the base condition of factorial recursive function and write various application of recursive functions. [4] [CO5] L2

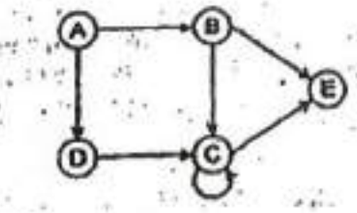
Q6. (a) Create a binary tree from the following inorder and postorder traversals sequence:

Postorder: 80,40,90,50,20,100,60,110,120,70,30,10.

Inorder: 80,40,20,90,50,10,60,100,30,110,70,120. [5] [CO4] L6

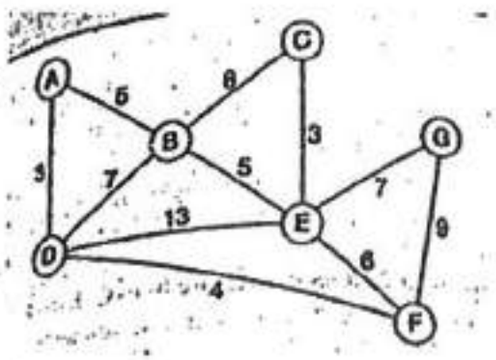
(b) Explain in brief the AVL tree rotation techniques with suitable graphical illustrations. [3] [CO4] L2

Q7. (a) For the directed graph below prepare the adjacency matrix (for both directed and undirected graph) and the incidence matrix. Edge naming / numbering to be shown in answer for incidence matrix by redrawing the graph.



[3] [CO4] L3

(b) For the given graph find the MST using Prim's algorithm.



[5] [CO5] L5

Q8. Write short notes on any two [4 x 2 = 8] [CO4, CO5] L1

(a) Searching algorithms

(b) Merge-in and Merge-short

(c) Depth-first search and Breadth-first search

(d) Hash table and Hash function

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Total no. of Pages: 02 *Roll no... ... ...*

II Semester
B.Tech.

End Term Examination **May-2025**

EE104 CIRCUIT AND FIELD THEORY

Marks :40 **TIME: 3:00 Hrs**

Note: ATTEMPT ANY FIVE. Question one is compulsory
Assume the suitable data, if required

Q . 1 Justify the answer in the following questions (a to d) by filling/choosing the correct answer in the blanks [CO1,4][L1,2] 4X2M

a. Power consumed by an ideal inductor is _____
b. Inductive reactance (increases/decreases) with increasing frequency.
c. In purely inductive circuit current lags the voltage by _____degrees.
d. In a balanced three phase system, the neutral current is_____

Q. 2 (a) Obtain the current in 2Ω resistor in the circuit of Fig. 1 by Thevenin's theorem [CO1][L4,5] 4M

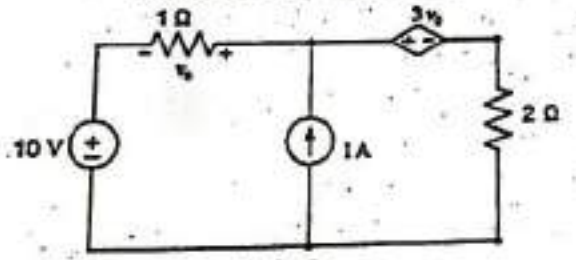

Fig1.

(b) Find v using the principle of Superposition theorem in Fig 2. [CO1[L4,5] 4M

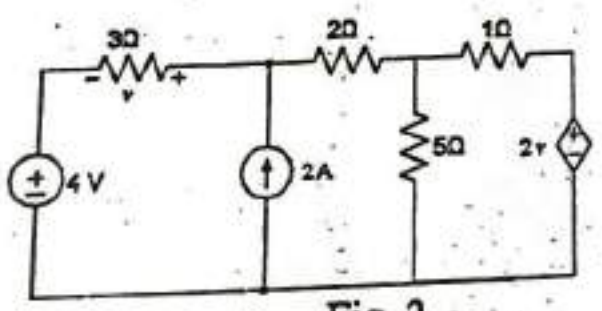

Fig. 2

Q. 3(a) Find the angle by which i_1 lags i_2 if $i_1 = 120\cos(100\pi t - 30°)$ and $i_2 = 5\sin(100\pi t + 50°)$ [CO2][L3] 4M

(b) A metal-filament lamp, rated at 750W, 100V is to be connected in series with a capacitance across a 230V, 50 Hz supply. Calculate the value of capacitance required. Draw the phasor diagram. [CO2][L4] 4M

Q.4 (a) A 3-Phase balanced load connected across a 3-phase, 400V ac supply draws a line current of 10A. Two wattmeters are used to measure input power. The ratio of two wattmeter readings is 2:1. Find the readings of the two wattmeters. [CO3][L5] 4M

(b) A balanced 3-phase load draws 8 kW at a lagging power factor of 0.8. if the line voltage applied is 440V, find the reactive power drawn and the line current. [CO3][L4,5] 4M

Q5 (a) What are the similarities and dissimilarities between electric and magnetic circuits? Enlist any five applications of magnetic circuits in engineering fields. [CO4][L2,6] 4M

(b) A toroidal core of radius 6 cm is having 1000 turns on it. The radius of core cross-section is 1 cm. Find the current required to establish a total magnetic flux of 0.4 mWb, if
(a) The core is nonmagnetic.
(b) The core is made of iron having the relative permeability of 4000. [CO4[L4,5] 4M

Q.6 (a) Write Maxwell's Equation in static and time-varying form. [CO5][L1] 4M

Q. 6 (b) If Electric flux density, $\vec{D} = (2y^2 + z)\vec{a_x} + 4xy\vec{a_y} + x\vec{a_z}$ C/m^2. Find [CO5][L4] 4M
i) Volume charge density at (-1,2,4)
ii) The flux through the cube defined by $0 \le x \le 1$, $0 \le y \le 1$, $0 \le z \le 1$

Q. 7 Write short notes on any two of the following: [CO2,5][L1,6] (4+4)M
a. Convection and Conduction Currents
b. B-H Curve and its applications
c. Resonance in parallel RLC circuit

Total no. of Pages: 03

Roll no.....

IV Semester

B. Tech, Electrical Engineering

END Term Examination **May- 2025**

EE202n/ME252 Power Plant Engineering

Time: 3:00 Hours ***Max. Marks: 40***

Note: i) Answer any Five of the following questions.
ii) Draw neat diagram (appropriately labelled), whenever required.
iii) Answer to each question must start on a fresh page.
iv) All parts of a question must be answered in one place only.
v) Assume missing data suitably, if any.

Q.1 (a) Draw the layout of hydroelectric power plant for net head available equal to 180 m. 2[CO2,3][L2,3]

(b) Enlist various components of a diesel engine power plant. 2[CO1][L1]

(c) What are the differences between water tube and fire tube boilers? 2 [CO2][L4]

(d) Explain the working principle of an electrostatic precipitator used in coal fired thermal power plants. 2 [CO-2,3][L5]

Q.2 (a) In a gas turbine plant operating on Joule Cycle, maximum and minimum temperatures are 825^0 C and 25^0 C. The pressure ratio is 4.5. 4 [CO4,5][L5]

Calculate i) specific work output,

ii) cycle efficiency and

iii) work ratio.

Assuming isentropic efficiencies of the compressor and the turbine at 85 and 90 percent respectively, calculate,

iv) heat rate in kJ/kW-hr, at turbine rating = 1300 kW.

Neglect mass flow of fuel and take c_p=1.005 kJ/kg K.

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(b) Draw schematic diagram of a <u>reheat cycle gas turbine plant</u>. Also sketch its T-s diagram and write the expression for its cycle efficiency in terms of temperatures at different points. 4[CO3,4][L3]

Q.3 (a) *Draw load curve and find out load factor* of a power station, if the plant supplies the following loads to the consumers for 24 hours. 4[CO4,5][L3,4]

Sr No	Time (Hours)	Load (MW)
1	0-6	40
2	6-8	50
3	8-12	60
4	12-14	50
5	14-18	70
6	18-22	80
7	22-24	40

Also find out the *load factor and the use factor* of the standby unit if the loads above 60 MW are taken by standby unit of 20 MW.

(b) i) What is the difference between *conventional and nonconventional sources of energy?* 4[CO1,2][L4]

ii) What are the advantages of *nonconventional sources energy* over conventional sources of energy?

Q.4 (a) i) Explain the term, *"Tidal Energy"*. With the help of neat sketches, explain how tidal energy can be used to generate electricity. 4[CO2,3][L1,2]

ii) What are the advantages and disadvantages of using *tidal energy* over using *wind energy* for power generation?

(b) i) Discuss various factors to be considered while selecting the site for a *hydro-electric power plant*. 4[CO2,3][L2]

ii) What are the advantages and disadvantages of *hydro-electric power plants* over coal fired thermal power plants?

Q.5 (a) i) What is a *super-critical boiler*? How super-critical boilers are different from that of sub-critical boilers? 4[CO3,4][L1,3]

ii) Describe advantages gained by using *economizers* in a modern thermal power plant.

(b) Draw schematic diagram of *Rankine cycle* (the theoretical cycle on which the steam turbine works in a steam power plant). Also sketch its T-s diagram and write the expression for its cycle efficiency in terms of enthalpy at different points. 4[CO3,4][L1,4]

Q. 6 Write short notes on the followings *(Any two)* 4+4[CO3,4][L5,6]

i) *Lay out of a Nuclear and Diesel Engine power plants ,*
ii) *Combustion process of pulverized coal and emissions in thermal power plants,*
iii) *Fluidized bed combustion,*
iv) *Geo-thermal energy.*

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Total No. of Pages.....

Roll No.....

FOURTH SEMESTER

B.TECH. ELECTRICAL ENGINEERING

END SEMESTER EXAMINATION

(May 2025)

EE-204, Power Transmission & Distribution

Time: 03 Hours

Max. Marks: 40

Note: *Answer any five questions. All question carry equal marks. Assume suitable missing data, if any.*

1. Explain: 2x4[CO1-5][BTL1,2]
   i. Overhead line conductor are in variably stranded and ACSR
   j. In order to maintain a good voltage profile on the line, the control of reactive power flow is necessary.
   k. Series compensation increases the power transmission capacity of a line.
   l. Insulators are often fitted with arcing horns.

2. (a) Derive an expression for the inductance of single phase two wire line. 4[CO3][BTL2]
   (b) A three-phase transmission line has a horizontal configuration with spacing of 6 m between adjacent conductors and 12 m between outer conductors. The radius of each conductor is 1.81 cm. Find the inductance per phase per km of the line. 4[CO3][BTL3]

3. (a) Develop the expression for sending end voltage and sending current for a medium length Transmission line using nominal T- circuit also draw the corresponding phase diagram for Nominal T- circuit. 4[CO2][BTL5]
   (b) A 200 km long 3-phase overhead line has resistance of 48.5 ohms per phase, inductive reactance of 80.20 ohms per phase and capacitance (line to neutral) 8.42 nF per km. It supplies a load of 13.5 MW at a voltage of 88 kV and power factor 0.9 lagging. Using nominal T circuit, find the Sending end voltage and regulation. 4[CO3][BTL3]

4. (a) What is string efficiency? Why is it necessary to have high string efficiency? How can the string efficiency be improved? 4[CO2][BTL1]
   (b) A string of insulator for a 66 kV line has 4 discs. The capacitance from each joint to tower is 25% of the self capacitance of each unit. Find the voltage distribution across the units and string efficiency. 4[CO2][BTL4]

5. Assuming that the shape of an overhead line can be approximated by a parabola, deduce expression for calculating sag and conductor length. How can the effect of wind and ice loading be taken into account? 8[CO2][BTL1,6]

6. (a) Describe the phenomenon of corona. Define disruptive critical voltage and visual and visual voltage. On what factor do they depend? Write equation for calculating these voltages. 4[CO5][BTL2,3]
   (b) Find the disruptive critical voltage and visual corona voltage (local corona as well general corona) for a 3-phase 220 kV line consisting of 22.26 mm diameter conductors spaced in a 6 m delta configuration. The following data can be assumed: Temperature 25^0 C, pressure 73 cm of mercury, surface factor 0.84, irregularity factor for local corona 0.72, irregularity factor for general (decided) for general (decided) corona 0.82. 4[CO5][BTL4]

7. Write short notes on any two of the following : 2x4[CO1-5][BTL1,2,6]
   a. Ring and Radial Distribution systems
   b. Choice of economical voltage of transmission
   c. Ferranti Effect

Total No. of Pages 03

Roll No. .....

FOURTH SEMESTER

B.Tech.(EE)

END SEMESTER EXAMINATION

May 2025

EE 206 Control Systems

Time: 3:00 Hours

Max. Marks :40

Note: Attempt any five questions. All questions carry equal marks. Use semilog graph paper for Bode plot and graph paper for Root locus plot. Assume suitable missing data, if any.

Q1. An Armature Controlled DC motor is used to rotate a load at a desired speed (ω rad/s). Based on the various parameters of DC motor, determine the closed loop transfer function of the Armature Controlled DC Motor. Define all the symbols/parameters with their units. Assume field time constant zero.

[CO1] [8] BLT 5, 6

Q2. Find the closed loop transfer function of the system, whose block diagram is given in figure 1. Use two methods (a) By Block Diagram Reduction Technique and (b) Draw the Signal flow graph and use Mason's gain formula.

[CO2] [4+4] BLT 4, 6

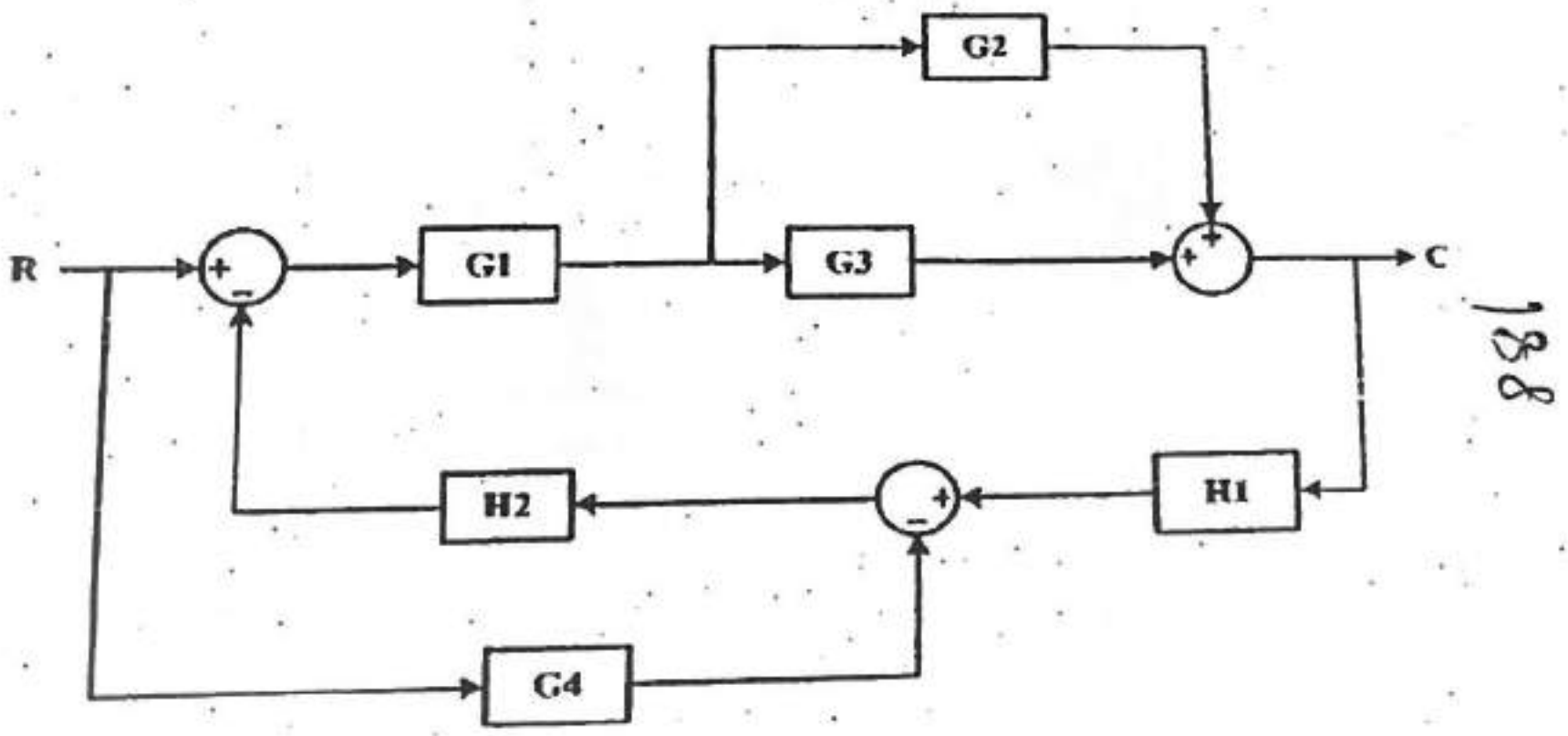

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Figure 1

Q3. The open-loop transfer function of the unity feedback system is given by

[CO4] [8] BLT 4, 5

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$$G(S)H(S)=\frac{K}{S(S+2)(s+4)}$$

Draw the root-locus sketch determining the following:

(i) number of open-loop poles and zeros on the s-plane
(ii) the root-locus on the real axis
(iii) the breakaway and break-in point and corresponding gain value of K
(iv) the point of intersection of asymptotes and angle of the asymptotes
(v) the points on the root-locus crossing imaginary axis and finding that frequency and gain value of K

Q. 4 (a)Measurements conducted on a servomechanism show the system response to be [CO4] [4+4] BLT 1, 3

$C(t)= 1+ 0.2\,e^{-60t} - 1.2e^{-10t}$

When subjected to a unit step input.

(b) Figure 2 shows a system employing proportional plus error-rate control. Determine the value of the error-rate factor "Ke" so that the damping ratio is 0.5. Determine the values of settling time, maximum overshoot and steady state error (for unit ramp input) with and without error-rate control. Comment upon the effect of error rate control on system dynamics.

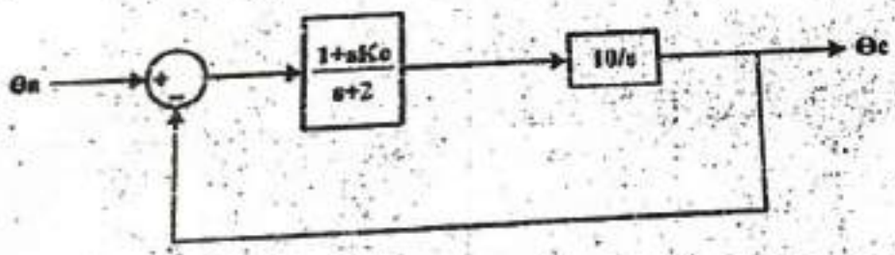

Figure 2

Q.5 (a) Examine stability of the following system given by characteristic equation,

using Routh-Hurwitz criterion. What would be the number of Poles in the right and left half of the s-plane? [CO5] [6+2] BLT 1, 4

$s^5+2s^4+2s^3+4s^2+4s+8$

(b) How to justify the system given by the characteristic equation is unstable.

$9s^6+2s^5++2s^3+5s^2+4s+18$

Q6. Construct the Bode Plot on the semi-log graph paper for unity feedback system whose open loop transfer function is given by [CO5] [8] BLT 4, 6

$$G(S)=\frac{500}{S(S+1)(s+50)}$$

From the Bode Plot determine (i) Gain and phase cross over frequency (ii) Gain and Phase Margin and (iii) Stability of the closed loop system.

Q.7 Write short notes on any two of the following [CO3] [4+4] BLT 1, 2

(a) AC servomotor
(b) Synchro
© Nyquist Criterion

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IVSEMESTER B.Tech. (EE)

END TERM EXAMINATION MAY2025

EE 208 AYSNCHRONOUS AND SYNCHRONOUS MACHINES

Time: 03:00 Hours Max. Marks: 40

Note: Answer any TEN questions. All questions carry equal marks. Assume suitable missing data, if any.

Q.1 Explain how and when an induction motor can be operated as generator? Also draw the torque characteristic of induction generator. [4][CO1][BTL3]

Q.2 Explain the concept of derivation of double revolving field theory in single phase induction machine. [4][CO2][BTL2]

Q.3 What are the conditions necessary for parallel operation of synchronous generator? Explain in detail a method to achieve it. [4][CO3][BTL1]

Q.4 Derive the power developed equation in cylindrical synchronous machines and draw its power angle characteristic. [4][CO3][BTL3]

Q.5 Explain the effect of excitation current on armature current of synchronous motor using phasor diagram and measured (rms) values. [4][CO3][BTL6]

Q.6 Discuss the effect of armature reaction in synchronous generator with phasor diagram for lag, lead and unity power factor conditions. [4][CO3][BTL2]

Q.7 A 11kV, 3 phase star-connected synchronous motor draws a current of 45A. The effective resistance and synchronous reactance per phase are 0.9 ohm and 28 ohm respectively. Calculate the power supplied to the motor and induced emf for a power factor of (i) 0.8 lag (ii) 0.8 leading. [4][CO3][BTL4]

Q.8 A 3.3 kV, 3 phase star-connected alternator has a full load current of 100A. Under short circuit condition it takes 5A field current to produce full-load short circuit current. The emf on open circuit for the same excitation is 900V (line-t0-line). The armature resistance is

0.9 ohm/phase. Determine synchronous reactance per phase and regulation for (i) 0.8 p.f lagging (ii) 0.8 p.f leading. [4][CO3][BTL5]

Q.9 A 220V, single phase induction motor gave the following test results: Blocked rotor test: 120V, 9.6A, 460W, No load test: 220V, 4.6A, 125W. The stator winding resistance is 1.5 ohm and during the blocked rotor test, the starting winding is open. Determine the equivalent circuit parameters. Also, find the core, friction and windage losses. [4][CO2][BTL5]

Q.10 A 3 phase induction motor has a starting torque of 100% and a maximum torque of 200% of the full load torque. Determine: (a) slip at which maximum torque occurs (b) full load slip (c) ratio of rotor starting current to full load current. [4][CO2][BTL5]

Q.11 A400V, 50 Hz, delta connected alternator has direct axis reactance of 0.1 ohm and a quadrature axis reactance of 0.07 ohm per phase. The armature resistance is negligible. The alternator is supplying 1000A at 0.8 pf. (a) Find the excitation emf neglecting saliency and assuming $X_q=X_d$. (b) Find the excitation emf taking into account the saliency. [4][CO3][BTL4]

Q.12 Write short notes on any two of the following:

(a) Construction and working principle of PMSM

(b) Hunting in synchronous machines

(c) Performance of Deep bar induction motors [4][CO4,2][BTL1]

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Total no. of pages: 02 *Roll No.....*

FOURTH SEMESTER
B.Tech(EE)
END SEMESTER EXAMINATION **May-2025**
EE-210n/202a Linear Integrated Circuits
Time: 3 Hours **Max. Marks: 40**

NOTE: Attempt any 8 questions. All questions carry equal marks. Assume suitable missing data if any.

Q1. For an inverting Schmitt trigger using an op-amp with ±15 V supply and saturation ±13 V, R_f = 150 kΩ, and R_{in} = 50 kΩ, calculate the upper and lower threshold voltages. Also determine the hysteresis width. **[05][CO3][BLT3]**

Q2. Find the transfer function (V_{out}/V_{in}) for the circuit given in fig. 1. **[05][CO2][BLT6]**

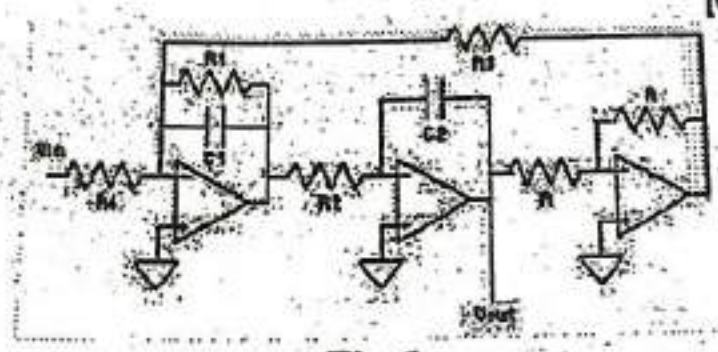

Fig. 1

Q3. Find V_{out} in terms of V_{in1} and V_{in2} for the circuit given in fig. 2. **[05][CO4][BLT5]**

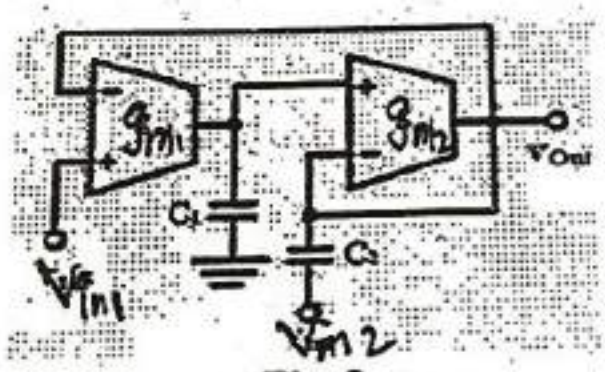

Fig. 2

Q4. Explain the internal circuit of 555 timer and show how 555 timer can be used for frequency modulation. **[05][CO4][BLT2,3]**

Q5. For the circuit in fig. 3, find the expression for closed loop voltage gain. Also find the gain value if all resistors are equal in magnitude i.e. R ohms. **[05][CO1][BLT2,3]**

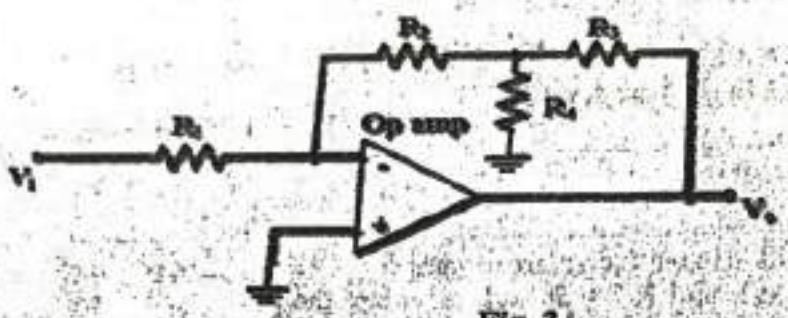

Fig. 3

Q6. Explain the circuit of an instrumentation amplifier with proper derivation. State its advantages over the normal differential amplifier. [05][CO1,2][BLT3]

Q7. Explain with the help of block diagram how will you find the square of an input voltage using op-amp. Draw the internal diagram of each block used. [05][CO3][BLT1,2]

Q8. For the circuit given in fig. 4, sketch the output voltage waveform if V_{in} = 500mV_{pp} sine wave at 100Hz and V_{ref} = 50mV. Given C_i = 0.1μF, R = 4.7KΩ, R_L =10KΩ and V_{sat} = 15V. [05][CO1][BLT2,3]

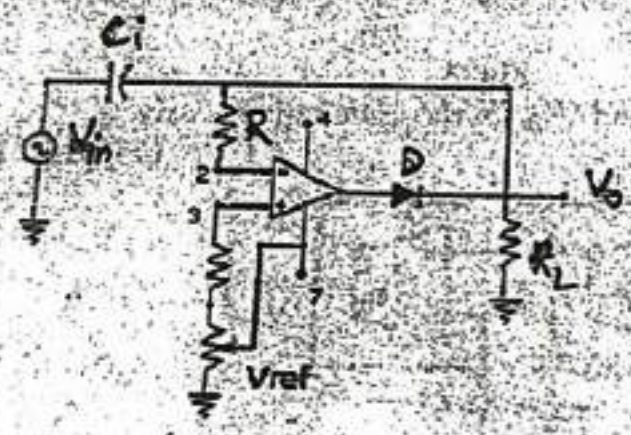

Fig. 4

Q9. Explain the functioning of a phase lock loop and describe in detail the structure of IC565. [05][CO5][BLT1,2,3]

Q10. Draw the basic circuit of general impedance converter(GIC). Using it, design a second order low pass filter with a cut-off frequency of 10KHz. [05][CO4][BLT3,4]

A 2 cm x 3 cm waveguide is filled with a dielectric material with $\varepsilon_r = 4$. If the waveguide operates at 20 GHz with TM_{11} mode, find:

a) Cutoff frequency
b) Phase constant
c) Phase velocity

[5M][CO5][BTL3]

Q.10 In a rectangular waveguide for which a = 1.5 cm, b= 0.8 cm, $\sigma = 0$, $\varepsilon = 4\varepsilon_0$, and $\mu = \mu_0$

$$H_x = 2 \sin\left(\frac{\pi x}{a}\right) \cos\left(\frac{3\pi y}{b}\right) \sin(\pi \times 10^{11} t - \beta z)\ A/m$$

Determine

(a) The mode of operation
(b) The cutoff frequency
(c) The phase constant β
d) The propagation constant Υ
(e) The intrinsic wave impedance η

[5M][CO5][BTL3]

------End------

Total no. of Pages: *Roll no.....*

IV SEMESTER

B.Tech

END TERM EXAMINATION ***May-2025***

EE262 ELECTROMAGNETICS

Time: 03:00 Hours ***Max. Marks: 50***

Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 It is found that $E = 60a_x + 20a_y - 30a_z$ mV/m at a particular point on the interface between air and a conducting surface. Find D and ρ_s at that point.

[5M][CO1,2][BTL3]

Q.2 Determine the capacitance of 10 m length of the cylindrical capacitors shown below in Fig.1. Take a = 1 mm, b = 3 mm, c = 2 mm, $\varepsilon_{r1} = 2.5$, and $\varepsilon_{r2} = 3.5$

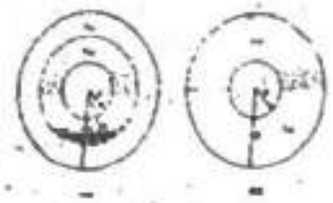

Fig.1

[5M][CO1][BTL3]

Q.3 Write down Maxwell equations for static and dynamic electric and magnetic fields. Find whether the following fields are magnetostatic fields or not:

a) $B1 = x\hat{a}_x - y\hat{a}_y$
b) $B2 = e^{-y}(\cos x\, \hat{a}_x - \sin x\, \hat{a}_y)$

[5M][CO2][BTL3]

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Q.4 Derive the formula for reflection coefficient and transmission coefficient when reflection of plane wave takes place at normal incidence with the suitable diagram.

[5M][CO4][BTL2]

Q.5 State Poynting's theorem and derive its formula with suitable diagram

[5M][CO3][BTL2]

Q.6 A transmission line of 75 ohm is connected to a 100 ohm load as shown in Fig.2. Find following:

a) Standing wave ratio due to this mismatch

b) Reflection coefficient

c) Ratio power reflected and incident powers at the load

d) Percentage of incident power reflected from the load

e) Percentage of incident power absorbed from the load

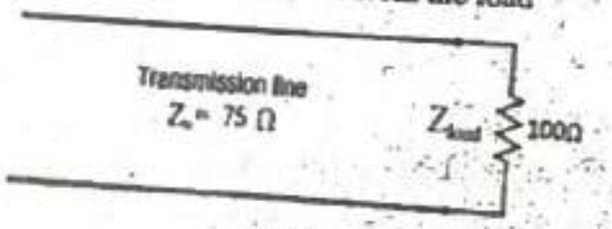

Fig.2

[5M][CO5][BTL3]

Q.7 A telephone line has R = 40 Ω/m, G = 400 μS/m, L = 0.2 μH/m and C = 0.5 nF/m.

a) If the line operates at 10 MHz, calculate the characteristic impedance Z_0 and velocity u.

b) After how many meters will the voltage drop by 30 dB in the line?

c) State the condition for distortion less and lossless transmission line

[5M][CO5][BTL3]

Q.8 Design a circuit model of a basic transmission line. A quarter wave lossless 100 Ω line is terminated by a load Z_L = 210 Ω. If the voltage at the receiving end is 80 V, what is the voltage at the sending end?

[5M][CO5][BTL6]

OR

Explain different mode of wave propagation in free space? Determine what mode is present in Fig.3 (a), (b), (c) in the rectangular wave guide.

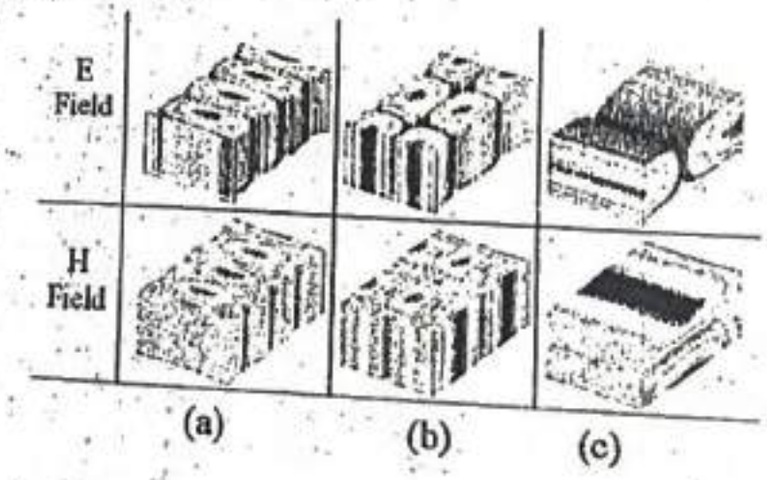

Fig.3

[5M][CO5][BTL5]

Q.9 In an air-filled rectangular waveguide with a = 2.286 cm and b = 1.016 cm, the y component of the TE mode is given by

$$E_y = \sin\left(\frac{2\pi x}{a}\right)\cos\left(\frac{3\pi y}{b}\right)\sin(10\pi \times 10^{10}t - \beta z)\ V/m$$

Find:

a) Operating mode

b) Propagation constant ϒ

c) Intrinsic impedance η

[5M][CO5][BTL3]

OR

Total no. of Pages: 02 *Roll no.....*

FOURTH SEMESTER 4 B.Tech.

END TERM EXAMINATION *May 2025*

EE 272 AUTOMOTIVE ELECTRICAL AND ELECTRONICS

Time: 03:00 Hours *Max. Marks: 40*

Note:
Question no. 1 is compulsory
Attempt any FOUR out of the remaining questions
Assume suitable missing data, if any.

Q.1 Indicate whether 'True or False' and justify briefly. [1x8][CO# 01]

(a) A relay is an electrically operated switch that uses a small electrical signal to control a higher-power circuit.

(b) A DC shunt motor is used as a cranking motor.

(c) The number of poles on the stator and rotor are always equal in all rotating machines.

(d) An increase in the plate area of a battery cell increases the internal resistance.

(e) The water is broken up into hydrogen and oxygen during the recharging of the Lead-acid battery.

(f) The cam angle is the number of degrees travelled by the distributor cam while the contact points are closed.

(g) If the result has an even numbers of 1s, the Parity flag is set in the 8085 microprocessor.

(h) As interfacing devices, a latch is used for an output port and a tri-buffer is used for an input port in the 8085 microprocessor.

Q.2 [4+4][CO# 01]

(a) Draw the schematic circuit diagram of the ignition coil of a four-cylinder petrol engine. Explain the function of each component.

(b) What is an earthed return system? Give the advantages and disadvantages of positive and negative earthing.

Q.3 [4+2+2][CO#01]

(a) Explain the construction and principle of operation of a Lead-acid battery.

(b) Enlist the emerging energy storage devices/technologies.

(c) Describe Sulphation and Internal short-circuiting for the lead acid battery.

P.T.O

Q.4 [4+4][CO#01,02]

(a) Give the constructional features of DC machines. Describe functions of field winding, armature winding and commutator.

(b) A 250 V DC shunt motor has an armature resistance of 0.5 Ω and a field resistance of 250 Ω. When driving a constant torque load at 600 RPM, the motor draws 21 A. What will be the new speed of the motor if an additional 250 Ω resistance is inserted in the field circuit?

Q.5 [4+2+2][CO#01, 02]

(a) Discuss the conventional and electronic engine management system (EMS) for automobiles.

(b) What are Electro Magnetic Interference and Electromagnetic Compatibility with reference to automobiles

(c) Explain Mass Air Flow and Crankshaft Position Sensors used in automobile.

Q.6 [4+4][CO#01]

(a) What is headlight dazzle? Discuss the various causes and remedies of dazzling effect. Also, discuss the fog lamp.

(b) Draw and explain in brief the pin diagram of the 8085 microprocessor.

Q.7 [4+4][CO# 02]

(a) Explain various address modes of the 8085 microprocessor with a suitable example.

(b) Write a program to add two hexadecimal numbers with carry; comment on each step clearly.

Q.8 [8][CO# 03 &4]

Two machine codes-0011 1110 (3EH) and 0011 0010 (32H)- are stored in memory locations 2000H and 2001H, respectively. The first machine code (3EH) represents the opcode to load a data byte in the accumulator, and the second code (32H) represents the data byte to be loaded in the accumulator. Illustrate the bus timings as these machine codes are executed. Calculate the time required to execute the Opcode Fetch and Memory Read cycles and the entire instruction cycle if the clock frequency is 2 MHz.

Total No. of Pages 3 *Name*_____ *Roll No*_____

B.Tech. SIXTH SEMESTER

END TERM EXAMINATION **MAY-2025**

COURSE CODE: EE-302 **COURSE TITLE: ELECTRIC DRIVES**

Time: 3:00 Hour **Max Marks: 40**

Note: Question 1 is compulsory;
Attempt **any four (4)** from the rest of the question.
All questions carry equal marks.
Assume suitable missing data, if any.

[1] Explain the following in brief: **[08] [BTL1-BTL4]**

(a) What do you mean by drive? Why electric drives are recently gaining popularity against their mechanical counterpart? Discuss the building blocks of electric drives while mentioning the role of its constituent components. [04][CO1]

(b) Steady state stability $dT_l/d\omega_m > dT/d\omega_m$; (where T_l and T are load and motor torque, respectively). [02][CO2]

(c) Energy loss during plugging is three times that of dynamic braking. [02][CO2]

[2] (a) Derive the fundamental load torque equation and discuss the different component of load torque. What kind of modification is required in load torque equation if there is presence of torsional elasticity in coupling shaft? Also, discuss the four-quadrant operation of hoist load. **[04][CO2] [BTL2]**

(b) A constant speed motor has the following duty cycle:
Load rising linearly from 200 to 600kW: 4min;
Uniform load of 400kW: 3 min;
Regenerative power returned to supply, reducing linearly from 400kW to 0: 3min;
Remains idle: 5min, determine rating of the motor assuming loss to be proportional to (power)^2? **[04][CO3] [BTL3]**

[3] (a) A 220 V, 24A, 1000rpm separately excited dc motor has an armature resistance of 2Ω. Motor is controlled by a chopper with frequency of 500Hz

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and source voltage of 230V. Calculate the duty ratio for 1.2 times rated torque and 500rpm. [04][CO3] [BTLA]

(b) A 230V, 960rpm, 200A separately excited dc motor has an armature resistance of 0.02Ω. The motor is fed from a chopper capable of performing motoring and braking operations. If the drive is operating under dynamic braking conditions with a braking resistance of 2 Ω, then calculate the following: [04][CO4] [BTL4]

(i) Duty ratio of chopper for a motor speed at 600 rpm with a braking torque of twice of the rated value.

(ii) Motor speed for a duty ratio of 0.6 at rated torque.

[4] (a) Discuss the closed loop speed control of PWM inverter fed induction motor. How the control loop could be modified to run the motor above the base speed? [04] [CO5] [BTL5]

(b) A 440V, 50Hz, 6-pole, Y-connected wound rotor motor has the following parameters: [04] [CO5] [BTL6]

$R_s = 0.5\Omega, R_r' = 0.4\Omega, X_s = X_r' = 1.2\Omega, X_m = 50\Omega.$

Stator to rotor turns ratio is 3.5.

The motor is controlled by static rotor resistance control. External resistance is chosen such that the breakdown torque is produced at standstill for a duty ratio of zero. Calculate the value of external resistance. How should the duty ratio be varied with speed so that the motor accelerates at maximum torque?

[5] A three-phase, delta connected 6-pole, 400 V, 50Hz, 925 rpm, Squirrel cage induction motor has the following parameters [2×4=08] [CO5] [BTL6]

$R_s = 0.2\Omega, R_r' = 0.3\Omega, X_s = 0.5\Omega, X_r' = 1\ \Omega.$

The motor is fed from a VSI with a constant V/F ratio from 0 to 50 Hz and constant voltage of 400V above 50 Hz frequency.

(i) Discuss the disadvantage of V/F control over vector control method.

(ii) Determine the break down torque for a frequency of 100Hz.

(iii) Also, obtain the torque at the rated motor current and 75 Hz.

(iv) Calculate the motor torque at 30Hz and a slip speed of 60 rpm.

[6] Write short notes on any TWO of the following: [4×2=08] [CO5] [BTL3-BTL6]

(a) Field orientation and development of equivalent circuit for Vector Control of Induction Motor.

(b) Hybrid braking scheme by combining schemes for operation during both low and high speeds respectively, in respect of induction motors. Support the answer with analysis and neat diagrams.

(c) Derivation of speed and current considering 2nd order model for starting of separately excited DC motor with armature control.

(d) Obtain the transfer function of the separately excited DC motor for speed control with current feedback loop; support the answer with analysis and neat block diagrams.

Total No. of Pages...02...

Roll No.....

SIXTH SEMESTER

B.TECH. ELECTRICAL ENGINEERING

END SEMESTER EXAMINATION

(May, 2025)

EE-304, POWER SYSTEM ANALYSIS

Time: 3.00 Hours Max.

Marks: 40

Note: Answer any five questions. All question carry equal marks. Assume suitable missing data, if any.

1. (a) What do you understand by a bus? Give the significance of voltage control bus, load bus and the slack bus in a power system. 2[CO1][BTL1]

(b) The Figure-1 shows a 4-bus power system. The shunt admittances at the buses are negligible. The line impedances are as below: Line impedances of a 4-bus system are as below: 6[C2][BTL2]

Bus code:	1-2	2-3	3-4	1-4	1-3
Impendence:	0.025+j0.10	0.02+j0.08	0.05+j0.20	0.04+j0.16	0.1+j0.4

Formulate the Bus Admittance Matrix (Y_{bus}).

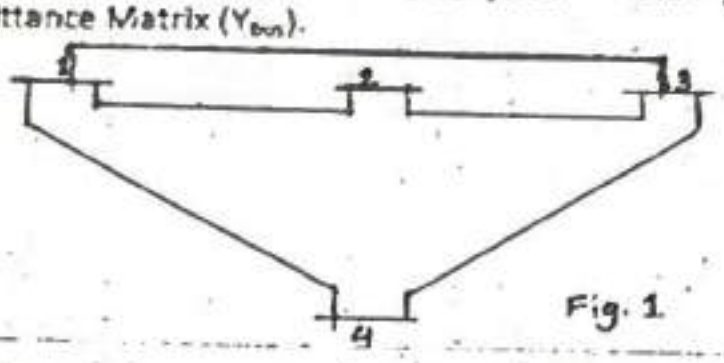

Fig. 1

2. (a) Explain the term 'Economic operating schedule'? Describe various types of system constraints to be considered for successful operation of power system. 4[CO3][BTL4]

(b) The incremental production cost of plant -1 and plant -2 are given as follows:

$dF_1/dP_1 = 0.4\ P_1 + 40.$

$dF_2/dP_2 = 0.5\ P_2 + 30$

Determine the economic operating schedule and the corresponding cost of generation if The maximum and the minimum loading on each unit are 100 MW and 25 MW. The demand is 180MW and transmission losses are neglected. If load is equally shared by both units determine the saving obtained by loading the units as per as per equal incremental production cost. 4[CO3][BTL3]

(a) Explain What are the various types of faults which usually occur in a power system? Discuss the various causes and consequences of a short circuit fault. How can we limit the magnitude of fault current? 4[CO2][BTL2]

(b) Three 10 MVA generators each having a reactance of 0.2 pu are operating in parallel. They feed a transmission line through a 30 MVA transformer having per unit reactance of 0.05. Find the fault MVA for a fault at the sending end of the line. 4[CO4][BTL5]

(a) Derive the necessary equations for calculating the fault current and the bus voltages for a single line to ground fault. 6[CO5][BTL1]

(b) The line currents in a 3 ph system are $I_a = 10/60^0$, $I_b = 10/-60^\circ$, $I_c = 0$. Find the symmetrical components. 2[CO4][BTL5]

(a) What is protective relay? Explain the functional requirement for a protective relay. 4[CO3][BTL1]

(b) Explain the constructional details of a circuit breaker. How is the arc produced between the circuit breaker contacts. How is the arc extinguished? 4[CO4][BTL1,2]

Q6)

6. Derive the Load Flow equations. Develop the G-S method for load flow study when P-V buses are absent for 'n' bus power system. How G-S method is modified when P-V buses are also present. B[CO5][BTL1,2]

7. Write short notes on any two of the following: 2X4[CO2,6][BTL1,2,6]
   a. Formation of Jacobien matrix
   b. Primary and backup protection
   c. Formation of Z_{bus} Matrix

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Total No. of Pages: 02

Roll No. .....

SIXTH SEMESTER

B.Tech.[EE]

END-TERM EXAMINATION

(May-2025)

EE-306 Microprocessors and Microcontrollers & its Applications

Time: 3 Hours

Max. Marks: 40

Note: All questions carry equal marks. Attempt any five questions. Assume suitable missing data, if any.

Q1. a) With timing diagram, explain the memory read operation in 8085 microprocessor. [4] [CO1] [BTL2]

b) Write an assembly language program based on 8085 microprocessor instruction set to find the square root of data from 1 to n using Lookup table [4] [CO2] [BTL1]

Q2. a) Explain the operation of 8255 PPI Port A programmed as input and output in Mode 1 with necessary handshaking signals [4] [CO3] [BTL6]

b) Design a microprocessor system to interface an 8K × 8 EPROM and 8K ×8 RAM [4] [CO4] [BTL7]

Q3. a) Draw the logical block diagram of 8279 keyboard display controller and explain each block. [4] [CO4] [BTL4]

b) Draw and describe the interfacing of A/D and D/A converter interfacing with 8085 microprocessor. [4] [CO3] [BTL2]

Q4. a) What are the different ways to start and end the interrupt execution in 8259 programmable Interrupt controller [4] [CO5] [BTL2]

b) With functional block diagram, explain the operation and [4]

programming of 8251 USART in detail [CO4] [BTL3]

Q5. a) Explain the program memory interfacing in 8051 microcontroller. [4] [CO5] [BTL6]

b) Write an assembly language program based on 8051 microcontroller instruction set to perform four arithmetic operations on two 8 bit data [4] [CO2] [BTL3]

Q6. Write short notes on any two of the following : [4+4] [CO2] [BTL2]

a) Interrupts in 8085

b) Stack and Subroutines

c) Addressing Modes in 8085

d) Delay Loops

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Total no. of Pages: 02 *Roll no.....*

6th SEMESTER

B.Tech. (EE)

END TERM EXAMINATION *May-2025*

EE308 POWER SYSTEM OPERATION and CONTROL

Time: 3 hrs. **Max. Marks: 50**

Note: Attempt FIVE questions in all. Q. No.1 is compulsory. Attempt any four questions from the remaining questions. All questions carry equal marks. Assume suitable missing data if any.

Q.1 State whether the following statements are True/False. Justify your answer.

i) Equal area criterion cannot be used to study stability problem due to switching action.

ii) A power system draws leading VARs during off-peak hours.

iii) The action of P-f loop is faster than Q-V loop.

iv) The inertia constant H of a 200 MVA machine is 2 pu. Its corresponding value to 400 MVA is 4 pu.

v) The P-δ characteristics of infinite machine is $P=\sqrt{3}Sin\delta$. It is operating at $\delta=30^0$. The synchronizing power coefficient is 1.5 at the operating point.

[2X5][CO2,5,3,1,4][BTL3,2,1,2,5]

Q.2 (a) Draw the complete LFC block diagram with transfer functions of an isolated Power System. Derive the transfer function of Generator-Load model. [4][CO3][BTL1,2]

(b) A control area has a total rated capacity of 10,000 MW. The Regulation R for all units in one area is 2 Hz/p.u MW. A 1% change in frequency causes 1% change load. If the system is operating at 5000 MW and the load increases by 2%. Find (i) Static Frequency drop. (ii) If the governor loop were open, what would be the frequency drop? Comment on the result. [6][CO3][BTL3,4]

Q.3 (a) Why is Governor provided in Power System? Explain its Droop characteristics. [4][CO3][BTL1,2]

(b) A 100 MVA, 50 Hz generator is operating at no load at 3000 rpm. A load of 25 MW is suddenly applied to the machine. Due to inertia the valve opens after 0.8 seconds. Inertia constant of generator is 4.5 MW-sec per MVA. Find the frequency deviation before the valve opens to meet the load demand. Assume no change in load due to change in frequency. [6][CO3][BTL3]

Q.4 (a) Explain the Point-by-Point method of solving swing equation. [4][CO2][BTL1,2]

(b) A 50 Hz generator is delivering 50% of the power that it is capable of delivering through a transmission line to an infinite bus. A fault occurs that increases the reactance between the generator and infinite bus to 400% of the value before the fault. When the fault is isolated, the maximum power that can be delivered is 75% of the original maximum value. Determine the critical clearing angle. [6][CO2][BTL2,3]

Q.5 (a) What are the objectives of LFC for two-area system. Derive the expressions for synchronizing coefficients for both the areas. [4][CO4][BTL2]

(b) A system has two areas of equal capacity of 2000 MW. The speed regulation constant of area A is 10 Hz/pu MW and that of area B is 2 Hz/pu MW. In each area 1% change in load occurs for 1% change in frequency. Find the steady state change in frequency and change in tie line power if 20 MW change in load occurs in (i) Area A (ii) Area B [6][CO4][BTL3]

Q.6 (a) What do you mean by good quality of power supply? What are the different methods of voltage control. Discuss any one method. [4][CO5][BTL1,2]

(b) A 100 MVAr shunt reactor operates at 98% and 96% of its rated voltage and frequency respectively. How much reactive power will the reactor absorb? [6][CO5][BTL1,2]

Q.7 Write short notes on *any two* of the following:

i) FACTS devices
ii) LFC of Two Area System
iii) Stability of Power System [2X5][CO5,4,1][BTL1,2]

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Total no. of Pages:01

Roll no.....

SIXTH SEMESTER

B.Tech.

END TERM EXAMINATION *May-2025*

EE-316 : ELECTRICAL ENERGY STORAGE SYSTEM

Time: 03:00 Hours *Max. Marks: 50*

Note : Answer any five questions, All questions carry equal marks. Assume suitable missing data, if any.

Q.1 Li-ion battery is mainly characterised by power capacity, battery internal impedance and open circuit voltage. Explain each and draw the equivalent circuit of LIB. [10][CO3][BTL1&3]

Q.2 Discuss the operational principles of rechargeable lithium ion batteries and draw block diagram showing major components of LIB. [10][CO3][BTL1&2]

Q.3 Differentiate between electric double layer capacitor (EDLC), pseudocapacitor and hybrid capacitor. [10][CO4][BTL4]

Q.4 What is the working principle of fuel cell, draw its schematic? List the different types of fuel cell. [10][CO4][BTL1&2]

Q.5 What is a BMS, list the various components of BMS. Discuss why it is important to have a BMS in a EV system. [10][CO5][BTL5]

Q.6 Differentiate between active and passive cell balancing. List the various techniques used for cell equalization. [10][CO5][BTL1&4]

Q.7 Design electric vehicle charging system architecture including off-board and on-board charger. Mention the importance of each component. [10][CO5][BTL6]

Total No. of Pages:2 *Roll No.....*

EVEN SEMESTE B.Tech. (EE/EC/CO/SE/MC/EP/PE)

END TERM EXAMINATION MAY-2025

EE-328 Deep Learning with Artificial Neural Networks

Time: 3:00 Hours *Max. Marks: 40*

Note: Answer FIVE questions. Q1 AND Q2 ARE COMPULSORY Write the ANSWERS IN A SEQUENCE. Assume any data if missing and clearly mention the assumption.

Q(1) (a). State the type of the optimization problems:

(i) max $\exp(-x^2)$ subject to $-2 \leq x \leq 5$

(ii) min $x^2 + y^2, (x-2)^2; (y-3)^3$

(iii) max $2x + 3y$ subject to $x > 0, 0 < y \leq 10, y \geq x$

(iv) min $x^2 y^6$ subject to $\frac{x^2+y^2}{4} = 1$

[4x1=4M][CO1][BTL1]

(b) Explain the Minimization of the constrained nonlinear optimization problem by using Karush-Kuhn-Tucker (KKT) conditions. Minimize $f(x,y) = (x-2)^2 + 4(y-3)^3$ for the constraints of $-x + y \leq 2$, $x + 2y \leq 3$. [4M][CO1][BTL2]

Q(2) (a) Write the mathematical expression and pseudo code for the following activation functions:

(i) Hard limiter (ii) Symmetrical Hard limiter (iii) Saturating Linear (iv) Symmetric Saturating Linear (v) Log Sigmoid (vi) Hyperbolic Tangent Sigmoid (vii) ReLU function (viii) Soft max function

[4M][CO2][BTL2]

(b) A fully connected feedforward network has 10 source nodes,2 hidden layers, one with 4neurons and the other with 3 neurons, and a single output neuron. Construct an architectural graph of this network

[4M][CO2][BTL5]

Q(3) (a) Find the optima of $f(x) = 1/(1 + |tanx|)$ in $\pi \leq x \leq \pi$. What is the potential difficulty? [4M][CO1][BTL3]

(b) Find if the following functions are convex or concave or neither?

(i) $x^2 + \exp(y)$ (ii) $1 - x^2 - y^2$ (iii) xy (iv) $\frac{x^2}{y}$ for $y > 0$

[4x1=4M][CO1][BTL3].

Q(4) A 2-2-1 radial basis function network is used to solve XOR problem. The first layer of weights is given as $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$. Calculate the activation functions for the hidden node units, for each XOR pattern using an activation function of the form $\varphi(net) = [-net^2]$, where net is the Euclidean norm

[8M][CO3][BTL4]

Q(5) The neural network with deeper layers yielded poorer performance is due to lack of proper training. Explain with suitable example the backpropagation algorithm training process of the deep neural network which experiences the primary difficulties (i)Vanishing gradient (ii)Overfitting (iii)Computational loading.

[8M][CO4][BTL4]

Q(6) Explain Convolution operation in convolutional neural network (CNN) and write short notes on the following layers: (i)Convolutional layer, Activation function layer (ReLU), Pooling layer, Fully connected layer and Dropout layer.

[8M][CO5][BTL5]

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Total No. of Pages: 02 Roll No. .....

B. Tech. (EE) SIXTH SEMESTER

END SEMESTER EXAMINATION (MAY-2025)

EE-324 Design, Estimation and Costing of Industrial Electrical System

Time: 3.00 Hours *Max. Marks: 50*

Note: Answer five questions in total. Question 1 is compulsory. Each question carry equal marks. Assume the missing data suitably (if any).

1. ***Answer the following questions in brief.*** [5×2=10]

   a. Briefly differentiate between lighting circuits and power circuits. [CO2][L1]

   b. What is MCB? How it is different from ELCB? [CO3][L2]

   c. What do you understand by overhead charges? Explain with suitable example. [CO1][L2]

   d. What is the purpose of cross arms in overhead transmission and distribution systems? [CO5][L2]

   e. Briefly describe the significance of of conduits? Briefly describe the selection of sizing of conduits. [CO4][L5]

2. a. How is the appropriate mode of procurement selected based on the requisition and estimation as per the latest general financial rules? What is the difference between GeM and e-tendering process? [CO1][L3][5]

   b. What is the purpose of estimation and costing? State the important facts, which an estimator should know for preparing an internal wiring estimate. [CO1][L4][5]

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3. a. Explain the concept and importance of a single line diagram. What key components and details should be included in a single line diagram to ensure it accurately represents the electrical distribution system? [CO2][L4][5]

b. How to determine the sizing of cables? Give your answer with suitable example. [CO2][L3][5]

4. a. Differentiate between the electrification of residential and commercial installations in terms of load requirements. [CO3][L3][5]

b. What is busbar? Describe its function, types and keep design consideration for busbar in electrical installation. [CO3][L2][5]

5. a. What are the different types of service connections, and what are their key features and applications. [CO4][L2][5]

b, What are joint box and looping-in wiring systems? Which system is more useful and why? [CO4][L2][5]

6. ***Write short notes on any two of the following.*** [2×5=10]

a. Procedure for determination of conductor size in domestic and commercial installation [CO5][L3]

b. Factors considered for selection of the site for a substation [CO5][L2]

c. Differentiate between Indoor and outdoor substations [CO6][L2]

d. Different type of earthing [CO6][L2]

Total no. of Pages: Roll no. 211

6/8th SEMESTER

B.Tech.

END TERM EXAMINATION May-2025

COURSE CODE EE416 COURSE TITLE GRID INTEGRATION OF RENEWABLE ENERGY SOURCES

Time: 3 Hours *Max. Marks: 60*

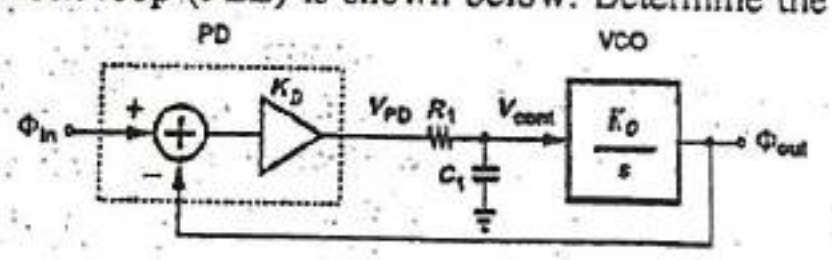
Note : Attempt any five questions.
Assume suitable missing data, if any.

Q.1 (a) Discuss the role of power electronics in harvesting the energy from intermittent renewables. How the ill effect of large penetration of renewables can be effectively managed by these power electronics devices? [6]

(b) Write a brief note on micro, string and centralized inverter while mentioning their advantages and disadvantages [6]

Q2. (a) Discuss the working principle of analog phase detector. How the the low pass filter design plays critical role in the development of phase detector? [6]

(b) The block diagram of typical phase lock loop (PLL) is shown below. Determine the close loop transfer function of the given PLL while assuming a unity feedback. Also derive the expression of natural frequency and damping factor for the same.

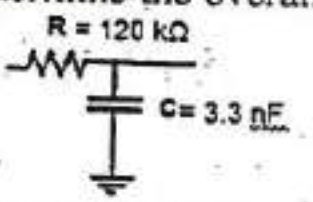


[6]

Q.3 A phase-locked loop has a center frequency of $\omega_0 = 10^5$ rad/s, $K_O = 10^3$ rad/s per V, and $K_D = 1$ V/rad. There is no other gain in the loop. Determine the overall transfer function H(s) for:

a) The loop filter F(s) = 1 (all pass filter).

b) The loop filter F(s) is shown below.



c) Loop filter F(s) as in part b) , XOR for the phase detector and $V_{DD} = 5V$.

d) Natural frequency ωn and damping factor ζ for part c) [12]

Q.4 What is the Park's transformation. Derive the park transformation and inverse park transformation matrices. How these transformations are used for the control of grid interfacing inverter. Explain with the help of suitable inverter control diagram. [12]

Q.5 (a) Discuss the different building blocks of Wind Energy Conversion Systems (WECS). List the various factor on which wind out power depends and also derive the expression for the same. [6]

2 12 (b) Calculate the energy of a wind turbine during 3h of continuous operation, with a blade length of 10m and efficiency of 40%, when the wind speed is 15kph and the air pressure and temperature are 10143.25 hPa and 15°C. [6]

Q.6 Write Short Note on any of the two

(a) Betz's Limit

(b) Types of WECS configuration

(c) Partial Shading [2x6]

Total No. of Pages: 03

Roll No. .....

SIXTH/EIGHTH SEMESTER

B.Tech

END SEM EXAMINATION

(MAY 2025)

EE434: Computer Control of Processes

Time: 3:00 Hours

Max. Marks: 50

Note: Question 1 is compulsory. Answer any four questions from remaining. All questions carry equal marks compulsory. Assume suitable missing data, if any.

Q1. Write true or false and justify your answer:

[CO1-CO5] [L1-6] (10*1=10)

(a) PID controller is the best choice for level control.(T/F)

(b) A temperature controller controls the temperature from $100^{\circ}C$ to $200^{\circ}C$. A sensor provides an output of 2 to 8 V for this temperature range. A circuit gain of 5 will be needed if proportional gain is 5%/%.(T/F)

(c) Three displays are commonly used in DCS.(T/F)

(d) Feedforward Control acts beforehand in an anticipatory manner. Justify the statement.(T/F)

(e) Ratio control is a type of feedforward control. Justify the statement.(T/F)

(f) Which type of controller mode builds up an corrective action proportional to the length of time the disturbance persists?

(g) Alternative path provided by vertical paths from the main rung of a ladder diagram that is paths in parallel represent "Logical OR" operation.(T/F)

(h) Override control protect the drum boiler from overheating by transfering the control action from the flow control to pressure control.(T/F)

(i) In model-refernce adaptive controller (MRAC), the specifications are given in terms of a performance index.(T/F)

(j) Three components of SCADA System are ..... , ... , and .....

Q2 (a) What are the main parts of a general purpose computer? Draw its block diagram and schematic diagram also. Describe input/output devices. [CO1] [L1,2] [5]

(b) Explain the SCADA hardware and software structure? [CO3][L1,2][5]

Q3 (a) What do you mean by PLC? Explain the PLC operation and scan time. [CO4][L2,3][5]

(b)Design PLC ladder diagram for water bottle filling mechanism:-

Whenever bottles are placed on the conveyor, the motor starts and the conveyor moves and photo-sensor senses the bottle motor stops and output valve opens for 30s. After 30s the valve is closed, motor starts and conveyor moves. When another bottle is detected, the process is repeated. Implement this in PLC using Ladder Diagram programming language.

[CO4][L4,5,6][5]

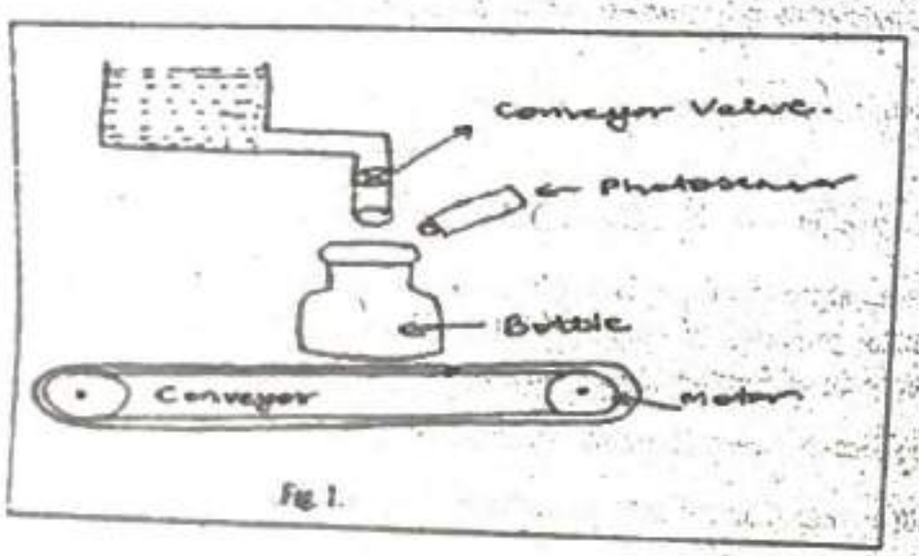


Fig 1.

Q4 (a) What are the various types of feedback controllers? Explain the selection criterion for selection of a controller for a particular application. [CO2][L2,3][5]

(b) A PID Controller has

$K_p = 5, K_I = 0.7\,s^{-1}$, $K_D = 0.5s$ and $p_I(0) = 20\%$. Draw the plot of the controller output. [CO2][L4,5,6][5]

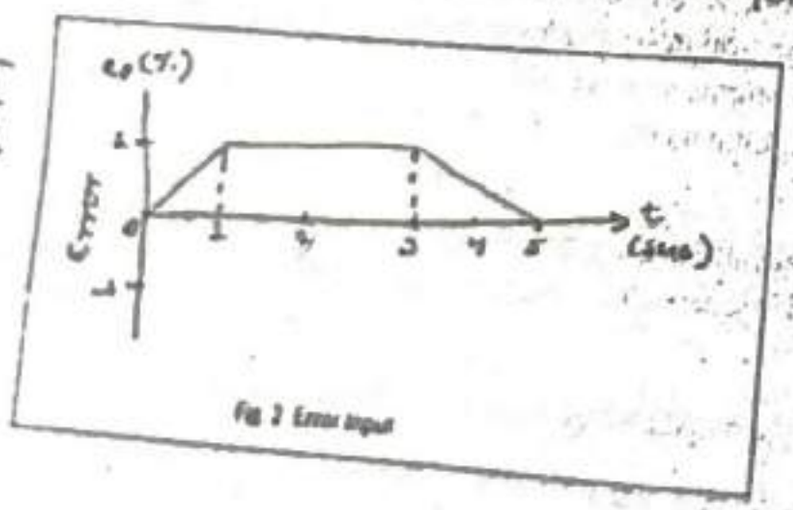


Fig 2 Error input

Q5 (a) Explain with the neat sketch the structure of a distributed control system (DCS). Discuss the functioning of its various parts. [CO3][L1,2][5]

(b) Write a short note on any two of the following

(i) OSI Model and DOD Model

(ii) Medium Access Protocol

(iii) IEEE 802

(iv) Hart Protocol [CO3][L1,2][5]

Q6 (a) What is an expert system? What is the structure of an expert system? With illustrative example, explain the use of expert control system for process control applications. [CO5][L2,3][5]

(b) Discuss about the different adaptive control techniques that are applied in industrial processes. [CO5][L1,2][5]

Q7 (a) Design a PID controller using op-amps showing the output at each op-amp and total output of the controller. [CO2][L2,3][5]

(b) A temperature control system inputs the controlled variable as arrange from 0 to 4 V. The output is a heater requiring 0 to 8 V. A PID is to be used with $K_p = 2.4\frac{\%}{\%}$, $K_I = 9\%/(\% - min)$, $K_D = 0.7\%/(\%/\text{min})$. The period of the fastest expected change is estimated to be 8s. Develop a PID circuit. [CO2] [L4,5,6] [5]

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EIGHTH SEMESTER

B.Tech.[EE]

END-SEMESTER EXAMINATION

(May-2025)

EE-446 DATA COMMUNICATION & COMPUTER NETWORKS

Time: 03 Hours

Max. Marks:50

[redacted]

Q1. a) A digitized voice channel, is made by digitizing a 10kHz bandwidth analog voice signal. We need to sample the signal at twice the highest frequency. We assume that each sample requires 8 bits. What is the required bit rate? [2] CO1 [BTL1]

b) We need to send 64 kbps over a noiseless channel with a bandwidth of 20 kHz. How many signal levels do we need? [2] CO2 [BTL1]

c) Compare and contrast a circuit-switched network and a packet-switched network. [2] CO2 [BTL2]

d) How does a single-bit error differ from a burst error? [2] CO3 [BTL2]

e) The address 43:7B:6C:DE:10:00 has been shown as the source address in an Ethernet frame. The receiver has discarded the frame. Why? [2] CO3 [BTL2]

Q2. Draw the graph of the NRZ-L scheme using each of the following data streams, assuming that the last signal level has been positive: a) 1110101 b)0100010 [10] CO2 [BTL2]

Q3. Five equal-size datagrams belonging to the same message leave for the destination one after another. However, they travel through different paths as shown in Table 1. [10] CO4 [BTL4]

Datagram	Path Length	Visited Switches
1	3200Km	1,3,5
2	11,700 Km	1,2,5
3	12,200 Km	1,2,3,5
4	10,200 Km	1,4,5
5	10,700 Km	1,4,3,5

Table 1

Assume that the delay for each switch (including waiting and processing) is 3, 10, 20, 7, and 20 ms respectively. Assuming that the propagation speed is 2 x 108 m, find the order the datagrams arrive at the destination and the delay for each. Ignore any other delays in transmission.

Q4. Let the message be the four element vector: n= [D7, D6, D5, D3]. The Hamming codeword $C(7,4)$ is generated using the four input bits n and modulus 2 arithmetic is assumed. The generated 7 bit codeword is represented as C = [D7, D6, D5, P4, D3, P2, P1], where the parity bits P1, P2, P3 and P4 are generated using the modulo 2 arithmetic and the syndrome S0, S1, S2 at the receiver is calculated as follows: [10] CO4 [BTL3]

P1= D7+D5+D3	S0 = D7 + D6 + D5 + P4
P2= D7+D6+D3	S1= D7 + D6 + D3 + P2
P3 =D7+D6+D5	S2 = D7 + D5 + + P1

a) Generate the Hamming code for the data words
b) Generate the table for the syndrome and the logical decision based on the syndrome value.

Q5 Compare and contrast Stop-and-Wait Automatic Repeat Request with Go-Back-N Automatic Repeat Request. [10] CO3 CO4 [BTL2]

Q6. Write short-notes on any two:

a) Network Layer Addressing
b) Switched Networks
c) Network Topology
d) Cyclic Codes

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Total no. of Pages:2 Roll no.....

VI/ VIII SEMESTER B.Tech.

END TERM EXAMINATION ***May-2025***

EE450 : Cloud Computing Fundamentals

Time: 03:00 Hours *Max. Marks: 50*

Note : All questions carry equal marks.
Answer any five questions.
Assume suitable missing data, if any.

Q.1 (a) Define the coefficient of variation and explain its significance in evaluating workload smoothness. Using CPU utilization as the context, analyze how positive and negative correlations between job workloads affect system smoothness. Rank the correlation types in order of efficiency and justify your answer with appropriate reasoning. [5M] [CO1] [BTL5]

(b) The storage demand as a function of time is expressed as:

$$S(t) = (60 \times (3 - e^{-0.01t})) + 70$$

Where t is measured in time units and S(t) is the storage required in terabytes (TB) at time t. The on-premise storage cost per TB is ₹120, and the cloud storage cost per TB is ₹280. In this situation, determine whether cloud storage is more cost-effective than on-premise storage for a period of 200 time units. The peak storage demand for the organization occurs at t=200. [5M] [CO3] [BTL3]

Q.2 (a) Mention the essential characteristics of cloud, deployment models in cloud, and service models in cloud as per the National Institute of Standards and Technology. [5M] [CO1] [BTL1]

(b) What is a packet in computer networks? Describe the various components of a network packet. [5M] [CO2] [BTL2]

Q.3 (a) Describe the read and write operations in block storage by mentioning their key parameters and their meanings. Also, mention any two common use cases of block storage. [5M] [CO3] [BTL2]

(b) Draw the architecture of a virtual machine manager (VMM) and explain the roles of its internal components. [5M] [CO4] [BTL4]

Q.4 (a) Give the other names of type-I and type-II hypervisors. Explain how virtualization supports both the combining and splitting of computing resources. Provide one real-world use case for each. [5M] [CO4] [BTL3]

(b) Provide the full forms of DHCP, SOA, REST, and SOAP. Differentiate REST and SOAP based on any two categories. [2+3M] [CO5] [BTL3]

Q.5 (a) What does a monitoring dashboard track? [1M] [CO5] [BTL1]

(b) Explain the two main methods by which IAM users can access AWS services: Console Login and Programmatic Access. [4M] [CO5] [BTL2]

(b) Consider yourself as a cloud security engineer responsible for writing an IAM policy that grants an application access to objects stored in a specific Amazon S3 bucket named project. The application should be able to perform all object-level operations (such as upload, download, and delete) on objects inside the bucket, but must not be allowed to list the bucket or perform any bucket-level actions. Create a valid IAM policy in JSON format using the version "2012-10-17" that fulfils these requirements. [5M] [CO5] [BTL2]

Q.6 Describe any five of the following:

a. RFC 1918
b. Bonding in Network Interface Card and its purpose
c. Object storage Tiers
d. Para Virtualization
e. Network Attached Storage
f. Content Delivery Networks

[5X2M] [CO2, CO3, CO4] [BTL2]

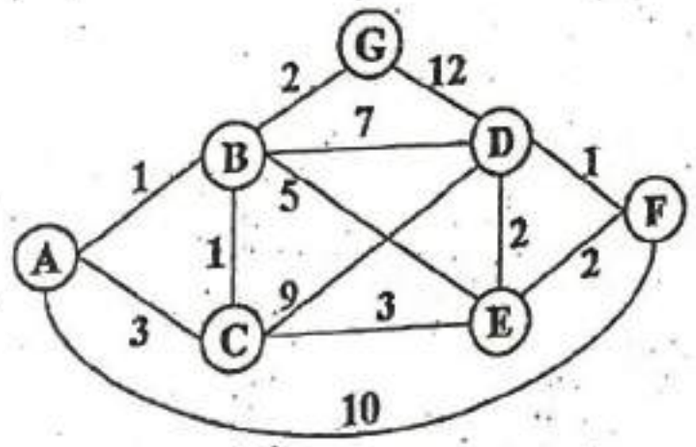

Figure 6

[4 M] [CO6] [BTL 3]

*** END ***

Total no. of Pages: 04 Roll no.

II SEMESTER

END TERM EXAMINATION ***May-2025***

EC 102: DATA STRUCTURES AND ALGORITHMS

Time: 3:00 Hours *Max. Marks: 40*

Note: All questions are compulsory.
Assume suitable missing data, if any.

Q.1 (a) Given the cost matrix between 4 cities (1,2,3,4). Calculate the minimum travelling cost from and back to city 1 for a travelling salesman.

	1	2	3	4
1	0	10	15	20
2	10	0	15	25
3	15	15	0	30
4	20	25	30	0

[4 M] [CO5] [BTL 3]

(b) Show how the depth first search works on the graph given in Figure 1 with vertex q as the source (starting vertex). Which vertex should be the source if the entire graph is to be spanned?

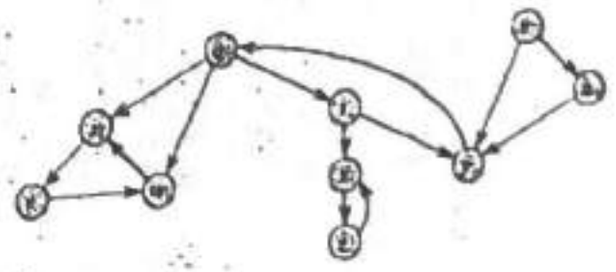

Figure 1

[4 M] [CO6] [BTL 3]

Q.2 (a) Write pseudocode to delete a node from a Binary Search Tree. Delete node 30 from the BST given in Figure 2.

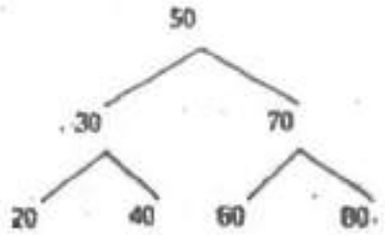

Figure 2

[4 M] [CO5] [BTL 3]

(b) Modify merge sort to sort an array in descending order. e.g. for the input array `[3, 1, 8, 2]`, your algorithm should output `[8, 3, 2, 1]`. Give clear pseudo-code for all functions.

[4 M] [CO4] [BTL 6]

Q.3 (a) Consider the following recurrence relation:

$$T(n) = 2T(n/2) + n$$

i. Use a recursion tree to determine a good asymptotic upper bound on the given recurrence relation.

ii. Use the Master theorem to verify the answer obtained in part (i).

[4M] [CO3] [BTL 2]

(b) Suppose array A contains the following elements:

10, 12, 14, 21, 23, 28, 31, 37, 42, 44, 49, 53

Show step by step analysis to search 44 and 36 from the given array using binary search.

[4M] [CO1] [BTL 2]

Q.4 (a) Write the time complexity for the following functions for both array and singly linked lists.

i. `insert_at(index, val)`: inserts value `val` at `index`.

ii. `get_at(index)`: Returns value at `index`.

iii. `set_at(index, val)`: sets the value at `index` to `val`.

iv. `delete_first()`: deletes the entry at index 0 so that item at index i is now at index i-1 for all i.

In what kind of applications would you prefer Arrays over Singly Linked lists and vice versa?

[4 M] [CO3] [BTL 5]

(b) Consider the tree given in Figure 4.

i. Traverse the tree in-order.

ii. Traverse the tree in pre-order.

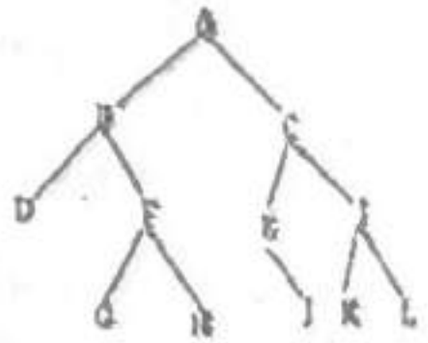

Figure 4

[4 M] [CO3] [BTL 3]

Q5 (a) Apply Kruskal's algorithm to find a Minimum Spanning Tree to the graph shown in Figure 5:

Vertices = {A, B, C, D}

Edges = {(A-B), (B-C), (C-D), (D-A), (B-D)}

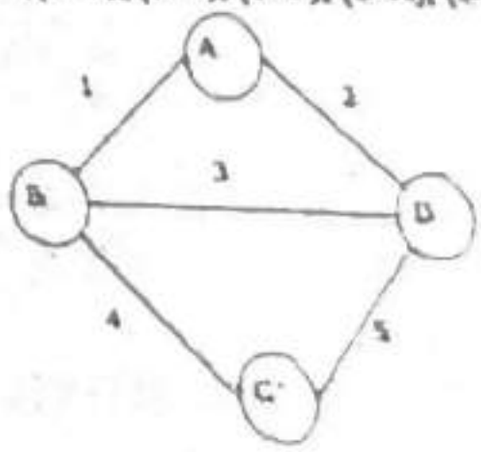

Figure 5

[4 M] [CO6] [BTL 3]

(b) Consider the graph given in Figure 6. Determine the shorte path from vertex A to vertex E using Dijkstra's algorithm. Wha

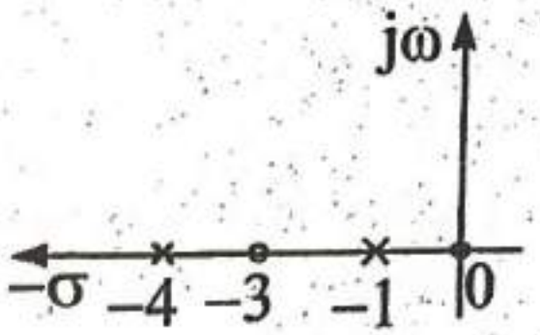

Fig. 5

6 Discuss the properties of LC immittance function. The input impedance for the network shown in Fig.6 is [10][CO5] [BTL2], [BTL5]

$$Z_{in}(s) = \frac{s^3 + 2s}{3s^4 + 2s^3 + 12s^2 + 4s + 9}$$

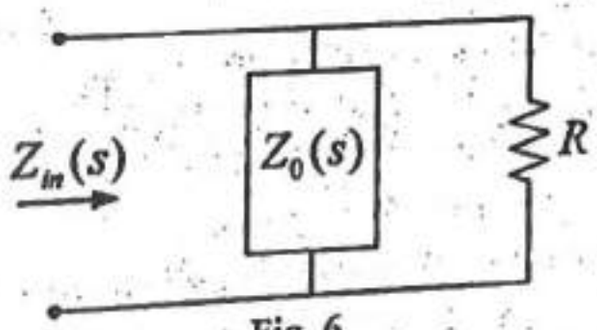

Fig. 6

If $Z_0(s)$ is LC network: (a) Find the value of R and the expression for $Z_0(s)$ (b) Synthesize $Z_0(s)$ as Foster parallel network and a Second Cauer network.

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Total No. of Pages 04 Roll No. __
SECOND SEMESTER B.TECH(EC)
END SEMESTER EXAMINATION MAY, 2025

EC104 Network Analysis & Synthesis

Time: 3Hours *Max. Marks: 50*

Note: Answer **ANY FIVE** questions. Any required data not explicitly given, may be suitably assumed. **Use the answer sheet space judiciously.** Symbols have their usual meanings.

1[a] Describe the complete response. Determine and analyze the type of response for v(t) and i(t) for all value of t in the circuit of Fig.1(a). [6][[CO1], [CO2], [CO3] [BTL2], [BTL3], [BTL4]

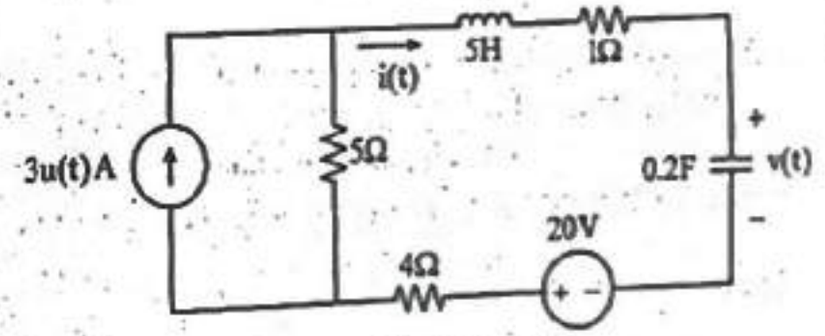

Fig.1(a)

1[b] Determine $i_1(t)$ and $i_L(t)$ for all value of t in the circuit of Fig.1(b). [4][CO1], [CO2], [CO3] [BTL3]

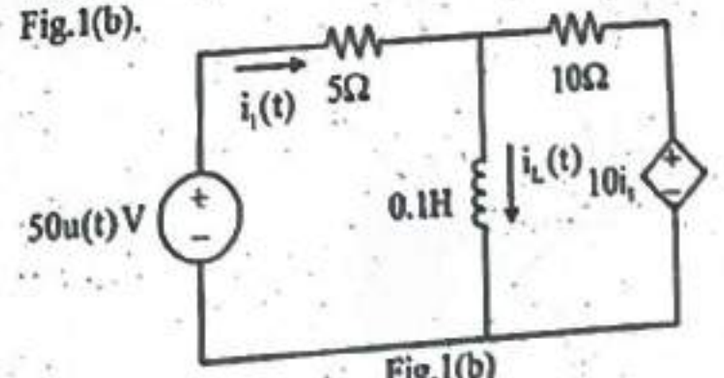

Fig.1(b)

2[a] In the circuit of Fig.2(a) switch has been closed for a long time and at t=0 it is opened. Determine and analyze the type of response for $i_L(t)$ and $i_C(t)$ for all value of t for this circuit. [6][CO1], [CO2], [CO3] [BTL3], [BTL4]

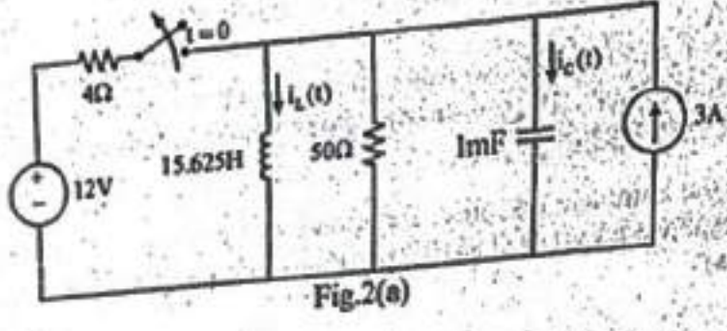

Fig.2(a)

2[b] Design and draw a RLC band pass filter with lower cutoff frequency of 1KHz and band width of 3KHz.What is the center frequency and quality factor of this filter? (Assume L=10mH) [4][CO1], [CO2] [BTL5]

3[a] Explain the open-circuit parameter for a two port Network. Networks a and b are connected as shown in the Fig.3(a). [6] [CO4] [BTL2], [BTL3]

Determine $\frac{V_o}{V_s}$. Where

$$[y_a]=\begin{bmatrix} 2mS & 0S \\ 0S & 10mS \end{bmatrix} and [h_b]=\begin{bmatrix} 0\Omega & 1 \\ -1 & 10mS \end{bmatrix}$$

{Hint: S is ℧ (mho), i.e. inverse of Ω (ohm)}

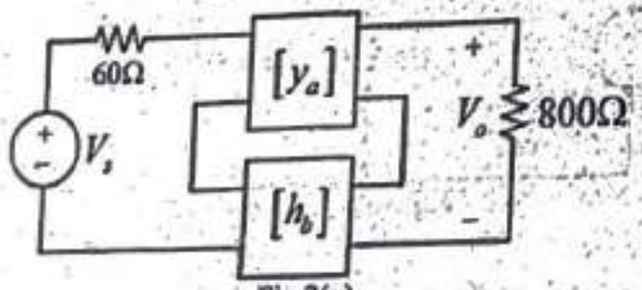

Fig.3(a)

3[b] Determine the ABCD (transmission parameter) for the network shown in Fig.3(b). [4] [CO4] [BTL3]

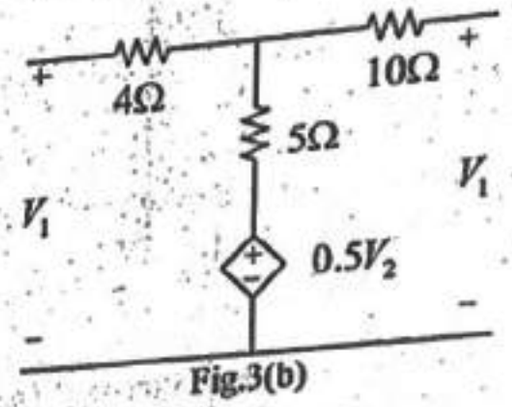

Fig.3(b)

4[a] Describe the properties of positive real function. Determine whether the given admittance function Z(s) is positive real. [5][CO5] [BTL2], [BTL3]

$$Z(s)=\frac{s^2+\frac{6}{5}s+\frac{6}{5}}{s^2+s+5}$$

4[b] Describe the properties of Hurwitz polynomial. Determine whether given polynomial is Hurwitz. [5][CO5] [BTL2], [BTL3]

$$P(s)=s^7+3s^6+3s^5+2s^4+s^3+3s^2+3s+2$$

5 Discuss the properties of RC impedance function. An impedance function has the pole-zero pattern shown in Fig.5. If Z(–2) = 2, find Z(s) and synthesize this in Foster's first form and Cauer's first form of realization. [10][CO5] [BTL2], [BTL5]

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SECOND SEMESTER

B.TECH.(EC)

END SEMESTER EXAMINATION

MAY, 2025

EC104 Network Analysis & Synthesis

Time: 3Hours

Max. Marks: 50

Note: Answer **ANY FIVE** questions. Any required data not explicitly given, may be suitably assumed. **Use the answer sheet space judiciously.** Symbols have their usual meanings.

1[a] Describe the complete response. Determine and analyze the type of response for v(t) and i(t) for all value of t in the circuit of Fig.1(a). [6][[CO1], [CO2], [CO3] [BTL2], [BTL3], [BTL4]

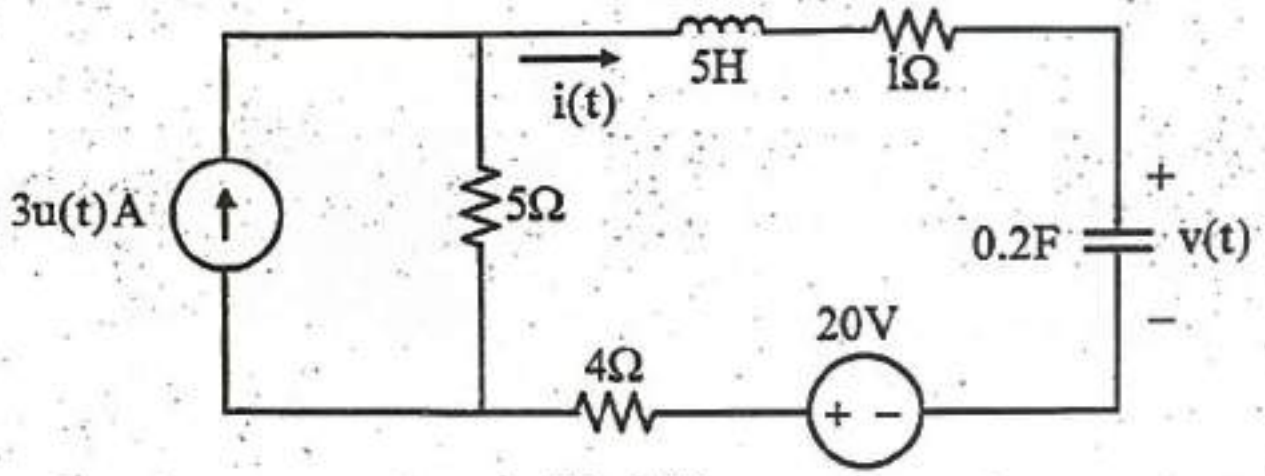

Fig.1(a)

1[b] Determine $i_1(t)$ and $i_L(t)$ for all value of t in the circuit of Fig.1(b). [4][CO1], [CO2], [CO3] [BTL3]

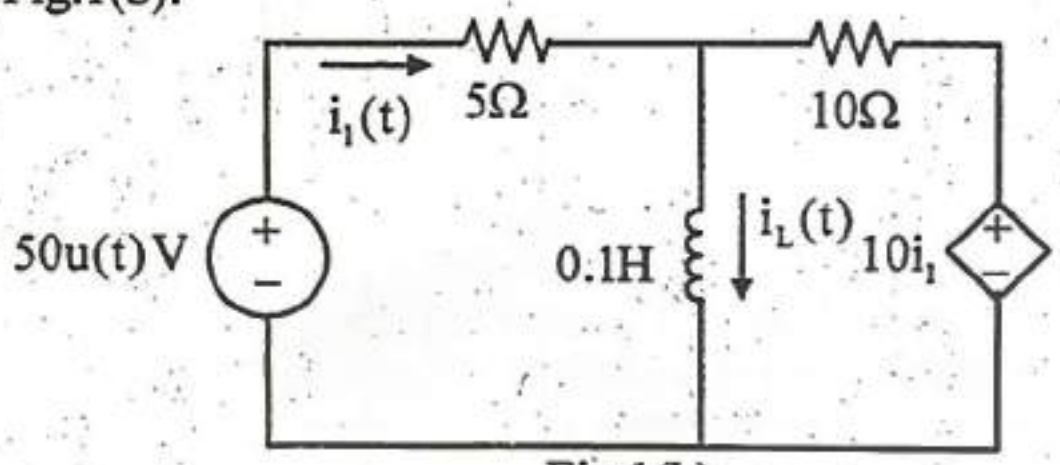

Fig.1(b)

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2[a] In the circuit of Fig.2(a) switch has been closed for a long time and at t=0 it is opened. Determine and analyze the type of response for $i_L(t)$ and $i_C(t)$ for all value of t for this circuit. [6][CO1], [CO2], [CO3] [BTL3], [BTL4]

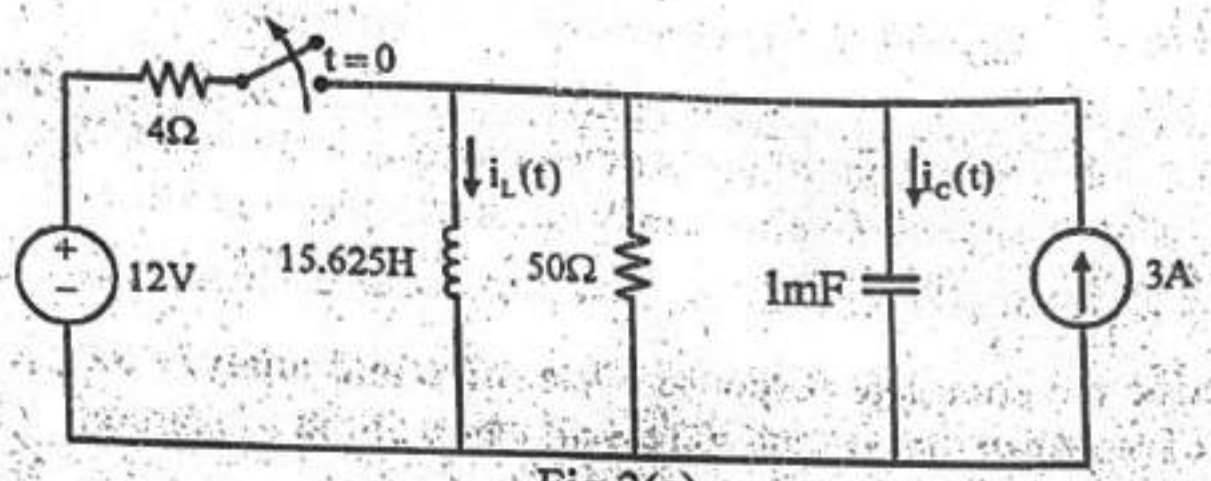

Fig.2(a)

2[b] Design and draw a RLC band pass filter with lower cutoff frequency of 1KHz and band width of 3KHz. What is the center frequency and quality factor of this filter? (Assume L=10mH) [4][CO1], [CO2] [BTL5]

3[a] Explain the open-circuit parameter for a two port Network. [6] [CO4] [BTL2], [BTL3]

Networks a and b are connected as shown in the Fig.3(a). Determine $\frac{V_o}{V_s}$. Where

$$[y_a]=\begin{bmatrix} 2mS & 0S \\ 0S & 10mS \end{bmatrix} and [h_b]=\begin{bmatrix} 0\Omega & 1 \\ -1 & 10mS \end{bmatrix}$$

{Hint: S is ℧ (mho), i.e. inverse of Ω (ohm)}

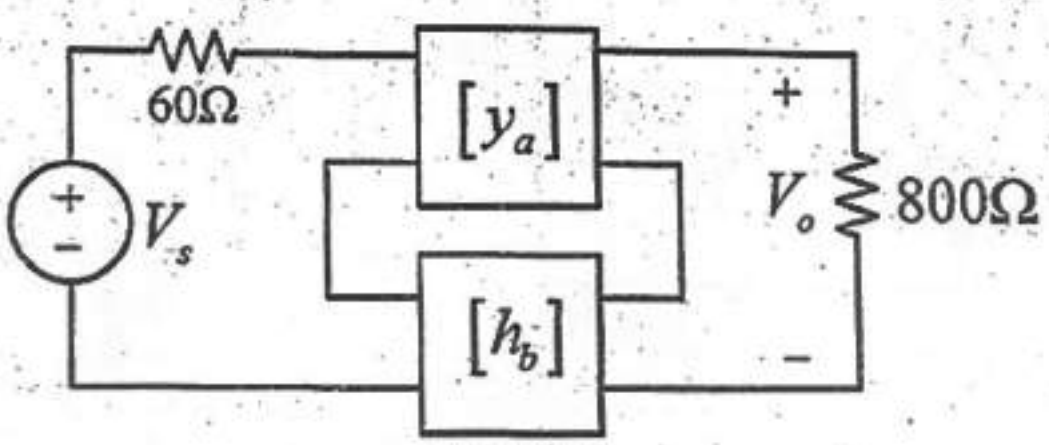

Fig.3(a)

225

3[b] Determine the ABCD (transmission parameter) for the network shown in Fig.3(b). [4] [CO4] [BTL3]

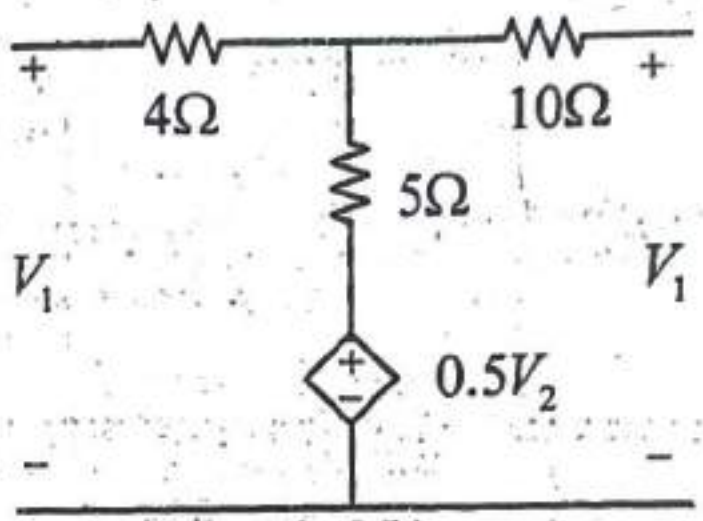

Fig.3(b)

4[a] Describe the properties of positive real function. Determine whether the given admittance function Z(s) is positive real. [5][CO5] [BTL2], [BTL3]

$$Z(s) = \frac{s^2 + \frac{6}{5}s + \frac{6}{5}}{s^2 + s + 5}$$

4[b] Describe the properties of Hurwitz polynomial. Determine whether given polynomial is Hurwitz. [5][CO5] [BTL2], [BTL3]

$$P(s) = s^7 + 3s^6 + 3s^5 + 2s^4 + s^3 + 3s^2 + 3s + 2$$

5 Discuss the properties of RC impedance function. An impedance function has the pole-zero pattern shown in Fig.5. If $Z(-2) = 2$, find Z(s) and synthesize this in Foster's first form and Cauer's first form of realization. [10][CO5] [BTL2], [BTL5]

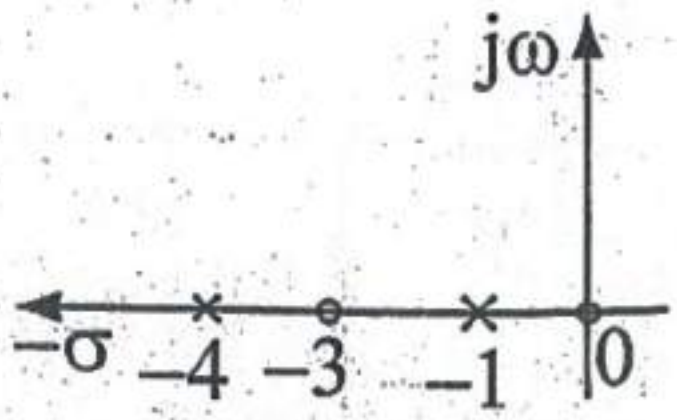

Fig. 5

6 Discuss the properties of LC immittance function. The input impedance for the network shown in Fig.6 is [10][CO5] [BTL2], [BTL5]

$$Z_{in}(s)=\frac{s^3+2s}{3s^4+2s^3+12s^2+4s+9}$$

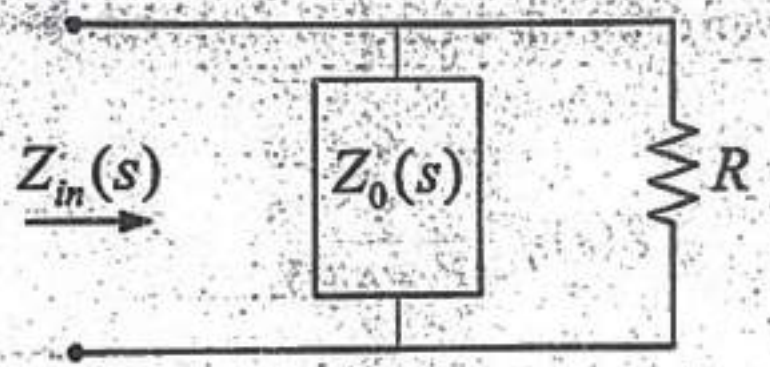

Fig. 6

If $Z_0(s)$ is LC network: (a) Find the value of R and the expression for $Z_0(s)$ (b) Synthesize $Z_0(s)$ as Foster parallel network and a Second Cauer network.

-END-

Total no. of Pages: 02 Roll no.....

IV SEMESTER

B.Tech (Electronics & Communication Engineering)

END TERM EXAMINATION ***MAY-2025***

EC202n / EE262 ELECTROMAGNETICS

Time: 3:00 Hours ***Max. Marks: 50***

Note: Attempt any five questions.
Assume suitable missing data, if any.

Q.1[a] Find a unit vector, which is normal to a surface given by $xy^2 + 3xz^2 = 0$ at point P(1,-3, 2). [3][CO1] [L5]

[b] Prove that the divergence of the curl of any vector field is zero. [3][CO1][L3]

[c] Derive the Helmholtz equation for electric field & magnetic field from the Maxwell's equation. [4][CO1][L2]

Q.2[a] The conductivity of sea water $\sigma = 5$ S/m and $\varepsilon_r = 100$. What is the range of EM wave (distance travel by EM wave) 'corresponds to 99% attenuation at 20 KHz and 50 MHz. [4][CO2][L5]

[b] What is Brewster's angle? Derive formula for Brewster's angle in case of perpendicular and parallel polarised oblique incidence. [3][CO2][L3]

[c] In free space ($x \leq 0$), a plane wave with $\mathbf{E} = 5\ \mathrm{Cos}\ (10^8\, t - \beta x)\ a_y$ V/m is incident normally on a lossless medium ($\varepsilon_{r1} = 2$, $\mu_{r1} = 5$) in region $x \geq 0$. Determine magnetic field components of transmitted and reflected wave. [3][CO2][L5]

Q.3[a] In a Non-magnetic medium, $E = 5\sin(2\pi \times 10^7 t - 0.5x)\,\widehat{a_z}\ V/m$. Calculate the average power carried by the wave and total power passing through 20 cm^2 area of plane $x + 2y = 10$. [5][CO3] [L6]

[b] Calculate power of transmitted and reflected wave if wave transmitted from free space (first medium) to second medium ($\varepsilon_{r2} = 2$, $\mu_{r2} = 5$ and $\sigma = 0$) with normal incidence and electric field in first medium is $\mathbf{E} = 10\ \mathrm{Sin}\ (10\pi \times 10^6\, t - \beta x)\ a_z$ V/m. [5][CO3][L5]

Q.4[a] Prove that distance between consecutive current maxima and current minima is $\lambda/4$ for open circuit transmission line. [4][CO4][L3]

[b] Calculate VSWR of lossless transmission line if L= 0.4 μH/m, C = 40 pF/m, f = 100 MHz, Length = 50 m and $Z_L = (50 + j\,100)\ \Omega$. [3][CO4] [L5]

[c] What is need of impedance matching of transmission line? Explain λ/4 impedance matching techniques with advantages and limitations. [3][CO4][L2]

Q.5[a] Prove that for rectangular waveguide wave propagation is possible only if $f \geq fc$. [4][CO5][L3]

[b] An open wire transmission line having characteristic impedance of 50 Ω is terminated by a resistive load of 20 Ω. Give arrangements for single stub and double stub matching. [6][CO4][L5]

Q.6[a] Explain the following terms related to rectangular waveguide: -

i) Dominant Mode

ii) Power losses [2 + 4][CO5][L1]

[b] Calculate the values of λ_g, V_g and Z_g for all possible modes of (3 x 2) cm rectangular waveguide for 25 GHz signal. [4][CO5][L4]

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Total no. of Pages:04

4th SEMESTER

Roll no.....

B.Tech. ECE

END TERM EXAMINATION

May-2025

COURSE CODE: EC204

Digital Design II

Time: 03:00 Hours

Max. Marks: 40

Note : All questions carry equal marks:
Attempt any 5 questions
Assume suitable missing data, if any.

Q.1[a]Using enumerated type, design a VHDL description of the following FSM. Also use attribute to perform one-hot state assignment:

[4][CO1][BTL1,2,3]

PS	NS (AB)				Z
	00	01	10	11	
INIT	A0	A0	A1	A1	0
A0	OK0	OK0	A1	A1	0
A1	A0	A0	OK1	OK1	0
OK0	OK0	OK0	OK1	A1	1
OK1	A0	OK0	OK1	OK1	1

Q.1[b] Explain the different types of delays available in VHDL. Also state their significance/applications. [4][CO1][BTL1,2,4]

Q.2[a] A sequential circuit has one input and one output. When the input sequence "110" occurs, the output becomes 1 and remains 1 until the sequence "110" occurs again, in which case the output returns to 0. The output remains 0 until "110" occurs a third time, etc Develop a mealy FSM for the circuit. [2][CO2][BTL3,4,6]

Q.2[b]Minimize the following incompletely specified state table using the merger table method. Also, draw its compatibility graph showing a closed covering.

[6][CO3][BTL1,2,3,4]

PS	NS, Z			
	I1	I2	I3	I4
A	-	A,1	E,1	B,1
B	E,0	-	-	-
C	F,0	F,1	-	-
D	-	-	B,1	-
E	-	F,0	C,0	D,1
F	A,0	-	B,0	A,1

Q.3 Explain the difference between critical and non-critical race with the help of an example. An asynchronous sequential circuit has two inputs (a and b) and two state variables x and y, where the next state variables are given by:

X= a'b +by'+x

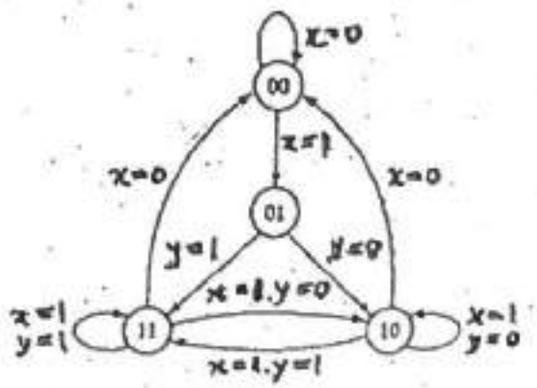
Y=ab+by+y'a'b'+a'b'x'

[a] Find all the races in this circuit and indicate those that are critical and those that are not.

[b] Find another assignment that contains no critical races.

[c] Are there any possibilities of hazards in this circuit? Suggest a solution to avoid those hazards. [8][CO4][BTL1,2,3,4]

Q4[a] Design the control using multiplexers whose state diagram is given Below- [4][CO5][BTL1,2,3,4,6]



[4][CO5][BTL1,2,3,4,6]

Q.4[b] An asynchronous sequential circuit with two inputs, x1 and x2, and one output, z. The initial input state is x1=x2=0. The output value is to be 1 if and only if the input state is x1=x2=1 and the preceding input state is x1=0,x2=1. Design the primitive flow table for the circuit.

[4][CO3][BTL,2,3,6]

Control Input	Present State	Next State
0	1000	1000
0	0100	0100
0	0010	0010
0	0001	0001
1	1000	0100
1	0100	0010
1	0010	0001
1	0001	1000

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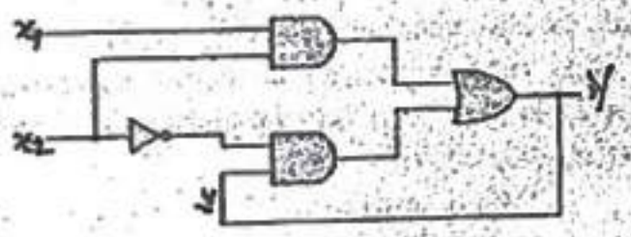
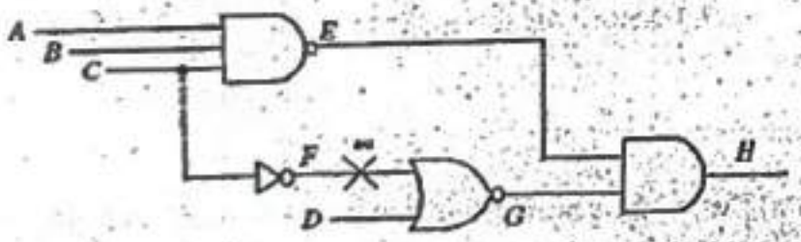
Q.5[a] Redesign the circuit given below using an SR latch. What advantage does one get in redesigning this circuit using an SR latch?

[4][CO3][BTL,2,3,4,5,6]



Q.5[b]Determine all the test vectors to detect a stuck-at-1 fault on line F in the Figure below. [4][CO4][BTL 2, 3,4]



Q.6[a]Implement the following Boolean function on PLA, PAL (4- input OR gate) and ROM (of suitable size): [4][CO5][BTL1,2,3,4,]

F (A, B, C) = π (0,3,6,7).

Q.6[b] Develop a state diagram and an ASM chart for a 4-bit rotate right shift register as shown in the Table below. Consider that the initial value is 1000

Total no. of Pages: 03 Roll no.....

3rd SEMESTER

B.Tech (ECE)

END TERM EXAMINATION ***May-2025***

EC 206 Communication Systems

Time: 03:00 Hours *Max. Marks: 40*

Note: All questions carry equal marks.
Assume suitable missing data, if any.

ATTEMPT ANY 4 QUESTIONS

Q.1 a) An AM signal contains 500W at its carrier frequency and 100W in each of its sidebands. [3] [CO1] [L3]

a) Determine the percentage modulation of the AM signal

b) Determine the power allocation (Carrier and Sidebands) if percentage modulation change to 60%.

b) Define modulation and explain its need in communication systems. [2] [CO1] [L1]

c) Explain the working of a balanced modulator. Draw its block diagram and discuss how it is used to generate a DSB-SC signal. Also, describe what happens if there is a phase mismatch during demodulation. [5] [CO2] [LT 2]

Q.2 a) Explain the Sampling Theorem with a detailed proof using frequency domain analysis. [2] [CO3] [L2]

b) Draw the block diagram of a Pulse Code Modulation (PCM) system and compare it with a Differential Pulse Code Modulation (DPCM) system. [3] [CO3] [L2]

c) An FM signal is given by [5] [CO2] [L 3]

$$s(t) = 5cos(4\pi * 10^6 t + 4sin(10\pi * 10^3 t))$$

Determine:

a) Maximum Phase deviation and Maximum frequency deviation
b) Modulation index
c) Bandwidth of signal
d) Transmitted power
e) Modulation index if message signal frequency is tripled.

Q.3 a) Draw the block diagram of an FM receiver in the presence of white Gaussian noise. Derive the Figure of Merit (FOM) for a single-tone modulated FM system. Compare the Figure of Merit of the FM system with that of a fully modulated AM system [5] [CO5] [L4]

b) Explain the modulation and demodulation processes of Pulse Width Modulation (PWM). How does it differ from Pulse Amplitude Modulation (PAM)? [3] [CO3] [L2]

b) Explain the different types of noise encountered in digital communication systems. How do these noises affect the performance of a communication system. [2] [CO4] [L1]

Q.4 a) Draw the block diagram of transmitter and receiver of Adaptive Delta Modulation. [3] [CO3] [L3]

b) Define slope overload noise and granular noise. [2] [CO3] [L1]

c) For a sinusoidal signal $y(t) = A_c \cos(\omega_m t)$ applied to delta modulator with a step size 'δ' and sampling interval 'T_s'. Show that slope overload distortion can be avoided if: [2] [CO3] [L3]

$$A_c > \frac{\delta}{\omega_m T_s}$$

d) Explain the direct method of generating an FM signal. How does it differ from the indirect method. [3] [CO2] [L2]

a) A message signal of $5\cos(4\pi \cdot 10^3 t)$ is transmitted through a 32 level PCM system having sampling rate four times Nyquist rate, calculate the following: [5] [CO4] [L4]

Q.5

i. Sampling rate
ii. Step size of each quantization levels
iii. Maximum quantization error
iv. Transmission bandwidth and Noise power
v. SNR (in dB)

b) For a continuous-time signal [5] [CO3] [L4]

$$x(t)=\sin(2\pi*3000t) + \sin(2\pi*7000t)$$

is to be sampled and transmitted digitally. Calculate the following

a) Minimum sampling rate required to sample this signal without aliasing.
b) Sampling interval
c) If the signal is sampled at 10,000 samples/second, will aliasing occur? Justify your answer.

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Total No. of Pages: Two *Roll No:* 232

4TH SEMESTER

B.Tech.

END TERM EXAMINATION

MAY-2025

COURSE CODE: EC206n

COURSE TITLE: DIGITAL COMMUNICATION

Time: 3:00 Hours ***Max. Marks: 40***

Note: Attempt any TEN questions. Assume suitable missing data, if any.

Q1. Distinguish between: [4][CO4][L4]

(A) BASK and BPSK

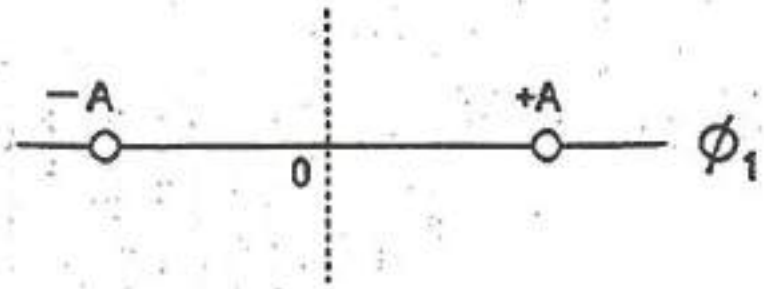
(B) Coherent BFSK reception and Non-Coherent BFSK reception

Q2. To transmit at 4.8 Kbps over a channel with 3.2 KHz bandwidth, which type of M-level PSK (BPSK, QPSK, or 8-PSK) would be most suitable? Explain why? [4][CO4][L4]

Q3. Write the properties of Matched Filter. Compute the matched filter output over $(0, T)$ to the pulse waveform: [4][CO3][L3]

$$s(t) = \begin{cases} \exp(-t) & ; \quad 0 \le t \le T \\ 0 & ; \quad otherwise \end{cases}$$

Q4. For the pair of signals shown in the constellation diagram in Fig 1. determine the expression for the probability of error in the presence of AWGN of power spectral density $N_0/2$ and zero mean using the Maximum Likelihood criterion. [4][CO3][L4]



Q5. Derive the expression of the Nyquist pulse shaping waveform function in the time domain when the raised cosine roll-off spectrum with roll-off factor, $\beta = r/4$ is given (symbol rate: r): [4][CO3][L3]

$$P_\beta(t) = \frac{1}{2\beta} rect\left(\frac{f}{2\beta}\right)$$

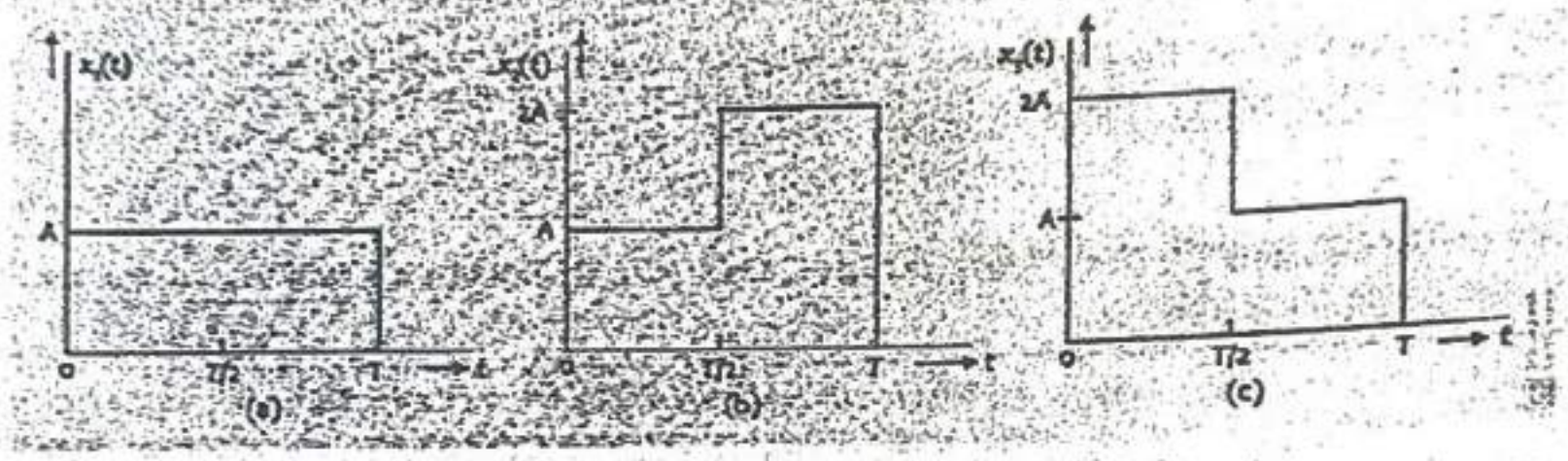
Q6. Derive the expression of the probability of error in the coherent QPSK system if the signal point $\left(-\sqrt{E/2}, +\sqrt{E/2}\right)$ is transmitted, but the noise is such that the received signal point falls outside its region in the signal space diagram. [4][CO4][L3]

Q7. Explain the idealised model of a baseband spread spectrum system transmitter and receiver. [4][CO5][L2]

Q8. Explain the "Processing Gain" concept as it applies to DSSS and discuss why FHSS does not rely on the same mechanism for its robustness. How does FHSS achieve robustness against jamming instead? [4][CO5][L2]

Q9. Derive the probability of error expression for MSK. Discuss the similarities between MSK and offset QPSK. [4][CO4][L2]

Q10. Using the Gram Schmidt orthogonalization procedure, find a set of orthonormal basis functions to represent the three signals $x_1(t)$, $x_2(t)$ and $x_3(t)$ as shown below: [4][CO2][L3]



Q11. How does the raised cosine pulse spectrum simultaneously achieve the goal of zero Inter-Symbol Interference (ISI) and allow for practical bandwidth control in digital communication systems? What is the role of the roll-off factor (α) in this process? [4][CO1][L3]

Q12. Derive the expression for probability of error for coherent BFSK. Compare BFSK and BPSK. [4][CO4][L4]

Q13. Explain the generation and detection of coherent QPSK signals. [4][CO4][L4]

Q14. Write short note on [Any TWO]: [4][CO3/5][L1]

(A) Bit error rate and Probability of error
(B) Maximum likelihood detector
(C) Pseudo-noise sequences

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Total no. of Pages:2 Roll no.....

IVth SEMESTER

B.Tech

END TERM EXAMINATION ***May-2025***

Course Code :EC208 Course Title: **COMPUTER ARCHITECTURE**

Time: 03:00 Hours *Max. Marks: 40*

Note : Attempt ANY FIVE questions.
Assume suitable missing data, if any.

Q.1(a) A processor is organized with a set of general-purpose registers, and uses a single-accumulator instruction format. Compare the following architectures:

1. Single accumulator architecture,
2. General register architecture,
3. Stack-based architecture,

in terms of instruction format complexity, execution time, and operand access. Support your answer with specific use cases and detailed analysis [4][CO1][BTL2]

(b) Explain the role of addressing modes in instruction execution. Compare and contrast at least four different addressing modes with examples, showing how each influences operand access and instruction size. Further, discuss how the choice of addressing mode affects the design of the instruction set architecture.

[4][CO5][BTL2]

Q.2(a) Write a symbolic microprogram routine for ISZ (Increment and skip if zero) instruction including microprogram for fetch and indirect routine. [3][CO1][BTL1]

b) Implement shift and add multiplication algorithm for multiplication of two numbers 11101 (multiplicand) and 10011 (multiplier). The signs are not included. Show the contents of registers E, A, Q and SC during the process of multiplication in tabular form.

[5][CO2][BTL3]

Q.3(a) Design a hardwired control unit (block diagram) consisting of IR, two decoders, a sequence counter, and logic gates. Also draw a timing diagram assuming that sequence counter is cleared to 0 at time T_3 if decoder signal D_2 is active.

D_2T_3: $SC \leftarrow 0$ [5][CO5][BTL6]

(b) Evaluate the following numerical arithmetic expression using stack operations by first writing it into reverse Polish notation.
(3+4) *[10 *(2+6) +8] [3][CO1][BTL1]

Q.4(a) Describe the role of the strobe signal in asynchronous data transfer. Draw the timing diagram for a data transfer operation between a source and destination unit using a strobe-based asynchronous protocol. [3][CO3][BTL2]

(b) Design a DMA transfer sequence for transferring a block of data from a disk to memory, including the role of the DMA controller, CPU, and memory. Provide a step-by-step explanation. Evaluate the challenges of implementing DMA in a multi-device system where multiple peripherals request simultaneous memory access. Propose a solution to manage bus contention and ensure efficient data transfer. [5][CO3][BTL5]

Q.5(a) Design the match logic circuit for the associative memory and draw the diagram also. Assume that there are m number of words each of n bits. [4][CO3][BTL6]

(b) The access time of a cache memory is 100 ns and that of main memory 1000 ns. It is estimated that 80 percent of the memory requests are for read and the remaining 20 percent for write. The hit ratio for read accesses only is 0.9. A write-through procedure is used.
i. What is the average access time of the system considering only memory read cycles?
ii. What is the average access time of the system for both read and write requests?
iii. What is the hit ratio taking into consideration the write cycles? [4][CO3][BTL5]

Q.6(a) Compare RISC and CISC architectures in terms of design philosophy, instruction format, instruction set complexity, memory access, code density and pipeline efficiency. Give one example of each. [4][CO4][BTL4]

(b) What are the advantages of pipelining. Calculate the time required to process 8 tasks using a six-segment pipeline. Draw its space-time diagram also. [4][CO4][BTL2]

factor is 0.1 V/V find the input impedance Z_{if} and the output impedance Z_{of} of the feedback amplifier. Also find the values of each impedance at a frequency of 10^3 Hz.

[3 marks] [CO2] [BL4].

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Total No. of Page: 4 *Roll No. .....*

FOURTH SEMESTER **B.Tech. (EC)**

END SEMESTER EXAMINATION *May-2025*

EC-210/EC-202 ANALOG ELECTRONICS-II

Time: 3:00 Hours *Max. Marks: 40*

Note:
Question no.1 is compulsory. Answer any *four* questions from the rest. Assume suitable missing data, if any.

Q1. (a) Analyzing the given transfer function T(s) determine the maximum possible value of 'x' for it to be the dominant pole for the transfer function given below:

$$T(s) = \frac{(s+100)(s+200)(s+400)}{(s+300)(s+500)(s+x)}$$

[2 marks] [CO1] [BL2]

(b) Which feedback configuration would you prefer to obtain very high input and output impedances in a feedback Amplifier? Justify briefly.
[2 marks] [CO2] [BL2]

(c) A sinusoidal signal $V_s = 5\sin 800t$ is applied to a class A power amplifier. The resulting current is $i_o = 4 + 8\sin 800t + 16\sin 1600t + 24\sin 2400t + 32\sin 3200t$. Calculate total harmonic distortion and % increase in power because of distortion. **[2 marks] [CO4] [BL3]**

(d) Calculate the series and parallel resonant frequencies (f_s and f_p) of a quartz crystal characterized by inductor (L) = 1H, series resistance (r) =100 Ω, series capacitance C_s = 20 pF and parallel capacitance C_p = 250 pF. **[2 marks] [CO3] [BL3]**

Q2.(a) A CD amplifier having load resistance (R_s) of 5 kΩ is biased for a transconductance (g_m) of 12.5 mS. Considering r_o =infinity. Determine the value of total input capacitance using Miller approximation if C_{gs} = 20 pF and C_{gd} = 5 pF. Comment on the effect of increasing the load resistance on total reflected input capacitance, if any.
[5 marks] [CO1] [BL3]

(b) The output power of an amplifier is 100 mW when the signal frequency is 5 KHz. The output power falls to 50 mW when the signal

frequency is increased to 25 KHz. Calculate the dB change in power and the 3dB frequency of the amplifier. **[3 marks][CO1] [BL3]**

Q3.(a) For the amplifier given in Fig.1 compute the a_1 and a_2 coefficients and hence determine the upper cut off frequency: Given that $r_\pi = 2$ kΩ, $\beta_0 = 100$, $C_\mu = 0.5$ pF and $C_\pi = 19.5$ pF. **[5 marks] [CO1] [BL4]**

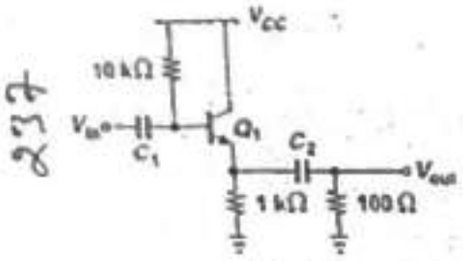

Fig.1

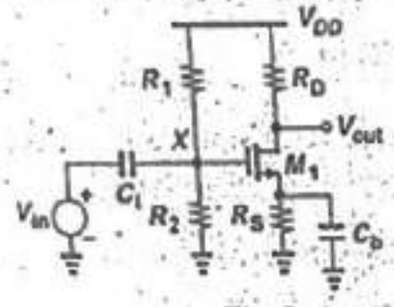

Fig. 2

(b)The amplifier shown in Fig. 2 is required to have a lower cutoff frequency of 100 Hz. Design the suitable values for the capacitors C_i and C_b if the C_b contributes 80% for f_L while C_i contributes only 20%. The amplifier components are given as $R_1 = R_2 = 50$ kΩ, $R_S = 5$ kΩ, $R_D = 2.5$ kΩ and $g_m = 1$mS. **[3 marks] [CO1] [BL4]**

Q4.(a) For the circuit shown in Fig. 3 identify the feedback topology and derive expressions for the A, R_i, R_o, A_f, R_{if} and R_{of}, where the terms have their usual meaning. **[5 marks] [CO2] [BL4]**

(b) Identify the feedback topology given in Fig.4 and derive expressions for A, A_f, R_{if}. **[3 marks] [CO2][BL4]**

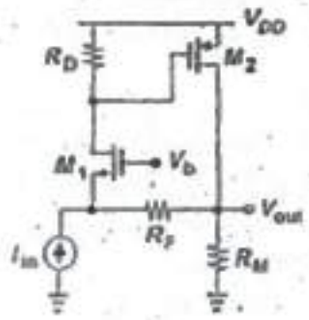

Fig.3

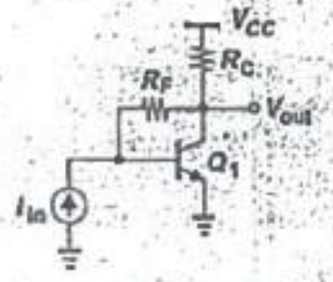

Fig.4

Q5.(a) Drawing the circuit diagram of a CE amplifier based Colpitts's oscillator derive an expression for condition of oscillation (CO) and frequency of oscillation (f_0). Determine the f_0, CO and the condition for minimum gain for sustained oscillations if L=100 μH, C_1=0.01μF and C_2 = 0.001μF. **[5 marks] [CO3] [BL4]**

(b) State the conditions under which feedback amplifier works as an oscillator. Design a BJT-based RC Phase Shift Oscillator to produce a sinusoidal output at a frequency of 10 kHz. Justify your component selection and explain how the circuit ensures positive feedback and maintains oscillation. **[3 marks] [CO3] [BL3]**

Q6.(a) A class B Push-Pull amplifier operates from ±5 V supplies. Assuming both the transistors to be ideal what will be the

(i) output voltage for maximum power conversion efficiency?

(ii) output voltage for maximum device dissipation?

(iii) smallest value of load resistance that can be tolerated if each transistor is individually rated for 1 W dissipation and amplifier is operating at full output voltage? **[5 marks] [CO4] [BL4]**

(b) Discuss briefly the cause of Harmonic distortion and Cross-over distortion in a power amplifier. **[3 marks] [CO4] [BL2]**

Q7. (a) A unity gain feedback is applied across a three stage cascaded amplifier as shown in Fig. 5 and the system results into sustained oscillation. Determine the condition of oscillation and frequency of oscillation if the transfer function A(s) of each stage is expressed as $A(s) = \frac{-A_0}{1+s/\omega_p}$. **[5 marks] [CO3] [BL4]**

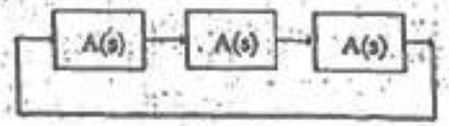

Fig. 5

(b) A series shunt feedback circuit employs a basic voltage amplifier that is represented as single pole system with DC gain of 10^4 V/V and unity gain frequency as 1 MHz. The input resistance of basic amplifier is 10 kΩ and output resistance is 1 kΩ. If the feedback

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Total No. of Pages :02

Roll no.....

4th SEMESTER (Reappear)

May-2025

B.Tech (CS/IT)

END TERM EXAMINATION

EC262: Digital Electronics

Time: 03:00 Hours

Max. Marks : 40

Note : All question are compulsory.
All questions carry equal marks.
Assume suitable missing data, if any.

Q1. Solve any two

a. Design a full adder. Draw its truth table. Calculate the propagation delay for this circuit if the delay of each gate used in above circuit is 10ns. [4M][CO1][L6]

b. Minimize $F(A,B,C,D)=\sum m(0,1,4,5,7,8,10,12,13)+\sum d(2,3,6,11)$ using Kmap. [4M][CO1][L3]

c. Implement $f(A,B,C)=\sum m(1,2,5,6)$ using 4x1 MUX [4M][CO1][L3]

Q2. Attempt any two

a. Compare the standard 4-bit ring counter with the 4-bit twisted-ring (Johnson) counter by stating the operation of each and providing neat, labeled circuit diagrams for both. [4M][CO2][L4]

b. Design a synchronous counter by T FF which counts the sequence 1—0 —4 — 6 —7 —5 —2 and repeat [4M][CO2][L6]

c. Design a one input one output overlapping sequence detector 0101 using mealy machine. What will be the output for the input sequence 1010101001. [4M][CO2][L6]

Q3. Attempt any two

a. Draw and explain the working of R-2R ladder network for DAC [4M][CO3][L2]

b. Explain the working of flash type ADC with neat diagram. [4M][CO3][L2]

c. A 8 bit SAR ADC has a resolution of 20mV. What will be its digital output for an analog input of 2.17 V. Also, calculate the conversion time if the T_{CLK} = 1 µsec. [4M][CO3][L3]

Q4. Attempt any two

a. Explain the working of Totem Pole configuration of TTL Logic Family [4M][CO4][L2]

b. Compare the TTL, ECL, CMOS logic family based on fanout, noise margin, figure of merit. [4M][CO4][L4]

c. Implement $f(A,B,C,D) = \overline{AB+CD}$ using CMOS. [4M][CO4][L3]

Q5.

a. Differentiate between Static and Dynamic RAM. [4M][CO5][L4]

b. Design a 256x8 memory using 64x8 memory. [4M][CO5][L6]

No. of pages 03

6th SEMESTER

Roll No._____

B.Tech

END TERM EXAMINATION

May-2025

COURSE CODE EC302 COURSE TITLE VLSI Design

Time: 3:00 Hours

Max. Marks: 40

Note : Q. No. 1 is questions are COMPULSORY. Attempt any FOUR questions from remaining five.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1(a) An NMOS transistor passes a strong '0' and weak '1'. Explain [2][CO3][L2]

(b) How does threshold voltage modify for short and narrow width devices? Justify. [2][CO1][L2]

(c) How does switching threshold voltage of CMOS inverter modify with (a) increasing V_{Tn} and (b) increasing V_{Tp}? [2][CO2][L3]

(d) What prevents cascading of two dynamic circuits? Suggest suitable measures to avoid it. [2][CO4][L2]

Q.2(a) An NMOS has a drain current of I_{D1} = 1mA at V_{GS1} = 1.5V and I_{D2} = 4mA at V_{GS2} = 2.5V. If the NMOS operates in the saturation region, determine (a) V_{Tn} (b) k_n (c) I_D at V_{GS} = 2V and (d) the minimum drain-to-source voltage ($V_{DS(sat)}$) for V_{GS} = 2V to operate in the saturation region. (Neglect channel length modulation) [4][CO1][L3]

(b) Design a resistive load inverter with V_{OL} = 0.2V and average power consumption of 58.5 μW. (Assume V_{DD} = 5V, V_T = 1V, k_n' = 30 μA/V²). Specifically determine the (W/L) ratio of driver transistor and the value of resistor R_L that achieve the required V_{OL} and power consumption. [4][CO2][L3]

Q.3 (a) Design a combinational circuit for $F = \overline{(A \oplus B)C + BC)}$ using static CMOS. Find out the equivalent W/L ratio of NMOS and PMOS network if all NMOS transistors have aspect ratio of 2 and all PMOS transistors have aspect ratio of 4. **[4][CO3][L3]**

(b) Analyze the circuit of Fig. 1 and obtain the Boolean function realized by it. Comment on the strength of output in terms of weak 0/1 and strong 0/1. **[4][CO3][L4]**

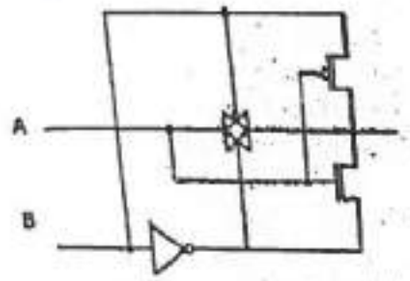

Fig. 1

Q.4 (a) Design the following Boolean functions using multiple output domino logic **[4][CO4][L3]**

F = A+B, G = (A+B).(C+D) and H = (A+B).(C+D).E

(b) A nonpipelined system performing ADD, MOD and LOG operations on an array A and B is depicted in Fig. 2. Determine the pipelined version of the circuit given in Fig. 2 and comment on improvement on clock frequency. **[4][CO5][L3]**

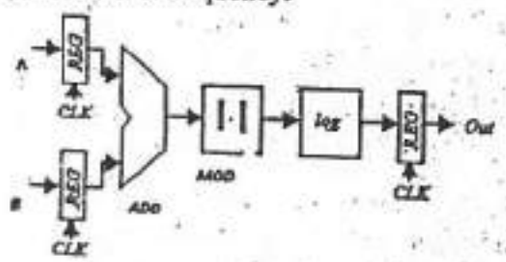

Fig. 2

Q. 5 (a) Analyze the circuit shown in Fig. 3 and answer the following (i) Is this a static or dynamic register? (ii) Is this positive edge triggered or negative edge triggered? (iii) Calculate t_{setup}, $t_{C_{to}Q}$ and t_{hold} for this register. **[4][CO5][L4]**

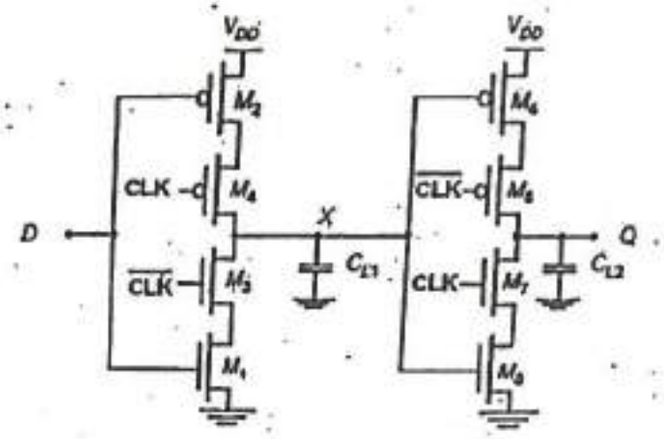

Fig. 3

(b) Analyze the circuit of Fig. 4 and compute propagation delay, setup and hold time. Can you embed the logic into the circuit? Illustrate your answer with suitable example. **[4][CO5][L4]**

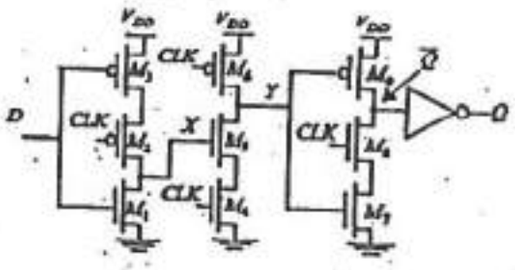

Fig. 4

Q. 6 (a) The transistors in 6T SRAM cell have to be properly sized to perform correct read and write operation. Explain. **[4][CO6][L2]**

(b) Explain VLSI design flow with help of Gajski Y chart. **[4][CO6][L2]**

Total no. of Pages:03

Roll no.....

6th SEMESTER

B.Tech.

END TERM EXAMINATION

May-2025

COURSE CODE: EC304

COURSE TITLE: Digital Signal Processing

Time: 03:00 Hours

Max. Marks: 40

Note : All questions carry equal marks.
Assume suitable missing data, if any.
Attempt any five questions

Q.1

[4 + 4 = 8M][CO3][BTL3]

(i) Consider an FIR lattice filter with coefficients $K_1 = 0.65, K_2 = -0.34, K_3 = 0.8$.

a. Find its impulse response by trancing a unit impulse through lattice structure. i.e. $A_c(z) = B_c(z) = 1$

b. Draw the equivalent direct form structure.

(ii) Convert the following pole-zero IIR filter into lattice ladder structure

$$H(z) = \frac{1 + 2z^{-1} + 2z^{-2} + 3z^{-3}}{(1 + \frac{13}{24}z^{-1} + \frac{5}{8}z^{-2} + \frac{1}{3}z^{-3})}$$

[4 + 4 = 8M] [CO4][BTL4]

Q.2

(i) Design a low pass butterworth filter using Bilinear Transformation with following specifications.

passband ripple: 1dB
passband edge: 4kHz
stopband attenuation: 40dB
stopband edge: 6kHz
sample rate: 24kHz

Also determine order of the filter

(ii) Consider the two-channel quadrature mirror filter bank as shown in Figure 1.

If the input to the filter bank x[n] is {2, 4, 6, 8}. Filter coefficient of prototype filter is $h_0(n)=\left\{\frac{1}{2},\frac{1}{2}\right\}$. Compute output in time and Z-domain at each mentioned points 1 to 9 as shown in Figure 1. Also comment on the reconstructed signal at point 9.

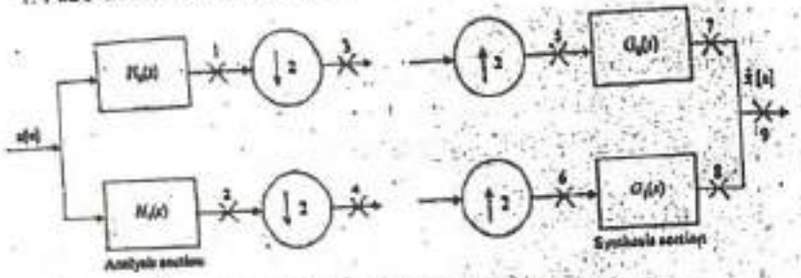

Figure 1 Two-channel quadrature mirror filter bank

Q.3 **[4 + 4 = 8M] [CO4][BTL3]**

(I) Obtain the frequency sampling structure of an FIR filter whose impulse response is given by

$$h(n)=\begin{cases}\frac{1}{32}\left[1-cos\frac{2n\pi}{32}\right], & 0\le n\le 31\\ 0, & \text{otherwise}\end{cases}$$

(ii) Compute the 8-point DFT of the given sequence $x(n)=\cos\left(\frac{n\pi}{2}\right)$ using decimation-in-time fast Fourier transform (DIT-FFT) algorithm. Also, calculate the number of computations required to perform DFT.

Q.4 **[4 + 4 = 8M] [CO5][BTL4]**

(I) The desired frequency response of high pass filter (HPF) is given by

$$H_d(e^{j\omega})=\begin{cases}e^{-j3\omega} & w_c\le|\omega|\le\pi\\ 0 & |\omega|<w_c\end{cases}$$

Design a linear-phase FIR high pass filter using Hamming window for M=7 and $w_c=2$ rad/sample.

(ii) Discuss the comparison between impulse invariant and bilinear transformation methods for infinite impulse response filter design.

Q.5 **[4 + 4 = 8M] [CO5][BTL4]**

(i) Design a digital filter using impulse invariant method from analog filter whose transfer function is given by

$$H(s)=\frac{s+0.3}{(s+0.3)^2+.16}$$

Assume T = 1 second

(ii) The transfer function of a normalised second-order low-pass Butterworth filter is given by

$$H(s)=\frac{1}{s^2+\sqrt{2}s+1}$$

Convert this filter into an equivalent (a) Low-pass filter and (b) High-pass filter with a cut-off frequency of 2 rad/s using frequency transformation

Q.6 **[4 + 4 = 8M][CO6][BTL3]**

(I) Analyze the internal architecture of the TMS320C54XX DSP. Highlight the significance of its MAC (Multiply-Accumulate) unit and how it contributes to efficient digital signal processing.

(II) Discuss the different memory types and addressing modes used in the TMS320C67XX DSP. How do these features support high-speed processing in signal processing applications?

Total No. of pages:2

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Roll No.....

VI TH SEMESTER

B.Tech (ECE)

End Semester Examination

May 2025

EC306 Embedded Systems

Time : 3 Hrs

Maximum Marks: 40

Note: Question No 1 is compulsory. Answer any 7 questions from remaining. Assume missing data if any.

1	a	What are the different interrupt sources of PIC Micro-controller	1	CO2 L1
	b	How many invisible Registers are there in ARM Micro Controller and what is its significance	1	CO3 L2
	c	What do you mean by Saturation Arithmetics and what is its significance in Signal Processing	1	CO1 L2
	d	What do you mean by SIMD instruction . Explain with Example	1	CO4 L2
	e	Explain the function of Dirty Bit in the context of Cache Memory	1	CO5 L2
2	a	Write an Assembly language for finding average of "n" numbers using PIC Micro Controller	3	CO3 L3
	b	Write an assembly language program for Initialize Timer 1 of PIC Micro-Controller for 100 ms delay	2	
		Explain the functions of following ARM instructions (i) LDR r_0,[r_1],#4 (ii) Differentiate between MOV, r1, N and MVN, r1, N (iii) Differentiate between SMULL r1,r2,r3,r4 and SMLAL r1,r2,r3,r4 (iv) TEQ r0,r9 and TST r0,r9 (v) MPY Xmem, Cmem, ACx :: MPY Ymem, Cmem, Acy	5	CO3, L4

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4		Write an ARM processor-based assembly language program to find out the lowest number from a group of "n" 16 bit numbers stored at consecutive locations.	5	CO3 L3	
5	a	Explain the working of a static RAM cell. Draw the timing diagram of a SRAM cell for write cycle and define all timing parameters	3	CO2, L2	
	b	What are the different methods for enhancing the speed of DRAM	2	CO1, L1	
6	a	Explain the main features of ARM7TDMI with the help of block diagram	3	CO4 L2	
	b	Explain significance of THUMB mode in ARM controller and its limitations	2		
7		State and explain all exceptions of ARM Micro-controller	5	CO2, L	
8	a	Enlist all specific features of a Digital signal processor. Explain the data path of a DSP with the help of a neat sketch	3	CO5	
	b	Why do we need multiple bus with different bus width in embedded systems. What are the different bus arbitration schemes used in Embedded Systems ?	2	L2	
9	a	What is the significance of MMU in ARM micro-Controller	3	CO5 L2	
	b	How does a processor protect individual process while handling multiple processes	2		

Table 5

Present State	Next State, Output	
	X=0	X=1
A	B,0	---, ---
B	C,1	D, ---
C	A,---	---, ---
D	---,---	A, ---
E	D, ---	---, ---

Q.6 (a) Consider an LFSR with characteristic polynomial $P(x) = x^{12} + x^7 + x^4 + x^3 + 1$. Determine if it is a primitive polynomial? Design a logic circuit for the Type 1 LFSR using D flip-flops and XOR gates only. Determine the first four states generated by the LFSR when it is initialized to the "seed" state 010111111010. **[6][CO#4][L2]**

(b) In Fig.2, determine the test vectors using verification testing. Show all the steps in the process. **[4][CO#4][L5]**

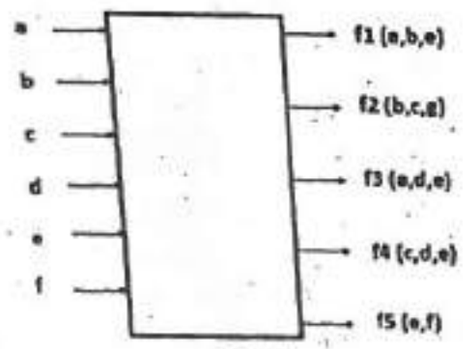

Fig.2

**********END**********

Total no. of Pages:4

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6th SEMESTER **B.Tech**

END TERM EXAMINATION *May-2025*

EC310 TESTING AND DIAGNOSIS OF DIGITAL SYSTEM DESIGN

Time: 03:00 Hours *Max. Marks: 50*

Note : All questions carry equal marks.
Attempt any **five** questions.
Assume suitable missing data, if any.

Q.1 (a) Define the following terms in not more than four lines: **i.** Self-Checking, **ii.** Fault Tolerance, **iii.** Primitive polynomial, **iv.** Design for Testability. **[4][CO#3,4,5][L1]**

(b) For the following finite state machines shown in Table 1 and Table 2, design the preset part of the checking experiment with prespecified state 'A'. **[6][CO#3] [L6]**

Table 1

Present state	Input $x=0$	Input $x=1$
A	B,0	D,0
B	A,0	B,0
C	D,1	A,0
D	D,1	C,0

Table 2

Present State	Next State, Output	
	Input x = 0	Input x =1
A	B,0	C,1
B	C,0	D,0
C	B,1	C,1
D	A,1	B,0

Q.2 (a) Use the PODEM algorithm to generate a test for the fault Y **stuck-at-0** in the circuit in Fig.1. Give your answer in the tabular decision/implication style as shown in Table 3, considering all possible combinations of inputs. Include comments to indicate the nature of each step.

[4][CO#2][L3]

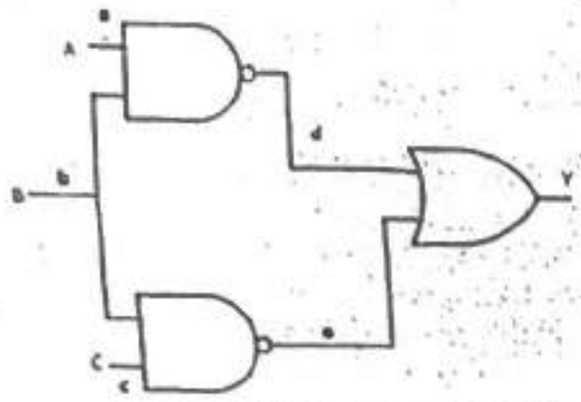


Fig.1

Table 3

Decisions	Implications	Comments

(b) Define synchronizing sequence and write the rules to draw a synchronizing tree. Based on these rules, determine the synchronizing sequence for the FSM shown in Table 4. **[6][CO#3][L1]**

Table 4

Present State	Next State, Output	
	X=0	X=1
A	B,0	D,0
B	A,0	B,0
C	D,1	A,0
D	D,1	C,0

Q.3 (a) Let 2 be the number of normal states in FSM. Let 2 be the number of protected states and α be the number of bits needed to encode the protected states. Let β be the number of extra bits needed in order to encode all the states. Derive the value of β for fault tolerant encoding of this machine? **[4][CO#5][L5]**

(b) Determine the expressions of check bits (step-by-step) to implement a self -checking circuit with four inputs x1, x2, x3, x4 and four outputs F1, F2, F3, F4.

$F1(x1,x2,x3,x4) = \sum(0,2,3,8,9,12)$

$F2(x1,x2,x3,x4) = \sum(0,4,7,14,15)$

$F3(x1,x2,x3,x4) = \sum(0,1,2,6,7,13)$

$F4(x1,x2,x3,x4) = \sum(0,1,3,4,5,6,9,12,14)$ **[6][CO#5] [L3]**

Q.4 Consider the following RAM test algorithm:{⇑(W0);⇑(R0, W1);⇓(R1, W0, R0)}. The elements are marked as M0, M1 and M2. This algorithm is used to test a large memory consisting of a total of n cells. You can assume that the initialization step correctly sets each memory cell to 0. Use the above information for parts [a-e]. **[10][CO#2][L3]**

(a) Consider a three-coupling fault in which cell content of a cell i changes when cell j is changed and cell k is 1.

i. For i= 500, j= 3000, and k= 5500, when will this fault be excited and when will it be detected?

ii. For i= 3700, j= 3000, and k= 500, Will this fault be detected and in which march element?

(b) Consider a RAM fault in which whenever the value of cell 260 is changed, the cell 200 will also change state (inversion coupling fault). Will the above fault be excited and in which march element? Will the above fault be detected and in which march element?

(c) Consider a memory fault in which whenever the content of cell 1250 is changed, the cell 5000 will also change state (inversion coupling fault). Will the above fault be excited and in which march element? Will the above fault be detected and in which march element?

(d) Will the above test be able to detect stuck at 0 fault? If yes, in which march element?

(e) Will the above test be able to detect stuck at 1 fault? If yes, in which march element?

(f) What are address decoder faults in memory?

(g) Why functional fault models are preferred for RAM testing?

Q.5 (a) Draw the architecture of Boundary scan cell and explain its modes of operation. **[4][CO#4][L2]**

(b) Machine Identification Problem: Identify the missing states in the FSM shown in Table 5 based on the input X and output Z values given:

[6] [CO#3][L5]

X	A_0^0	B_1^0	C_2^0	A_0^0																				
Z					1	0	1	0	1	0	1	0	0	1	0	1	0	0	0	1	0	0	1	0
					1	3	2	1	1	0	1	3	3	2	0	1	3	3	3	2	1	2	1	1

may be used to make an inference $C(z)$ from context $A(x)$. You must justify your derivation. The relation from a possible "pre-admission grade" (x_i) to "admission to a group of universities" (y_j) for a particular student is given by the discrete fuzzy relation:

$$P(x_i, y_j) = \begin{bmatrix} 0.4 & 0.3 & 0.1 \\ 0.5 & 0.4 & 0.2 \\ 0.6 & 0.5 & 0.4 \\ 0.8 & 0.7 & 0.5 \\ 1.0 & 0.8 & 0.6 \end{bmatrix}$$

The relation from a possible "admission to a university" (y_j) to possible "completion time" (z_k) of degree is given by the discrete relation:

$$Q(y_j, z_k) = \begin{bmatrix} 1.0 & 0.7 & 0.6 & 0.4 \\ 0.9 & 1.0 & 0.5 & 0.3 \\ 0.5 & 1.0 & 0.8 & 0.5 \end{bmatrix}$$

Determine a suitable relation $R(x_i, z_k)$ that relates possible pre-admission grade (x_i) to the possible completion time (z_k) of the degree. Use both max-min composition and max-product compositions. [5M][CO3,5][BTL5, L6]

Q.5 a) Explain briefly the role of different operators, namely reproduction, crossover and mutation, used in a Genetic Algorithm. [5M][CO4][BTL2]

b) Maximize this objective function $f(x) = x^2$ over {0,1,...,31} using genetic algorithm approach. To start with, select the initial population of size 4 (13,24,8 and 19) and 1-point crossover, bitwise mutation with chromosome flipping of 10000,00000,00000,00100 respectively. [5M][CO4][BTL3,L6]

Q.6 a) Consider two fuzzy sets:

A= [0.7/1+0.5/2+0.5/3+0.6/4]

B= [0.3/1+0.9/2+0.4/3+0.7/4]

Find i) Algebraic Sum ii) Bounded Sum iii) Bounded Difference and iv) Algebraic Product. [5M] [CO3][BTL3]

b) Explain the steady-state genetic algorithm with a flow chart. [5M][CO4][BTL2,L4]

**********END**********

Total no. of Pages:04 *Roll no.....*

SEMESTER- VI

B.Tech.

END TERM EXAMINATION *May-2025*

COURSE CODE: EC320 **COURSE TITLE: Soft Computing**

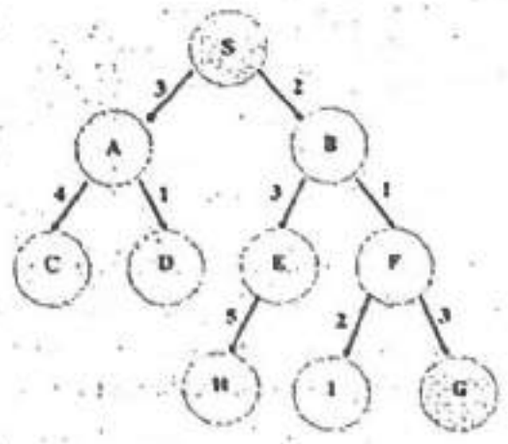
Time: 03:00 Hours ***Max. Marks: 50***

Note: Answer *any Five* questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 a) A weighted graph is illustrated along with the corresponding heuristic values for each node, as shown in Fig.1

i. Apply the Depth-First Search algorithm to the graph shown in Fig.1, beginning from the start of node *S*.

ii. Evaluate the graph to determine the traversal order using the Best-First Search algorithm, starting from node *S* and aiming to reach the goal node *G*, by utilizing the given heuristic values.



Node	*H(n)*
A	12
B	4
C	7
D	3
E	8
F	2
H	4
I	9
S	13
G	0

Fig. 1: Graph representation with edge costs and heuristic values *H(n)* for each node.

[5][CO1][BTL3, L5]

b) Represent the following statements to the knowledge-based agents using the semantic network representation technique i) Jerry is a cat

in Jerry is a mammal iii) Jerry is owned by Priya iv) Jerry is brown colored v) All mammals are animals. [5M] [CO1][BTL2]

Q.2 a) Consider the McCulloch-Pitts neural network shown in Fig. 2. All the units, except those at the input level, have the following activation function

$$f(x) = \begin{cases} 1, & \text{if } x \geq 2, \\ 0, & \text{otherwise.} \end{cases}$$

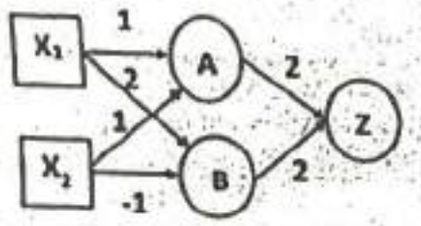


Fig. 2. A McCulloch-Pitts neural network.

What is the response of the output unit Z with respect to various input combinations? We assume the inputs are binary. What logical function does the whole network realize? [5M] [CO2][BTL4]

b) Implement logical AND-NOT and XOR with the McCulloch-Pitts neural model network. [5M] [CO2] [BTL3]

Q.3 a) The membership function of a fuzzy set *HIG*, where *HIG* stands for a high-income group, is defined as follows:

$$\mu_{inc}(i) = \begin{cases} 0, & \text{if } i \leq 3 \\ \dfrac{i-3}{3}, & \text{if } 3 \leq i \leq 6 \\ 1, & \text{if } 6 \leq i \end{cases}$$

The income i is given in lakhs of Rupees per annum. Let U = *{Joy, Jeev, Nina, Simi}* be a universe of four persons. The yearly income of *Joy, Jeev, Nina* and *Simi* are Rs. 5 lakhs, Rs. 8 lakhs, Rs. 4 lakhs, and Rs. 3.5 lakh respectively. Construct a fuzzy set *Rich* on U where the richness of a person is given by the membership value of his / her income with respect to the fuzzy set *HIG*. Compute the fuzzy cardinality of *Rich*. [5M][CO3][BTL3, L4]

b) Given a fuzzy set A defined on the universe $X = \{1,2,3,4,5\}$ with membership function

$$\mu_A(x) = \{(1,0.2), (2,0.5), (3,1.0), (4,0.5), (5,0.2)\},$$

Identify and explain the following fuzzy set properties:

i. Support of A
ii. Core of A
iii. Crossover point(S) of A
iv. Whether A is a singleton fuzzy set
v. Whether A is a normal fuzzy set

[5M] [CO3][BTL2]

Q.4 a) Consider two membership functions shown in Fig. 3. Aggregate membership function 1 and membership function 2. Find the defuzzified output after aggregation using the center of gravity method and weighted average method. [5M] [CO3,5][BTL5]

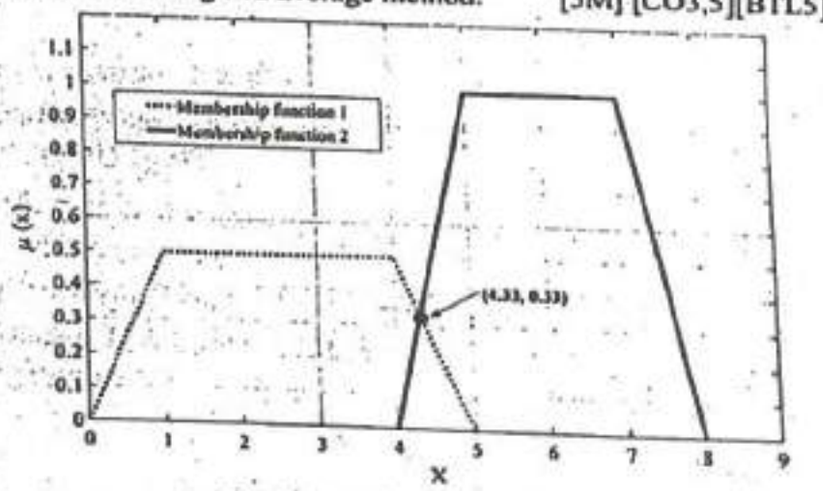


Fig.3. Membership functions

b) Suppose that a fuzzy rule base (relation) $P(x, y)$ is used to make an inference $B(y)$ from a context $A(x)$. Also, suppose that another fuzzy rule base $Q(y, z)$ is used to make an inference $C(z)$ from context $B(y)$. From this information, derive a suitable rule base $R(x, z)$ that

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VI-SEMESTER

B.Tech

END TERM EXAMINATION ***May-2025***

EC328 - SPPECH RECOGNITION

Time: 03:00 Hours *Max. Marks: 40*

Note : Attempt total six questions while Q.5 is compulsory. Assume suitable missing data, if any.

Q.1 Draw and explain Automatic Speech Recognition (ASR) system with different models. [6][CO1][BTL2]

Q.2 Analyse the speech non-stationary behaviour using discrete Fourier transform. [6][CO2][BTL4]

Q.3 Write short notes [6][CO2,3][BTL1,2]

(i) Critical Band Analysis

(ii) Speaker Recognition/Verification

(iii) Syntax and Pragmatics in ASR

Q.4 Design Mel Frequency Cepstral Coefficients (MFCC) algorithm. [6][CO3][BTL6]

Q.5 Demonstrate Log spectral distance. Evaluate the shortest distance between vectors A and B by DTW, [10][CO4][BTL3,5]

$A = [1, 3, 4, 9, 8, 2, 1, 5, 7, 3]$ & $B = [1, 6, 2, 3, 0, 9, 4, 3, 6, 3]$

Q.6 Formulate Gaussian Mixture model and design algorithm for its solution. [6][CO5][BTL6]

Q.7 Explore the role of Vector Quantization Model in ASR system. [6][CO5][BTL2]

Q.6 Attempt any two questions:

(a) Consider a (15, 5) triple error correcting BCH code with generator polynomial $g(X) = 1+X+X^2+X^4+X^5+X^8+X^{10}$. The received vector is $r(X) = X^3+X^5+X^{12}$. Using GF (2^6) and primitive polynomial $p(X) = 1+X+X^6$, determine the syndrome vectors, error locations and hence the corrected code.

[5] [CO3,4] [BTL3]

(b) Discuss RS codes and Golay Codes

[5] [CO3,4] [BTL2]

(c) Answer the following questions:

i. Consider the primitive polynomial $p(X) = 1+X+X^4$ over GF (16). Derive all the 16 elements of GF (16).

ii. Consider GF (4) with elements {0, 1, x, x+1}. Complete the following addition and multiplication tables if primitive polynomial is $p(x) = x^2 + x + 1$.

+	0	1	x	x+1
0				
1				
x				
x+1				

.	0	1	x	x+1
0				
1				
x				
x+1				

[5] [CO3,4] [BTL3]

*** END ***

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VI/VIII SEMESTER

B.Tech. [Elective]

END TERM EXAMINATION *May 2025*

EC332: INFORMATION THEORY AND CODING

Time: 03:00 Hours *Max. Marks: 50*

Note: Attempt any five questions.
Assume suitable missing data, if any.

Q.1 (a) Prove that:

$$I(X; Y) = H(X) + H(Y) - H(X, Y)$$

[3] [CO1] [BTL3]

(b) Prove that:

$$H(X, Y) \leq H(X) + H(Y)$$

[3] [CO1] [BTL3]

(c) Illustrate that the entropy H(X) of a binary memoryless source X is maximum when all the symbols are equiprobable. Also, plot the graph showing how the entropy varies with the increasing probability.

[4] [CO1] [BTL4]

Q.2 (a) Derive the channel capacity of a Binary Symmetric Channel.

[3] [CO2] [BTL3]

(b) State and prove Kraft's inequality.

[3] [CO2] [BTL2]

(c) A Discrete Memoryless Source (DMS) X has five symbols x_1, x_2, x_3, x_4 and x_5 with respective probabilities 0.3, 0.2, 0.19, 0.18 and 0.13. Construct a Shannon-Fano code for X and calculate the code efficiency and redundancy.

[4] [CO2] [BTL3]

Q.3 (a) For a (6,3) systematic linear block code, the three parity check digits c_4, c_5 and c_6 are given as:

$$c_4 = d_1 \oplus d_2 \oplus d_3$$
$$c_5 = d_1 \oplus d_2$$
$$c_6 = d_1 \oplus d_3$$

i. Construct the generator matrix for the given code. [1] [CO3] [BTL3]

ii. Construct all the codewords generated by this matrix. [2] [CO3] [BTL3]

iii. Determine the minimum weight of this code and the error correcting capability. [1] [CO3] [BTL3]

iv. Suppose the received vectors are 101100 and 101010. Decode the received word by determining the location of error and the transmitted data bits. [2] [CO3] [BTL5]

(b) The generator matrix of (7,4) linear code is given as:

$$G = \begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$$

i. Let $u = (u_0, u_1, u_2, u_3)$ be the message to be encoded and let the corresponding codeword be $v = (v_0, v_1, v_2, v_3, v_4, v_5, v_6)$. Express $(v_0, \ldots, v_6)$ in terms of $(u_0, \ldots, u_3)$. [2] [CO3] [BTL3]

ii. Determine the codeword for the input message (1101). [2] [CO3] [BTL4]

Q.4 Consider a (7,4) cyclic code generated by the generator polynomial $g(x) = 1+x+x^3$.

(a) Construct the generator matrix for the given code. [1] [CO4] [BTL3]

(b) Design the encoder circuit for the same. [2] [CO4] [BTL6]

(c) Determine the codeword for the input message (1011) using the encoder circuit. Also show the contents of each register of the circuit in each step. [2] [CO4] [BTL4]

(d) Design the decoder circuit for the same. [2] [CO4] [BTL6]

(e) Suppose the received vector is 0001010. Show the step by step analysis to determine the error syndrome using the decoder circuit and find out the correct transmitted codeword. [3] [CO4] [BTL5]

Q.5 Consider the convolutional encoder shown in Figure 1. Suppose the input message is 11010:

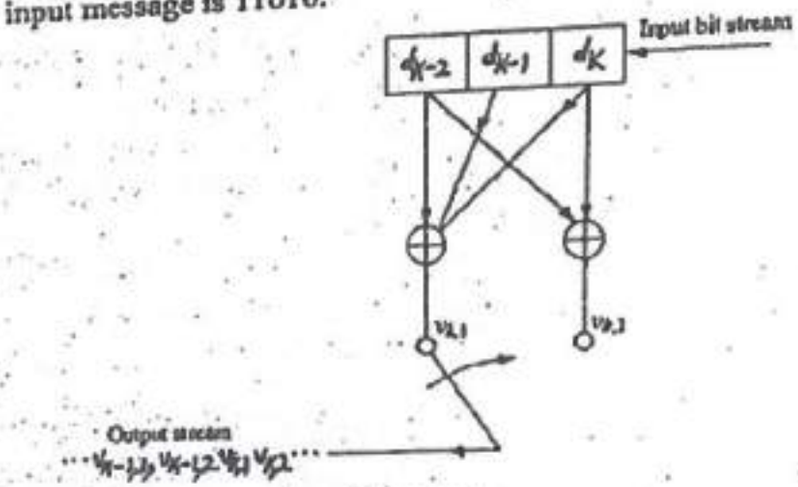

Figure 1

(a) Derive the state table for the given encoder. [2] [CO5] [BTL3]

(b) Draw the state transition diagram for the given encoder. [2] [CO5] [BTL3]

(c) Draw the tree diagram for the given encoder. [3] [CO5] [BTL3]

(d) Draw the trellis diagram for the given encoder and determine the free distance. [3] [CO5] [BTL3]

Total no. of Pages: 03 Roll no.....

6th SEMESTER

B. Tech. ECE (Elective)

END TERM EXAMINATION ***MAY-2025***

COURSE CODE: EC 342 COURSE TITLE: Machine Learning

Time: 3:00 Hours *Max. Marks: 50*

Note : Attempt any FIVE questions .
Assume suitable missing data, if any.

Q.1 a) Give two real life examples of supervised, unsupervised, and reinforcement learning by providing two distinct real-world scenarios for each approach? [3][CO5][L2]

b) Consider that you are a machine learning engineer at a medical diagnostics company. System Y is designed to detect malignant tumors from medical images. Failing to detect a malignant tumor could have severe health consequences for the patient, while incorrectly classifying a benign tumor as malignant would lead to further, potentially unnecessary, investigations. You are given the results of System Y on a sample of patient scans: Number of malignant tumors correctly identified: 85, Number of benign tumors incorrectly identified as malignant: 15, Number of malignant tumors missed by the system: 5. Calculate the precision and recall of System Y and determine which metric is more critical for evaluating the performance of this system. [4][CO5][L5]

C) Explain the "bias-variance tradeoff." Why is it often challenging to simultaneously minimize both bias and variance in a machine learning model? [3][CO1][L3]

Q.2 a) In a sports competition of a university, the management want to design a machine learning based model to select team members. The data for the previous selection of athletes is given in Table I. Use k-nearest neighbors (KNN) with k = 3, and 5 to predict whether the player with speed 6.75 and agility 3.0 will be selected or not. Use Euclidean distance.

[5][CO2][L4]

Table 1

S.No	Speed	Agility	Draft
1	2.5	4	No
2	3.75	8	No
3	7	4.25	Yes
4	4.25	3.75	No
5	7.25	3.75	Yes
6	4.5	5	No
7	5.25	9.5	Yes
8	7.5	8	Yes
9	5.5	6.75	Yes
10	4.25	3.75	No

b) You have a dataset with high dimensionality and three distinct classes. Your goal is to reduce the dimensionality of the data for visualization while preserving the separability between the classes as much as possible. Would you choose LDA or PCA? Justify your choice [2][CO3] [L4]

c) Derive the expression for simple linear discriminant function. [3][CO2][L2]

Q.3 a) Compare bagging, boosting and stacking. [3][CO3][L4]

b) Consider the data in Table 2, where the Y label is whether or not the child goes out to play. Calculate the IG (information gain) for each attribute (feature) and Choose which feature to split with? [4][CO2][L3]

Table 2

# ex.	Weather	Parents	Cash	Exam	Decision
1	sunny	visit	rich	yes	cinema
2	sunny	no-visit	rich	no	tennis
3	windy	visit	rich	no	cinema
4	rainy	visit	poor	yes	cinema
5	rainy	no-visit	rich	no	stay-in
6	rainy	visit	poor	no	cinema
7	windy	no-visit	poor	yes	cinema
8	windy	no-visit	rich	yes	shopping
9	windy	visit	rich	no	cinema
10	sunny	no-visit	rich	no	tennis
11	sunny	no-visit	poor	yes	tennis

c) How is clustering different from classification? Mention the different types of clustering methods as well as cluster distance measure. [3][CO3][L2]

Q.4 a) What are the core components of Hidden Markov Model? Describe one real world application of Hidden Markov Model. [3][CO5][L2]

b) Training data for two classes are given below:

Class 1: x1 = [2, 3], x2 = [3, 3], x3 = [4, 5]

Class 2: x4 = [6, 8], x5 = [7, 9], x6 = [8, 7]

Given a test point x = [5, 6], use LDA to classify it. [7][CO2][L4]

Q.5 a) Define policy and state value in Reinforcement Learning? Also derive the Bellman's equation for the optimized value. [7][CO1][L2]

b) Describe ReLU and softmax activation functions? [3][CO4][L2]

Q.6 a) Consider the neural network given in fig 1 and assume that the neurons have a sigmoid activation function. Perform one epoch and evaluate the updated weights of W_{35} and W_{13}. Assume that the actual output is Y=0.5 and learning rate is 1. [6][CO4][L5]

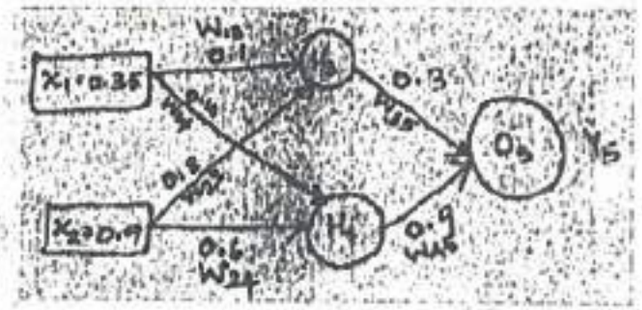

Fig 1

b) What is the role of convolution layer and fully connected layer? What do you mean by vanishing or exploding gradient descent problem? [4][CO4][L2]

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SECOND SEMESTER B.Tech. (EP)

END SEMESTER EXAMINATION (May-2025)

EP-102n/ EP-102/ EP-208 COMPUTATIONAL METHODS

Time: 3 Hours Max. Marks: 50

Note : Answer any five questions.
Assume suitable missing data, if any.

1. (a) Write down the significant figures in below mentioned numbers
(i) 0.000745 (ii) 4.56002 (iii) 45700
Also round off the numbers 67430 and 712.56 to four significant digits. [5] [CO # 2] [BTL # 4]

(b) Clearly define the mathematical condition to obtain rate of convergence of any root finding methods explaining each term. Solve and find out the rate of convergence of Newton-Raphson method. [5] [CO # 3] [BTL # 1, 3]

2. (a) Find out the minimum number of iteration required to find the root of given function within limit [a, b] with accuracy ε in trapezoidal method. Also find out the root of $x^3 - 9x + 1 = 0$ in the range of [2 ,3] using three iterations of trapezoidal method. [5] [CO # 3] [BTL # 1, 3]

(b) Show that [5] [CO # 4] [BTL # 4]

(i) $\Delta^n y_{-1} = \Delta^n y_0 - 2\Delta^{n+1} y_0 + 3\Delta^{n+2} y_0 \ldots\ldots\ldots\ldots$

(ii) $\Delta \log f(x) = \log\left[1 + \frac{\Delta f(x)}{f(x)}\right]$

3. (a) Evaluate the double integration $\int_0^{0.8}\int_0^{0.8} e^{-(x+y)}dxdy$ using Simpson's one-third method taking $h = k = 0.2$. [5] [CO # 1, 4] [BTL # 5]

(b) Find the first two derivatives (y' & y'') of given function $y = f(x)$ at $x = 0.5$ using the data given in the below table.

x	0.35	0.40	0.45	0.50	0.55	0.60	0.65
$y=f(x)$	1.521	1.506	1.488	1.467	1.444	1.418	1.389

[5][CO # 4] [BTL #3,5]

4. (a) Describe the reason for error in quadrature formula of integration. Evaluate the error in Trapezoidal formula and explain the finding of the result. [5] [CO # 4] [BTL #2,5]

(b) Using Romberg's method evaluate $I = \int_0^1 \frac{dx}{1+x}$ taking h=0.5, 0.25 and 0.125 [5] [CO # 4, 5] [BTL # 1,5]

5. (a) Use Modified Euler's method to find the solution of y at 0.1 and 0.2 in the step $h = 0.1$ for the given differential equation. Use five steps to converge the value of y in each steps.

$\frac{dy}{dx} = f(x,y) = 1 - y; x(0) = 0, y(0) = 0$ [5] [CO # 4] [BTL # 3,5]

(b) Using second approximation of Picard method solve the value of y and y' at $x = 0.1$ for given second order differential equation

$y'' + 2xy' + y = 0; y(0) = 0.50 \;\&\; y'(0) = 0.1.$

[5] [CO # 4, 5] [BTL #3]

6. (a) Using Everett formula, solve the value of cos (12.5) taking 10^0 as central line

x	0	5^0	10^0	15^0	20^0
$\cos x$	1.000	0.9962	0.9848	0.9659	0.9397

[5] [CO # 4, 5] [BTL # 3]

(b). By Lagrange's formula find the density of saturated water when the temperature of the saturated steam is 110^0C from the following data which are taken from steam table

Temp (^{0}C)	100	150	180	200
Density (kg/m)	958	917	887	865

[5] [CO # 4, 5] [BTL #3]

Total No. of Pages: 03

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Second Semester
B.Tech. [EP]

END TERM EXAMINATION May-2025

EP104 FUNDAMENTALS OF ELECTRODYNAMICS

Time: 3:00 Hours *Max. Marks: 50*

Note: Answer any *five* questions.
Assume suitable missing data, if any.

Q1 (a) Given a vector function $\vec{A} = (x + c_1 z)\hat{x} + (c_2 x - 3z)\hat{y} + (x + c_3 y + c_4 z)\hat{z}$.

i) Calculate the value of constants c_1, c_2, c_3 if $\vec{A}$ is irrotational.

ii) Determine the constant c_4 if $\vec{A}$ is also solenoidal.

iii) Determine the scalar potential function V, whose negative gradient equals $\vec{A}$.

(5M)(CO#1)(L2,3)

(b) An electric field at a point P, expressed in cylindrical coordinate system is given by

$$\vec{E} = 6r^2 sin\emptyset\, \hat{r} + 2r^2 cos\emptyset\, \hat{\emptyset}$$

Find the value of divergence of the field if the location of point P is given by (5, 5, 5) in cartesian coordinate system. (5M)(CO#1,2)(L2,3)

Q2 (a) A long coaxial cable (Fig. 1) carries a uniform volume charge density ρ on the inner cylinder (radius a), and a uniform surface charge density on the outer cylindrical shell (radius b). This surface charge is negative and of just the right magnitude so that the cable as a whole is electrically neutral. Find the electric field in each of the three regions: (i) inside the inner cylinder (s < a), (ii) between the cylinders (a < s < b), (iii) outside the cable (s > b). Plot $|\vec{E}|$ as a function of s. (5M)(CO#1,2)(L2,3)



Fig. 1

(b) A steady current I flows down a long cylindrical wire of radius 'a'. Find the magnetic field both inside and outside the wire, if

i) The current is uniformly distributed over the outside surface of the wire.

ii) The current is distributed in such a way that J is proportional to 's', the distance from the axis. (5M)(CO#1,2)(L2,3)

Q3 (a) Let $\vec{E} = \hat{x} E_0 \exp[i(\vec{k}.\vec{r} - wt)]$ represent an electric field of a plane electromagnetic wave of frequency ω, where $\vec{k} = \hat{z}\,(k\cos\emptyset + ik\sin\emptyset)$ and $\hat{x}, \hat{y}, \hat{z}$ are the Cartesian unit vectors, then what will be the magnetic field $\vec{B}$ of the wave? Define Poynting vector and also find it using above equation. (5M)(CO#2,3,4)(L1,3,4)

(b) Derive Maxwell's equations in integral form and give their physical significance. (5M)(CO#2,3,4)(L1,2,6)

Q4 (a) For electromagnetic waves propagating inside a conducting medium, derive wave equations and give their plane wave solutions in terms of electric and magnetic field vectors. Show that for a bad conductor skin depth is independent of frequency of electromagnetic wave. (5M)(CO#2,3,4)(L1,2)

(b) i) The electric field intensity of a uniform plane wave in air is 7500 V/m in the y-direction. The wave is propagating in x-direction at a frequency of 2×10^9 rad/s. Find (a) the wavelength, (b) the frequency, (c) the time period and (d) the amplitude of $\overline{H}$. (2.5M)(CO#2,3,4)(L2,3)

ii) Find the wavelength and propagation speed of radio wave in copper at the frequency of 1 MHz. Conductivity of copper is $5 \times 10^7 (\Omega m^{-1})$, $\mu_r = 1$. (2.5M)(CO#2,3,4)(L2,3)

Q5 (a) Define the transmission lines. Derive transmission line equations for voltage and current at receiving and sending ends. (5M)(CO#5)(L1,2)

(b) The power radiated by a lossless antenna is 10 W. The directional characteristics of the antenna are represented by radiation intensity of

$$U(\theta) = B_0 \cos^3\theta \ \ (Watts\ unit\ solid\ angle) \qquad (0 \le \theta \le \frac{\pi}{2}, 0 \le \emptyset \le 2\pi)$$

i) Find the maximum power density at a distance of 1000 m (assume far-field distance)

ii) Calculate the directivity of an antenna

iii) Calculate the gain of an antenna when loss resistance is 8 Ω and radiation resistance is 72 Ω. (5M)(CO#5)(L2,3)

Q6 (a) State and prove Poynting Theorem. Give physical significance of each term of Poynting Theorem. Define Poynting vector and also write its formula. (5M)(CO#2,3,4)(L1,2,6)

(b) A transmission line has the following parameters per unit length: R = 0.1 Ω/km, L = 1 mH/km, G = 0, and C = 0.01 μF/km. Find the characteristic impedance and propagation constant γ at 50 Hz. (2.5M)(CO#5)(L2,3)

(c) The flux density at a point distance r from a long filamentary conductor carrying a current I in z direction is given by $\vec{B} = \frac{\mu_0 I}{2\pi r}\hat{\emptyset}$. Calculate the flux crossing the portion of the plane $\emptyset = \frac{\pi}{4}$ define by $0.01 < r < 0.05$ m and $0 < z < 2$ m for a current of 2 A. (2.5M)(CO#1,2)(L2,3)

b) A satellite link operating at 14 GHz has receiver feeder losses of 1.5 dB and a free-space loss of 207 dB. The atmospheric absorption loss is 0.5 dB, and the antenna pointing loss is 0.5 dB. Depolarization losses may be neglected. Calculate the total link loss for clear-sky conditions.
[2M][CO5][L2].

Total no. of Pages: 04 *Roll no.....*

SEMESTER:IV **B.Tech.**

END TERM EXAMINATION *May-2025*

COURSE CODE: EP201 COURSE TITLE: Communication Systems

Time: 03:00 Hours ***Max. Marks: 40***

Note: Attempt any 5 questions.
Assume suitable missing data, if any.

Q.1.a) A SpaceX mission to the ISS is an example of a LEO satellite mission. Before rendezvousing with the ISS on this mission, SpaceX inserted the *Dragon* capsule into an initial circular orbit 250 km above the earth's surface, where there are still a finite number of molecules fromthe atmosphere. The mean earth's radius, r_e, is 6378.14 km. Using these numbers, calculate the period of the Dragon capsule of SpaceX in its 250 km orbit. Kepler's constant= 3.986×10^5 km^3/s^2 [4M][CO5][L3]

b) What is spread spectrum technology? Describe its implementation through DSSS and FHSS. [4M] [CO4][L1]

Q.2 a) An AM modulated signal is given as s(t)=(20+4cos500πt)*cos(2π*10^5t). Find:

i) Modulation Index

ii) Power in the sidebands

iii)Total Transmitted Power

iv)Efficiency [4M][CO1][L2]

b) If a signal to interference ratio of 15 dB is required for satisfactory forward channel performance of a cellular system, what is the frequency reuse factor and cluster size that should be used for maximum capacity if the path loss exponent is (i) n = 4, (ii) n = 3? Assume that there are 6 co-channels cells in the first tier, and all of them are at the same distance from the mobile. Use suitable approximations. [4M][CO1][L3]

Q3) a) Describe how the atmospheric effects cause attenuation in the satellite communication systems. Under clear-sky conditions, the downlink [Eb/No] is 12 dB, the effective noise temperature of the receiving system being Tsys =400 K. Assume an apparent absorber temperature Ta = 280 K.

and no attenuation in the feeder. If rain attenuation exceeds 1.9 dB for 0.1 percent of the time calculate

i) Rain noise temperature T_{rain}
ii) System temperature with rain $T_{sys,Rain}$

[4M][CO4][L3]

b) What is handoff? With illustrations, show a proper, improper handoff situation. Describe handoff priority schemes and strategies [4M][CO2][L2]

Q4) a) 10 sinusoidal message signals, each having frequency of 10 KHz are multiplexed using TDM. Sampling rate is 25% higher than the NR. Maximum quantization error can be at most of 1% of peak to peak amplitude of message signal. 5 number of synchronization bits are transmitted at the end of each frame. Find Bit rate of the transmitter?
[4M][CO3][L2]

b) A satellite at a distance of 40,000 km from a point on the earth's surface radiates a power of 10W from an antenna with a gain of 17 dB in the direction of the observer. Find the flux density at the receiving point, and the power received by an earth station antenna at this point with an effective area of $10m^2$.
[4M][CO4][L3]

Q5 a) A hexagonal cell within a four-cell system has a radius of 1.387 km. A total of 60 channels are used within the entire system. If the load per user is 0.029 Erlangs, and $\lambda = 1$ call/hour, compute the following:

(i) Given that for an Erlang C system that has a 5% probability of a delayed call for 15 channels per cell, the traffic intensity is 9.0 Erlangs, how many users per square kilometer will this system support?
(ii) What is the probability that a delayed call will have to wait for more than 10 s?
(iii) What is the probability that a call will be delayed for more than 10 seconds?
[4M][CO2][L4]

b) Three message signals each bandlimited to 5 KHz are multiplexed using FDM. Guard band is 1 Khz. Find multiplexed signal bandwidth ,if the modulation schemes used are AM and SSB respectively.
[2M][CO3][L2]

c) A 4 GHz carrier is DSB-SC modulated by a low-pass message signal with maximum frequency of 2 MHz. The resultant signal is to be ideally sampled. Calculate the minimum frequency of the sampling impulse train.
[2M][CO1][L2]

Q6)a) A voice signal is sampled at the rate of 8000 samples/sec and each sample is encoded in to 8 bits using PCM. The binary data is transmitted into free space after modulation. Determine the Bandwidth of modulated signal, if the modulation technique is ASK, PSK & FSK for $f_1 = 10$ MHz, $f_2 = 8$ MHz.
[4M][CO2][L2]

b) What is Pulse Position Modulation? Discuss its generation, advantages and disadvantages of deploying it.
[4M][CO2][L1]

Q7. a) Discuss Kepler's law for a two body satellite system.
[4M][CO5][L2]

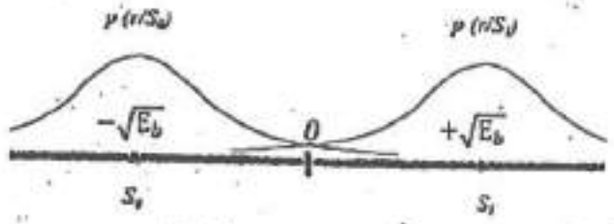
b) Calculate the baud rate of signal having a bit rate of 400 bps for:
i) ASK ii) BPSK
[2M][CO3][L2]

c) For a sequence of 10001010, draw the suitable waveforms of the signal generated for BPSK, FSK.
[2M] [CO3][L2]

Q8a) A BPSK system represents binary digits, 1 and 0, through analog levels $+\sqrt{E}b$ and $-\sqrt{E}b$ respectively as shown in the figure. The received signal is $y=s_0+n$ and $y=s_1+n$ for 0 and 1 bit transmission where n is the AWGN noise. Compute the probability of error given s_0 was transmitted $p(e|s_0)$ and s_1 was transmitted $p(e|s_1)$. Prove that for a BPSK system having the signals $s_1(t)$ and $s_0(t)$, the probability of error over an AWGN channel with Noise spectral density $N_0/2$ is $Q\sqrt{\frac{2E_b}{N_0}}$, where E_b is the energy per bit.

The AWGN noise has the distribution as $p(x)=\frac{1}{2\pi\sigma^2}e^{-\left(\frac{x-m}{2\sigma^2}\right)^2}$.

[6M][CO3][L3].



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4th SEMESTER **B.Tech. (EP)**

END SEMESTER EXAMINATION ***MAY-2025***

COURSE CODE: EP-204 COURSE TITLE: Thermal Physics

Time: 3:00 Hours *Max. Marks: 50*

Note: All questions carry equal marks
Assume suitable missing data, if any.

1(a). From the law of thermodynamics, prove that $\left(\frac{\partial U}{\partial V}\right)_T = T\left(\frac{\partial U}{\partial V}\right)_V - P$ and hence show that the internal energy of an ideal gas is independent of its value but not so for an actual gas. [05] [CO#1][L5]

1(b). For an ideal gas, the molar heat capacity varies as $C = C_V + 3aT^2$. Find the equation of state for the process in the variables 'T' and 'V', where 'a' is constant and 'C_V' is the heat capacity at constant volume. [05] [CO#1][L3]

2(a). State and explain the zeroth, first and second law of thermodynamics. Give the significance of the second law. [05] [CO#2][L1]

2(b). Define entropy. What is its physical significance? Derive an expression for the change in entropy of a perfect gas in terms of volume and temperature. [05] [CO#2][L1]

3(a). For the following differential equations

$$dU = TdS - PdV \text{ and } dH = TdS + VdP.$$

Prove that for the perfect gas equation $\left(\frac{\partial U}{\partial P}\right)_T = 0$ and $\left(\frac{\partial H}{\partial P}\right)_T = 0$. [05] [CO#3][L4]

3(b). Define various thermodynamical potentials. Derive various Maxwell's thermodynamic relations. [05] [CO#3][L1]

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4(a). Derive the relation for Clausius-Clapeyron's equation. Using Clusius-Clapeyron's equation, estimate the enthalpy of vaporisation. The following data is given at 200 °C; $v_g = 0.1274\, m^3/kg$; $v_g = 0.001157\, m^3/kg$; $\left(\frac{dp}{dT}\right) = 32\, kPa/K$. [05] [CO#4][L3]

4(b). Explain the Joule-Kelvin effect. What is the Joule-Thomson coefficient and inversion of temperature? Why is it zero for an ideal gas? [05] [CO#3][L2]

5(a). Describe the different operations of the Rankine cycle. Derive also the expression for its efficiency? [05] [CO#5][L1]

5(b). A Carnot engine working between 400 °C and 40 °C produces 130 kJ of work. Determine

(i). The engine thermal efficiency.

(ii) The heat added.

(iii) The entropy changes during heat rejection process.

[05] [CO#5][L3]

OR

6(a). A reversible engine converts one-sixth of the heat input into work. When the temperature of the sink is reduced by 70 °C, its efficiency is doubled. Find the temperature of the source and the sink. [05] [CO#5][L3]

6(b). Derive an expression of efficiency and work done in the Diesel cycle with a neat diagram. [05] [CO#5][L6]

*****END*****

Total No. of Pages:3

FOURTH SEMESTER

Roll No. .....

END SEM EXAMINATION

B.Tech.(EP)

May-2025

EP 204- OPTICS

Time: 3 Hours

Max. Marks: 40

Note: Answer any eight questions.

1. (a) In the Newton's rings arrangement, if the incident light consists of two wavelengths 4000 A^0 and 4002 A^0 calculate the distance (from the point of contact)at which the rings will disappear. Assume that the radius of curvature of the curved surface is 400 cm.

   If the lens is slowly moved upwards, calculate the height of the lens at which the fringe system (around the center) will disappear.

   (b) Draw a neat ray diagram showing the production of interference pattern by Lloyd mirror experiment.

   [3,2] [CO# 2]

2. (a) Show that the figure of merit of the Fabry Perot cavity is the ratio of the separation between transmittance peaks to the full width at half maximum.

   (b) A particular laser is operating in single mode and emitting a continous wave lasing emission whose spectral width is 1 MHz. What is the coherence time and coherence length?

   (c) Plot the function '$\mathrm{Sin^2 N\gamma / Sin^2 \gamma}$ 'for N =5.

   [2, 2,1] [CO# 2]

3. Assume a Gaussian pulse of the form

$$\psi(x = 0, t) = E_0 \, exp(-\frac{t^2}{2\tau^2}) e^{i\omega_0 t}$$

   Find the fourier transform A(ω). Show that the temporal coherence is ~ τ. Assume τ >> ($1/\omega_o$, plot the Fourier transform A(ω) [as function of ω] and interpret it physically. Show that the frequency spread $\Delta\omega \sim 1/\tau$.

   [5] [CO# 1]

4. A grating with 200 lines (slits) per millimetre and of width 2cm is fully illuminated by light consisting of wavelengths 600nm and 600.1 nm.
   (a) What is the lowest diffraction order where the two wavelengths will be resolved?
   (b) If the slits are of width 3μm in the grating, then calculate the ratio of the intensities of the 600nm wavelength in the second order to that in the first order.

[5] [CO# 3]

5. Consider a plane wave incident normally on a rectangular aperture of width b (along the ξ axis and width a (along the η axis) placed on the aperture plane i.e.

$$U(\xi,\eta,0) = A \qquad |\xi| < b/2 \text{ and } |\eta| < a/2$$
$$= 0 \quad elsewhere$$

for all values of η.

Calculate the corresponding Fraunhoffer diffraction.

[5] [CO#3]

6. (a) Plane waves of monochromatic light (600 nm) light are incident on an aperture. A detector is situated on axis at a distance of 20 cm from the aperture plane.
   (i) What is the value of R_1, the radius of the first Fresnel half period zone, relative to the detector?
   (ii) If the aperture is a circle of radius 1cm, centered on axis, how many half period zones does it contain?
   (iii) If the aperture is a zone plate with every other zone blocked out and with radius of the first zone equal to R_1 (found in (i)), determine the first three focal lengths of the zone plate.

(b) State Babinet's principle.

[3,2] [CO# 3]

7. Explain Cornu's spiral. Analyze the Fresnel diffraction at a straight edge using Cornu's spiral. Also sketch the intensity pattern.

[5] [CO# 3]

8. Explain the working of the He-Ne laser, with the help of the suitable diagram indicating the various vibrational levels taking part in the transition.

[5] [CO# 4]

9. (a) Consider two crossed polaroids placed in the path of an unpolarised beam of intensity I_0. If we place a third polaroid in between the two then, in general, some light will be transmitted through. Explain this phenomenon.

Assuming the pass axis of the third polaroid to be at 45^0 to the pass axis of either of the polaroids, calculate the intensity of the transmitted beam. Assume that all the polaroids are perfect.

(b) The electric field components of a plane electromagnetic wave are

$$E_x = 2E_o cos(\omega t - kz + \phi)\,;\, E_y = 2E_o sin(\omega t - kz + \phi)$$

Draw the diagram showing the state of polarisation when $\phi = 0$

[3,2] [CO# 4]

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Roll No.....

FOURTH SEMESTER

B.Tech. (EP)

END SEMESTER EXAMINATION *May-2025*

EP-206: Microprocessor Architecture and Design

Time: 3:00 Hours *Max. Marks : 40*

Note : Attempt any 4 questions in all. All questions are compulsory and carry equal marks. Assume suitable missing data, if any.

Q.1.(a) Interface an 8-bit DAC to 8086 through 8255 and write the program to generate a triangular wave for this interface. Assume that the port address for the control register is AEH. [L3][CO4][5]

(b) Briefly explain the timing diagram of Interrupt Acknowledge Bus Cycle in 8086 indicating the status of all relevant bus signals. [L3][CO2][5]

Q.2.(a)Analyze the status bits affected by the following instructions in PIC-16F877:

(i) incfsz, (ii) bsf, (iii) clrwdt, (iv) subwf and (v) retfie [L5][CO5][5]

(b) Explain the Specific Rotation mode in 8259 along with the significance of Interrupt Mask Register, Priority Resolver and In-Service Register. [L3][CO4][5]

Q.3.(a)Discuss the role of PGD, PGC, PGM and MCLR signals of PIC-16F877. In 8253, write a control word in the control register located at a port address of 40H such that the Timer 0 is designed in rate generator mode and acts as a BCD counter with an initial count of 123H. [L4][CO4][CO5][5]

(b) Write an assembly language program in 8086 to find out the average of 10 numbers stored at a memory location 1000:0200H onwards. [L3][CO2][5]

Q.4.(a) Differentiate between the following in 8086:

(i) LOCK and TEST signals

(ii) AND and TEST instructions.

Find the physical address in the interrupt vector table associated with the breakpoint interrupt. [L2][CO1][CO2][5]

(b)With the help of an example, describe the action performed by microprocessor 8086 for the following instructions:
(i) CMPSW (ii) CLC (iii) DAA (iv) SHL (v) LDS
[L3][CO1][5]

Q.5.(a)The contents of CS and IP in 8086 are 4500H and 5600H. Obtain the 20-bit effective/physical address to be used in the address bus for accessing the specified location. The contents of memory location $F0000_{16}$ are FF_{16}, $F0001_{16}$ are 00_{16} and at $F0002_{16}$ are 11_{16} What is the even-addressed data word stored at an address $F0000_{16}$ and the odd addressed data word stored at an address $F0001_{16}$. [L5][CO1][5]

(b) Give the addressing modes of the following instructions in 8086:
1. PUSH AX
2. DAA
3. MOV CX, [BX+DI]
4. JMP [2]
5. ROR AX,02 [L4][CO2][5]

END

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Total No. of Pages: 02

Roll No. .....

FOURTH SEMESTER
B.Tech. (EP)
END SEMESTER EXAMINATION

(May-2025)

EP208n Artificial Intelligence for Material Science

Time: 3 Hours

Max. Marks: 40

Note: Attempt any five questions
All questions carry equal marks.
Assume suitable missing data, if any.

Q1. Write a short note on the following. **[2, 2, 4] [CO # 1, 2][L4,5]**

(i) Role of AI in experimental material science.

(ii) List at least five techniques for dealing with missing data.

(iii)Challenges and Limitations of AI in Material Science.

Q2. (i) Discuss the feature engineering approaches for material science.

(ii) Write a short note on AI-Based Materials Knowledge Systems.

[6, 2] [CO # 1, 2][L2,3]

Q3. (i) What is the polynomial regression approach in ML, and discuss the cost function and gradient descent for the polynomial regression method?

(ii) What are the support vectors? Write support vectors for the non-separable case of the datapoint using the KKT condition.

[6, 2] [CO # 3][L1,2,5]

Q4. (i) Discuss the Principal Component Analysis (PCA) technique for dimensionality reduction.

(ii) What is the *k*-Means clustering approach? Drive the Minimization condition of the Objective function *J*.

[4, 4] [CO # 3, 4][L1,3,4]

Q5. Consider a Neural network with two hidden layers, having input dataset points $X_1, X_2, ..., X_p$ (where $p = 784$) and outputs are $f_0(X), f_1(X), ..., f_9(X)$ in the output layer. Discuss its architecture and activation functions throughout the data flow in the layers.

[8] [CO # 3, 5][L3,4]

Q6. (i) Discuss the Logistic regression method for the classification of the data under the Supervised ML approach.

(ii) Discuss the *t*-Distributed Stochastic Neighbour Embedding (*t*-SNE) to deal with the higher-dimensional data in an Unsupervised ML approach.

[4, 4] [CO # 3, 4] [L3,4]

**********END**********

Total No. of Pages:2

Roll No. .....

FOURTH SEMESTER

B.Tech. [ENGINEERING PHYSICS]

END TERM EXAMINATION

MAY- 2025

EP-210: CONDENSED MATTER PHYSICS

Time: 3:00 Hours

Max. Marks: 40

Note: Answer *ANY FIVE* questions.
Assume suitable missing data, if any.

1.(a) Describe the scheme to determine the Miller indices of a plane with an example. What is the role of Miller indices in crystal structure, and write important features of Miller indices? [5][CO1&2][BTL1&2]

(b) The potential energy of a diatomic molecule in terms of the interatomic separation R is given by $U(R) = -\frac{A}{R^2} + \frac{B}{R^{10}}$; where A= 1.44×10^{-39} Jm^2 and B= 2.19×10^{-115} Jm^{10}. Calculate the equilibrium spacing (R_e). [3][CO5][BTL3]

2.(a) Describe the Einstein model of lattice heat capacity, along with the successes and failures of this model. [5][CO1&2][BTL2&4]

(b) What is relaxation time? Find the relaxation time of conduction electrons in a metal of resistivity 1.54×10^{-8} Ω-m, if the metal has 5.8×10^{28} conduction electrons/m^3. [3][CO5][BTL3]

3.(a) Obtain an expression for the allowed energy levels of an electron using free electron theory in one dimension. Explain degenerate and non-degenerate states with an example. [5][CO3][BTL2&3]

(b) How does band theory of solids lead to the classification of solids into conductors, semiconductors and insulators? [3][CO3][BTL6]

4. (a) What are dielectric materials? Derive the relation between electric susceptibility and dielectric constant of a dielectric medium. [5] [CO4][BTL1&3]

(b) Distinguish between the properties of ferro, antiferro and ferrimagnetic materials. [3][CO 4][BTL5]

5. (a) Derive London equations and discuss how one of its solutions explains the zero resistance property. [5][CO 1&5][BTL3&4]

(b) The critical field for niobium is 1×10^4 A/m at 8 K and 2×10^5 A/m at 0 K. Calculate the transition temperature of the element. [3][CO 5][BTL5]

6. Write short notes on the following: [3+3+2= 8][CO 2, 5 &4][BTL1, 6 &2]

(a) Edge dislocation

(b) Maglev Vehicles

(c) Soft and Hard Magnetic Materials

All the Best

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SIXTH SEMESTER

Roll No. .....

B.Tech. [EP]

END SEMESTER EXAMINATION

(May 2025)

EP- 302 FIBER OPTICS & OPTICAL COMMUNICATION

Time: 3:00 Hours

Max. Marks:40

Note: Answer any eight questions.
Assume suitable missing data, if any.
Symbols have their usual meanings

1. Calculate the power associated with symmetric TM mode in a planar step index waveguide.

[5] [CO#1,4] [BTL# 4]

2. (a) Consider a planar symmetric waveguide with $n_1 = 1.5$ and $n_2 = 1.0$ and $d = 0.555$ μm. At $\lambda_0 = 1.3$ μm, calculate V and the propagation constant β for TE as well as TM mode.
[Use b(TE) = 0.6280 and b(TM) = 0.4491]

(b) Write the transcendental equations for the symmetric and asymmetric TE modes of a symmetric planar step index waveguide at cut off.

[3,2] [CO#1,4] [BTL#3,1]

3. (a) Plot normalized radial intensity distribution of LP_{01}, LP_{22} and LP_{32} modes for a step index fiber.
(b) Briefly describe the three types of fiber misalignment which may contribute to loss at a joint between two single mode fibers.

[3,2] [CO#2,3] [BTL#3,1]

4. Starting from the Maxwell's Equations for dielectric medium, establish an eigen value equation for step index optical fiber. Point out the method to solve the above mentioned Eigen value equation.

[5] [CO#2,3] [BTL#4]

5. (a) Consider a step index fiber for which $n_1 = 1.475$ and $n_2 = 1.460$, and $a = 25\ \mu m$. What is the maximum value of θ for which the rays will be guided through the fiber? Corresponding to the maximum value of θ, calculate the number of reflections that would take place in traversing a kilometre length of the fiber.

(b) Sketch the schematic diagram of a fiber drawing apparatus.

[3,2] [CO#1,4] [BTL#3,1]

6. (a) An approximation for the normalised propagation constant in single mode step index fiber is given by

$$b(V) \approx \left(1.1428 - \frac{0.9960}{V}\right)^2$$

Obtain the corresponding approximation for the waveguide parameter $V\frac{d^2(bV)}{dV^2}$ and hence write down the expression for waveguide dispersion in the fiber.

(b) The refractive index for fused silica in the wavelength region $0.5\ \mu m < \lambda_0 < 1.6\ \mu m$ is approximately given by the following empirical formula

$$n(\lambda_0) = C_0 - a\lambda_0^2 + \frac{b}{\lambda_c^2}$$

Where $C_0 = 1.451$; $a = b = 0.003$ and λ_0 is measured in micrometers.

Using the above mentioned empirical formula, calculate the zero material dispersion wavelength. Also find the dispersion at 1.55 μm.

[3,2] [CO#1,3] [BTL#3,4]

7. (a) A double heterojunction InGaAsP LED emitting at peak wavelength of 1310 nm has radiative and non radiative recombination times of 25ns and 90ns respectively. The drive current is 35 mA. Find the internal quantum efficiency and the internal power. If the refractive index of the light source material is $\bar{n} = 3.5$. Find the power emitted from the device.

(b) With the help of suitable diagram, explain the frequency response for an LED, exhibiting electrical bandwidth and optical bandwidth. Mention the relationship between optical bandwidth and output power.

[3, 2] [CO#2,4] [BTL#3,4]

8. (a) Establish the relation between responsivity and quantum efficiency of a PIN photodiode.

(b) Consider an InGaAs PIN photodiode with a quantum efficiency of 0.6. Calculate the responsivity at 1300 and 1550 nm. Why is the responsivity larger at 1550nm?

[3,2] [CO#2,4] [BTL#4,5]

9. (a) Describe the design and working mechanism of semiconductor laser diode. Discuss both quantitatively and qualitatively, how the condition of population inversion and light amplification is achieved in semiconductor laser diodes.

(b) Consider a semiconductor laser operating at 900 nm. If the spectral width over which gain is available is 15 nm, what is the maximum cavity length for single longitudinal mode operation? Assume the refractive n = 3.6.

[4,1] [CO#2,4] [BTL#2,3]

Total No. of Pages: 03

Roll No.....

SIXTH SEMESTER

B.Tech. (Engineering Physics)

END SEMESTER EXAMINATION *May, 2025*

EP 304: FABRICATION & CHARACTERIZATION of NANOSTRUCTURES

Time: 3.00 Hours *Max. Marks: 50*

Note: Question no 1 is compulsory. Answers any four questions from the remaining Questions. All questions carry equal marks. Assume suitable missing data, if any.

Q1. Differentiate between the following. Atleast give two differences for each. **[10] [CO # 3, 4][BTL 2, 4]**

a) Thermionic electron emission gun and Field emission electron gun

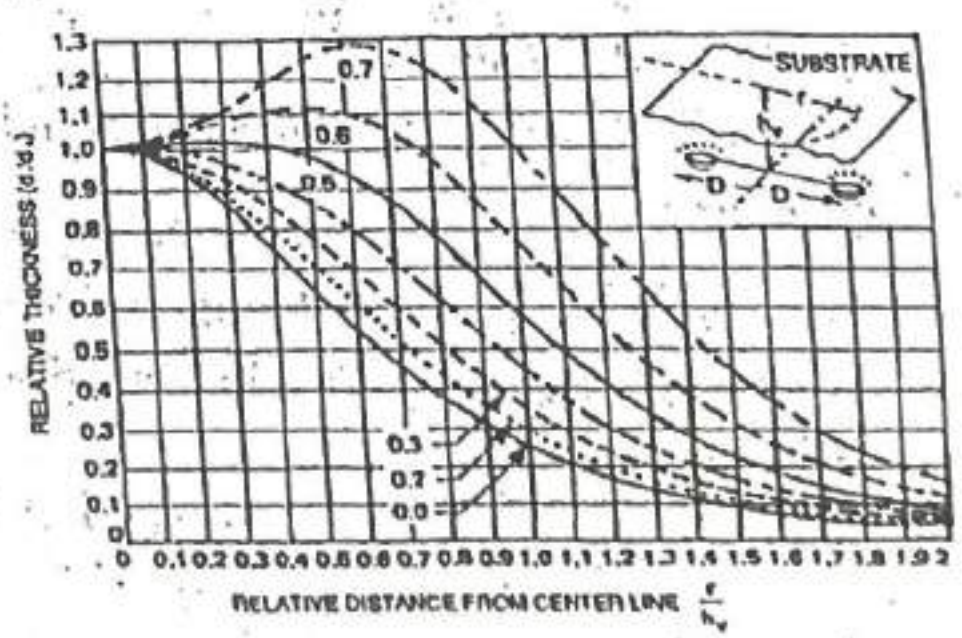
b) TEM and SEM

c) PVD and CVD

d) Constant height and Constant force mode in AFM

Q2. (a) Define "sputter yield". Explain the operation and effects of magnetron sputtering. Analyze the advantage of magnetron sputtering over non-magnetron sputtering by comparing the process parameters requirements. **[5] [CO# 3][BTL 2]**

(b) Suppose it is desired to coat a 150-cm-wide strip utilizing two evaporation sources oriented as shown in the given figure below. If a thickness tolerance of ± 10 % is required, what should be the distance between sources and how far should they be located from the substrate? **[5] [CO1, CO3][BTL 6]**



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Q3. (a) Explain the working of neutral atomic beam lithography deposition technique highlighting its advantages over other beam lithography techniques. [4] [CO# 2,4][BLT4,5]

(b) Calculate the ratio of the surface energy of Ca metal nanostructure surface along {110} and {111} facets. The Ca metal possesses FCC structure of unit cell constant a = 5.6 Å, lattice energy U = 180 kJ mol^{-1}, coordination number in the bulk = 12. Whereas each atom on {100} and {111} has 5 and 3 broken chemical bonds, respectively. (Assume all bonds have same strength). [3] [CO# 1,3][BLT3,5]

(c) With reference to nucleation process in the nanomaterials growth in accordance with Thermodynamic Equilibrium Approach. Determine the critical energy barrier (Delta G) for heterogeneous nucleation at a contact angle of 180 and 0 degrees and explain their relevance with growth process of nanostructures. [3] [CO# 3][BLT2,4]

Q4. (a) Define structure factor (F) and how is it different from atomic scattering factor (f), also write the expression for both? Derive the structure factor for Zinc Blende system and also write the selection rule for the same. Also explain the significance of the obtained results. [5] [CO# 1,4][BTL 3]

(b) Explain the procedure to determine the Miller indices of a crystal plane. Calculate the Miller indices of a plane (also draw the plane) that intersects the crystallographic axes ($\vec{a1}, \vec{a2}, \vec{a3}$), at 3 $a1$, 4 $a2$ and 2 $a3$. Also write the relation between miller indices and d-spacing for a cubical system. [5] [CO# 1,4][BTL 3]

Q5. **Answer the following question in short:** [2x5] [CO1,3,4][BLT3,4,5]

a) Why RAMAN spectroscopy becomes most significant characterization tools nowadays?

b) Differentiate between Dark Field Imaging and Bright Field Imaging in TEM operation

c) How Selected Area Electron Diffraction (TEM) is different from the X-ray Diffraction?

d) Calculate the number of atoms in a critically sized (diameter =1.944nm) nucleus for the homogenous nucleation of a pure iron. The lattice constant of iron is 0.28664 nm.

e) Calculate the light wavelength(s) that can safely be used for making grating with spatial frequency of 100 μm^{-1} in a contact mode mask aligner and a photoresist with typical thickness of 0.32 μm are employed?

Q6. (a) Differentiate between secondary electron I and secondary electron II in scanning electron microscopy. What are the factors which influences the emission of secondary electrons? [3] [CO# 2, 4][BTL3]

(b) Explain the working principle of RAMAN spectroscopy with suitable diagram. What information we can extract about a sample from its RAMAN spectroscopy data. [5] [CO# 2, 4][BTL1,4]

OR

(b) Discuss the working principle of FTIR with labelled block diagram. Illustrate the FTIR spectrum of any one compound, highlighting and explaining the fingerprint and characteristic regions. [5] [CO# 2, 4][BTL 1,4]

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Total No. of Pages :02 Roll no.....

VIth SEMESTER B.Tech. (Engineering Physics)

END TERM EXAMINATION May 2025

COURSE CODE: EP – 306 COURSE TITLE: Microwave Engineering

Time: 3.00 Hours Max. Marks: 40

Note: Attempt any Five Questions
Assume suitable missing data, if any

Q. 1 (a) What are the applications of Microwaves? write down the various microwave bands with its frequency range. [4] [CO #1][BTL#3]
(b)Differentiate between E-plane tee and H-plane tee junctions. [4] [CO# 2] [BTL# 4]

Q 2. Explain the J-E characteristics of Gunn diode with the help of two valley model theory. Discuss the applications of Gunn diode. A typical n-type GaAs Gunn diode has the following parameters: Threshold field Eth= 2800 V/cm, applied field E= 3200 V/cm, device length L =10μm, doping concentration $n_o = 2 \times 10^{14}$ cm^{-3}, operating frequency f= 10GHz. Determine: (i) the electron drift velocity (ii) the current density. [8] [CO#2][BTL# 1,2,5]

Q. 3 (a)Describe the two-cavity Klystron amplifier, with the aid of a schematic diagram. Make the clear distinction between velocity modulation and current modulation, and explain how current modulation is necessary if the tube is to have Significant power gain. [4] [CO#3] [BTL# 4]

(b) A two cavity Klystron amplifier has the following parameters: beam voltage Vo=1000V, resistance Ro=40kΩ, beam current Io = 25mA, operating frequency f= 3GHz, gap in either cavity d= 1mm, spacing between the two cavities L=4cm, effective shunt impedance Rsh=30kΩ. Determine (i) the electron velocity just leaving the cathode (ii) the gap transit angle θg. [4] [CO#3] [BTL#1,5]

Q. 4 (a)What are the applications and limitations of the reflex klystron? [4] [CO#3] [BTL# 6]

(b) What is a Travelling Wave Tube (TWT)? With the aid of a schematic diagram, explain about the helical slow -wave structure. [4][CO#4][BTL#2]

Q. 5 (a) Derive the expressions for the Hull cutoff voltage and Hull cutoff magnetic field of a cylindrical cavity magnetron. [4][CO# 5] [BTL#1,2]

(b) An X-band pulsed cylindrical magnetron has the following operating parameters: Anode voltage Vo= 26kV, beam current Io= 27A, magnetic flux density Bo = 0. 336Wb/m^2, radius of cathode cylinder a= 5cm, radius from the center of the cathode to the edge of the anode b= 10cm. Determine (i) the cyclotron angular frequency (ii) the cutoff voltage for a fixed Bo (iii) the cutoff magnetic flux density for a fixed Vo. [4] [CO# 5] [BTL# 1,5]

Q.6 (a) What is directional coupler? Define coupling factor and Directivity of a directional coupler. [4] [CO# 2][BTL# 4]

(b) What is S-parameters? Derive the S-matrix of a directional coupler. [4][CO# 2] [BTL# 4]

Q.7 (a)What is circulator?explain using schematic diagram. [4][CO# 2][BTL#4]

(b)Explain how a tunnel diode can be used as a negative resistance amplifier [4] [CO#2] [BTL#2]

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Total no. of Pages: 02

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Sixth SEMESTER

B.Tech.

END TERM EXAMINATION

May-2025

EP316 COSMOLOGY & ASTROPHYSICS

Time: 3:00 hrs *Max. Marks: 50*

Note : Answer all Questions by selecting any two parts from each Question
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 a) What is parallax? [5][CO1][L1]

b) What is the distance of a star along the polar axis of the earth's orbit,if the parallax angle of the star is measured as 0.002 arcsecond

or

Derive the virial theorm and explain. [5][CO1][L1]

c)Derive the hydrodynamic equilibrium equation of a star. Write the relation between pressure and energy density for a relativistic and a non-relativistic star. [5][CO1][L3]

Q.2 a) Show that the solution of gravitational central force motion is a general conic equation. [5][CO2][L3]

b)A satellite was launched at a velocity of 28000 km/h at an altitude of 640 km.If the burnout velocity of the last stage is parallel to earth's surface ,compute the maximum altitude from earth that the satellite will reach.Also find its orbital time and eccentricity.Given radius of the earth =6400 km [5][CO3][L3]

c) Write the expression for Planck's radiation law.Suggest any use of this in modern cosmology. [5][CO3][L2]

Q.3 a)What is the Hubble law ,also write it quantitatively using hubble parameter. Write how the scaling factor depends on time in a flat radiation dominated universe. [5][CO4][L2]

b)Write the Friedmann I and Friedmann II equation for an expanding relativistic universe. What is its use in modern cosmology. [5][CO4][L2]

c) Using the Friedmann II equations show that for a matter dominated universe, the scaling factor is proportional to $t^{2/3}$. [5][CO4][L2]

Q.4 a) Write a note on cosmic microwave background.

Or

Big Bang Nucleosynthesis. [5][CO3][L2]

b) b) What are rotation curves of galaxies. Drawing a sample plot of rotation velocities vs distance from the galactic core reason how it supports the existence of dark matter on the outer region of galaxies. [5][CO3][L2]

c) A blob of hydrogen gas observed perpendicular to its line of sight. If the frequency of the gas is v and the gas is relativistic,what is the frequency of the observed emission. [5][CO3][L2]

Q.5 a)What is Boltzmann excitation equilibrium equation and Saha ionization equilibrium equation. [5][CO3][L3]

b) Consider a pure hydrogen gas at a temperature of 10000 K. What is the ratio of the populations of the ground state (n =1) To the first excited state(n=2). [5][CO3][L3]

c) With the help of the Friedmann I equation,reason why the late time acceleration of the universe can only be due to a component like dark energy with a negative pressure. [5][CO3][L3]

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Total No. of Pages: 2

SIXTH SEMESTER

Roll No. .....

END~~MID~~-SEMESTER EXAMINATION

B.Tech. [EP]

(MAY-2025)

EP—324—Compact Modelling and Process Simulation of Semiconductor Devices

Time: 3 Hours

Max. Marks: 50

Note: Attempt all the questions, except where choices are given.
All questions carry equal Marks, 10 for each question. Assume suitable missing data, if any
Write relevant answers only, and choose questions to attempt wisely.

Use the Constant Values given below anywhere in the question paper, if you need: Boltzmann Constant (k or k_B)=1.38×10^{-23} J/K=8.617×10^{-5}eV/K, Temperature (T)=300 K, Electronic Charge (e) =1.6×10^{-19}C, Absolute Permittivity (ε_0)=8.85×10^{-14} F/m, Dielectric Constant (ε_r)=11.7

Qus. 1 (a) Clarify the difference among the 3 types of box models. Illustrate using a diagram. (3M) [CO: 1] [BTL:1]

1 (b) Develop a Python program to plot the **Fermi-Dirac Distribution Function** of particles or variation of occupation probability vs Energy using the equations shown below. The symbols/constants in the equation have their usual meaning. (Take E_F=0.0 eV, $f(E_F)$=0.5 at suitable places)

$$f(E) = \frac{1}{1+\exp\{(E-E_F)/k_BT\})}$$

ensuring the program can draw a *smooth* f(E)-E curve with *proper x- and y-labels with units, legends,* along with the *title* of the graph, positioned at suitable places in the graph. Provide the Output Graph based on your Python program code. (4M) [CO: 2,3] [BTL:3]

1 (c) Analyse Iconic, Analogical, and Symbolical type of characteristic differentiation of mathematical models. (3M) [CO: 2] [BTL:2]

Qus. 2(a) Develop a Python program to plot the **p-n junction band diagram** in diode, showing the variation of E_c, E_v, E_f, E_i with distance from the depletion region (N_i =1.5×10^{10} cm^{-3}, N_a =1×10^{18} cm^{-3}, N_d =1×10^{16} cm^{-3}, E_g =1.12 V) (You can use/write any other equation(s) also for the smooth transition of bands). The symbols/constants in the equation have their usual meaning.

$$V_{bi} = \frac{kT}{q} ln\left(\frac{N_A N_D}{n_i^2}\right)$$

ensuring the program can draw a *smooth* E-d curve with *proper x- and y-labels, legends,* along with the *title* of the graph, positioned at suitable places in the graph. Provide the Output Graph based on your Python program code. (6M) [CO: 2,3] [BTL:3]

2 (b) Analyse the following in the context of Compact Modelling:

(i) Smoothing Functions and their necessity. (2M) [CO: 2] [BTL:1]

(ii) Numerical blow-ups, their consequences, and prevention. (2M) [CO: 2] [BTL:1]

OR

(ii) Clamping and Stitching Functions with examples. (2M) [CO: 2] [BTL:1]

Qus. 3 (a) Develop a Python program to plot the **MOSFET I-V characteristics** in triode and saturation regions at different gate voltages (V_{GS}=1.5V, 2 V, 2.5V and 3V), and 0 to 5V region of V_{DS} using the equations shown below. The symbols in the equation have their usual meaning.

$$Triode\ Region: I_{D,triode} = k_n[(V_{GS}-V_{th})V_{DS} - \frac{1}{2}V_{DS}^2]$$

Saturation Region: $I_{D,sat} = \frac{1}{2} k_n (V_{GS} - V_{th})^2$

ensuring the program can draw a *smooth* I-V curve with *proper x- and y-labels, legends*, along with the *title* of the graph, positioned at suitable places in the graph. Provide the Output Graph based on your Python program code. (5M) [CO: 2,3] [BTL:3]

3(b) Explain your understanding of transient simulation and process simulation with 1 example each. (2M) [CO: 2,3][BTL:3]

3(c) Explain your understanding about 'Binning', 'Binning Equations', and 'Noise Modelling'. (3M) [CO: 1,2] [BTL:2]

OR

3(c) A compact model uses binning based on channel length (L) and width (W). Devices with L < 0.1 µm and W < 0.2 µm use Parameter Set A. Devices with L ≥ 0.1 µm and W < 0.2 µm use Parameter Set B. Devices with L < 0.1 µm and W ≥ 0.2 µm use Parameter Set C. Devices with L ≥ 0.1 µm and W ≥ 0.2 µm use Parameter Set D. If a device has L = 0.08 µm and W = 0.15 µm, which parameter set is used? (3M) [CO: 2,3] [BTL:3]

Qus 4(a) Develop a Python program to plot the reverse biased p-n diode capacitance variation (or C-V characteristics) q=e, N_A=1x10^{17} cm^{-3}=N_D, V_{bi}=0.7 V) region using the equations below. The symbols/constants in the equation have their usual meaning.

$$\textit{Depletion Width: } W_d = \sqrt{\frac{2\varepsilon(V_{bi} + V_R)}{q}\left(\frac{1}{N_A} + \frac{1}{N_D}\right)}$$

$$\textit{Junction Capacitance: } C_j = \frac{\in A}{W_d}$$

ensuring the program can draw a *smooth* C-V curve with *proper x- and y-labels, with units, legends*, along with the *title* of the graph, positioned at suitable places in the graph. Provide the Output Graph based on your Python program code. (4.5M) [CO: 2,3] [BTL:3]

OR

4(a) Present a comparative tabular analysis of industry-based standard compact models of BSIM-BULK/CMG/IMG, and ASM-HEMT. Also illuminate current challenges & future trends of these models with concluding remarks on these models. (4.5M) [CO: 1,2] [BTL:1]

4 (b) An intrinsic MOSFET has a gate capacitance (C_g) of 20 fF. Due to the layout, there is a parasitic capacitance (C_p) of 5 fF in parallel with the gate capacitance. Calulate the total effective capacitance seen at the gate terminal. (2.5M) [CO: 3] [BTL:4]

4(c) A compact model has a model parameter Mobility = 300 cm^2/Vs. An instance of this device in a circuit netlist is defined with an instance parameter M = 2, which is a multiplier for the effective width (W_{eff} = W * M). If the intrinsic model uses the Mobility parameter directly in current calculations, and the device instance has W = 0.5 µm and the instance parameter M = 2, how does the effective width used in the model differ from the drawn width? (3M) [CO: 3] [BTL:4]

Qus. 5 (a) Explain your understanding about key criteria of a good MTJ compact model. (2M) [CO: 1, 2] [BTL:2]

5 (b) Write down the following equations in the context of compact modelling

(i) LLGS Equation. (2M) [CO: 2] [BTL:2]

(ii) L-k Equation (2M) [CO: 2] [BTL:2]

(iii) Any one equation related to the tunnel resistance model (1M) [CO: 2] [BTL:2]

5 (c) Write down key problems in STT-MRAM compact modelling and scope for their improvement. (3M) [CO:1] [BTL:2]

END OF QUESTION PAPER

Total No. of Pages: 2 *Roll No. .....*

SIXTH SEMESTER B.Tech. [EP]

END-SEMESTER EXAMINATION (MAY-2025)

EP—326--Advanced Chiplets Packaging and Reliability Engineering

Time: 3 Hours *Max. Marks: 50*

Note: Attempt all the questions except where choices are given.
All questions carry equal Marks, 10 for each question. Assume suitable missing data, if any
Read questions carefully, and write relevant answers only

Qus. 1 (a) Explain the role of organic substrates in chiplet heterogeneous integration (CHI), highlighting their significance with examples. Discuss their key benefits, applications, and associated challenges in CHI systems. (4M) [CO: 1, 2] [BTL:1, 2]

1 (b) Explain hybrid bonding and FOWLP as the advanced packaging technologies used with CHI. Also, discuss the challenge of "interconnect-complexity" in the context of CHI. (3M) [CO: 2] [BTL:2]

OR

1 (b) A silicon chiplet (αSi=2.5 ppm/°) is bonded to an organic substrate (αsub=18 ppm/). Calculate the stress if the temperature rises by 200°C (Young's modulus =150) (3M) [CO: 2] [BTL:2]

1 (c) A TSV has a diameter of 10 μm, height of 45 μm, and SiO_2 dielectric (εr=2.). Calculate its parasitic capacitance. (3M) [CO: 4] [BTL:1]

Qus. 2(a) Define 2D, 2.1D, and 2.3D chiplet heterogeneous integration and differentiate each on the basis of the interconnect used. (4M) [CO:1, 3] [BTL:1, 2]

OR

2 (a) Write down the possible advantages and challenges of each 2D, 2.1D, and 2.3D chiplet heterogeneous integration packaging. (4M) [CO: 2, 4] [BTL:1]

2 (b) Identify key obstacles OSATs and foundries encounter when upgrading infrastructure for advanced packaging technologies. Also discuss panel-level packaging and glass substrates? (3M) [CO: 2, 4] [BTL:1]

2 (c) Two parallel interconnects on a chiplet have a mutual capacitance of 25 fF. If one interconnect switches from 0 V to 1 V in 50 ps, calculate the crosstalk noise voltage induced on the adjacent line. (3M) [CO: 2, 4] [BTL:1,2]

Qus. 3 (a) Discuss the relevant laser technologies for 2.5D and 3D packaging. (3M) [CO: 2,3][BTL:3]

Total No. of Pages: 2

Roll No. .....

SIXTH SEMESTER

B.Tech. [EP]

END-SEMESTER EXAMINATION

(MAY-2025)

EP—326--Advanced Chiplets Packaging and Reliability Engineering

Time: 3 Hours

Max. Marks: 50

Note: Attempt all the questions except where choices are given.
All questions carry equal Marks, 10 for each question. Assume suitable missing data, if any
Read questions carefully, and write relevant answers only

Qus. 1 (a) Explain the role of organic substrates in chiplet heterogeneous integration (CHI), highlighting their significance with examples. Discuss their key benefits, applications, and associated challenges in CHI systems. (4M) [CO: 1, 2] [BTL:1, 2]

1 (b) Explain hybrid bonding and FOWLP as the advanced packaging technologies used with CHI. Also, discuss the challenge of "interconnect-complexity" in the context of CHI. (3M) [CO: 2] [BTL:2]

OR

1 (b) A silicon chiplet (αSi=2.5 ppm/°) is bonded to an organic substrate (αsub=18 ppm/). Calculate the stress if the temperature rises by 200°C (Young's modulus =150) (3M) [CO: 2] [BTL:2]

1 (c) A TSV has a diameter of 10 μm, height of 45 μm, and SiO_2 dielectric (εr=2.). Calculate its parasitic capacitance. (3M) [CO: 4] [BTL:1]

Qus. 2(a) Define 2D, 2.1D, and 2.3D chiplet heterogeneous integration and differentiate each on the basis of the interconnect used. (4M) [CO:1, 3] [BTL:1, 2]

OR

2 (a) Write down the possible advantages and challenges of each 2D, 2.1D, and 2.3D chiplet heterogeneous integration packaging. (4M) [CO: 2, 4] [BTL:1]

2 (b) Identify key obstacles OSATs and foundries encounter when upgrading infrastructure for advanced packaging technologies. Also discuss panel-level packaging and glass substrates? (3M) [CO: 2, 4] [BTL:1]

2 (c) Two parallel interconnects on a chiplet have a mutual capacitance of 25 fF. If one interconnect switches from 0 V to 1 V in 50 ps, calculate the crosstalk noise voltage induced on the adjacent line. (3M) [CO: 2, 4] [BTL:1,2]

Qus. 3 (a) Discuss the relevant laser technologies for 2.5D and 3D packaging. (3M) [CO: 2,3] [BTL:3]

3 (b) Explain your comprehension of 3D-chip architecture and list its limitations. What are the environmental benefits and possible future of chiplets and advanced packaging? (3.5M)[CO: 2,3] [BTL:3]

3 (c) Explain your understanding of co-packaged optics and silicon photonics and their relation to chiplets and advanced packaging. (3.5M) [CO: 3,4] [BTL:3]

Qus. 4 (a) Two chiplets (Chip A: 25 W, Chip B: 20 W) are placed 4 mm apart on a substrate. The thermal resistance from Chip A to ambient is 0.3°C/W, and from Chip B to ambient is 0.8°C/W. Their mutual thermal coupling resistance is 0.15°C/W. Calculate the junction temperatures of both chiplets at 25°C ambient. (3M) [CO: 1, 4] [BTL:3]

4 (b) What do you understand by condition monitoring? How AI and ML pluy vital roles in condition monitoring? Discuss the data collections used in the condition monitoring process. (3M) [CO: 2, 4] [BTL:1]

Qus. 4 (c) Write down the full forms of <u>any 8</u> acronyms
DAHI, DBS, PDN, ABB, FMEA, EM, ECC, TDDB, HTOL, HAST, MTBF, FIT, EFR (4M) [CO: 2, 3] [BTL:2]

Qus. 5 (a) Write down PHM implementation challenges and future trends in PHM in the context of advanced chiplets. (3.5M) [CO: 3] [BTL:3]

OR

5 (a) What do you understand by PHM? Write down key activities within PHM and how they relate to degradation and failure mechanisms of the advanced chiplets. (3.5M) [CO: 2] [BTL:3]

5 (b) Illustrate your understanding of degradation analysis of the advanced chiplets. Explain the use of AI, ML, and PHM for the degradation analysis of advanced chiplets. (3.5M)[CO: 2] [BTL:3]

5 (c) A chiplet has 700 interconnects with a defect rate of 0.15%. Using the Poisson model ($Y=e^{-\lambda}$), calculate the yield if 10% redundancy is added. (3M) [CO: 3] [BTL:3]

END OF QUESTION PAPER

Total no. of Pages: 3

Roll no.....

VIth SEMESTER **B.Tech. [EP,EE]**

END TERM EXAMINATION ***May-2025***

COURSE CODE: EP328 COURSE TITLE: Semiconductor Optoelectronics

Time: 03:00 Hours ***Max. Marks: 50***

Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1. With the help of appropriate equations and diagrams, explain the origin of band gaps in semiconductors. What's the significance of the E-k diagram of a material? [5][CO1][L2]

Q.2. Consider an n-type semiconductor at temperature T=300 K. The conduction band edge is at an energy $E_c = 0$ eV and the Fermi level is located at $E_F = 0.25$ eV. Assume the effective mass of electrons is $m_e^* = 0.1\ m_0$, where m_0 is the free electron mass.

(a) Write the expression for the density of states in the conduction band for $E > E_c$, and calculate $\rho(E)$ at E=0.1 eV.

(b) Using the Fermi-Dirac distribution, calculate the probability that a state at E = 0.1 eV is occupied. [5][CO1][L3]

Q.3. A solid-state laser operates at a peak emission wavelength of 0.62 μm and has a refractive index of 1.65.

(a) Derive an expression for the frequency spacing (mode separation) between adjacent longitudinal modes in terms of the laser cavity length.

(b) If the total number of longitudinal modes supported within the gain bandwidth is 2.5×10^8, calculate the required length of the laser cavity. [5][CO2][L3]

Q.4. What are optoelectronic integrated circuits (OEICs) ? Discuss any two applications of optoelectronic integrated circuits? [5][CO5][L2]

OR

Discuss the working principle of an Electro-Absorption Modulator with appropriate diagrams and equations. [5][CO4][L2]

Q.5. Derive the expression of the internal power generated in an LED in terms of the drive current and internal quantum efficiency. Analyze the Power versus Drive Current characteristics of an LED. [5][CO2][L4]

Q.6. A solar cell is tested under standard conditions and exhibits a short-circuit current of 5 A, while the current and voltage at the MPP are 4.5 A and 0.5 V respectively. The fill factor (FF) of the cell is given as 0.75. The solar irradiance incident on the cell is 1000 W/m², and the area of the cell is 150 cm². Calculate:

(a) the open-circuit voltage, V_{oc}, of the cell

(b) Power conversion efficiency (PCE) of the cell [5][CO4][L3,L4]

Q.7. With the help of proper diagrams, elaborate the working of a photodetector showing clearly the drift, diffusion and the no-field zone. Why are PIN photodiodes preferred over PN photodiodes? [5][CO3][L2,3]

OR

Explain the factors on which the speed of a photodetector depends with appropriate equations and diagrams. [5][CO3][L2,3]

Q.8. A photodiode has a quantum efficiency of 70% when photons of energy 1.5×10^{-19} J are incident upon it.

Total no. of Pages: 01 *Roll no.....*

VIII_SEMESTER

B.Tech.

END TERM EXAMINATION *May-2025*

COURSE CODE: EP414

COURSE TITLE: Space and Atmospheric Sciences II

Time: 03:00 Hours *Max. Marks: 50*

Note : All questions carry equal marks.

Assume suitable missing data, if any.

Q.1 List any five types of aerosols on the basis of source. [10][CO2][L1,L2]

Q.2 What is Thunderstorm. Explain the electrical structure of a thunderstorm. [10][CO4][L3,L4]

Q.3 What do you understand by the term RADAR. Explain the transmitting and receiving antenna system of a radar. [10][CO4][L1,L4]

Q.4 What do you understand by Environmental pollution. List any five types of pollutions and their control measures. [10][CO2][L1,L2]

Q.5 With the help of a diagram explain the direct and indirect impact of aerosols. [10] [CO4][L1,L4]

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SECOND SEMESTER
END-TERM EXAMINATION B.Tech.(Env. Engg.)
MAY- 2025
EN- 102 ENVIRONMENTAL AWARENESS
Duration: 3:00 Hrs. Maximum Marks: 50
Note: Attempt *ANY FIVE* questions.

Assume suitable missing data, if any.

		Marks	CO	BTL
Q.1(a)	Define environmental justice. List any three environmental acts in India that aim to protect the environment.	5	1	1
(b)	What is the Convention on Biological Diversity (CBD)? Briefly define the Biodiversity Act in India and state its primary objectives.	5	1	1
Q.2(a)	Explain the main goals, structure, and powers of the National Green Tribunal (NGT)? Give a local example of how it can help resolve an environmental issue.	5	2	2
(b)	Describe the role of CITES in regulating international wildlife trade. How does CITES work with national governments to ensure that the trade of endangered species is controlled and monitored?	5	2	2
Q.3(a)	How does the Montreal Protocol combat ozone depletion, and what steps can your country take to support its goals	5	3	3
(b)	Define sustainable development along with its major pillars. Also, describe any three Sustainable Development Goals that can be applied to promote a sustainable future for any nation.	5	3	3
Q.4(a)	Analyze how India's legal framework supports environmental justice. Compare the roles of the judiciary, statutory bodies like the CPCB, and environmental laws in ensuring fair treatment and protection for all citizens.	5	4	4
(b)	How economic growth is linked to environmental degradation, and how can tools like pollution taxes or tradable permits help reduce the impact?	5	4	4

Q.5(a) Evaluate the effectiveness of ISO 14000 standards in promoting sustainable environmental management practices in industries. Do ISO 14000 standards effectively promote sustainable practices in industries, or are they mainly for corporate image? Justify your view. 5 5 5

(b) Critically assess how the Indian Forest Act of 1927 and the Forest Conservation Act of 1980 work together to manage forests and address deforestation in India. 5 5 5

Q.6. **Write short notes on any two:**

(a) Basel Convention 5
(b) Ecotourism 5
(c) EIA Notification 2006 5

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Total no. of Pages: 02 Roll no.....

SECOND SEMESTER B.Tech

END TERM EXAMINATION May-2025

EN-104 BASIC ENVIRONMENTAL ENGINERING

Time: 03:00 Hours Max. Marks: 50

Note : All questions carry equal marks.
Attempt any five questions.
Assume suitable missing data, if any.

Q.1 (a) Explain the process of determining the total water requirement for a town when designing a water supply scheme to ensure adequacy and sustainability. [5][CO4][BTL3]

(b) Evaluate the role of CFCs in ozone depletion and assess the long-term environmental consequences of their impact on the ozone layer. [5][CO3][BTL5]

Q.2 (a) Analyse the physical, chemical, and biological characteristics of wastewater and identify how each aspect influences the treatment process, providing relevant examples. [5][CO2][BTL4]

(b) Explain the working of trickling filters used for treatment of industrial waste water. [5][CO5][BTL2]

Q.3 (a) Design a comprehensive water supply system model that addresses the key factors influencing water demand in urban and rural areas. [5][CO4] [BTL6]

(b) Differentiate between hazardous and non-hazardous industrial solid

waste. Discuss the characteristics that, if exhibited by solid waste, designated it as a hazardous waste. [5][CO2][BTL4]

Q.4 (a) Define green house effect and global warming. What are the environmental consequences of global warming? Discuss. [5][CO3][BTL1]

(b) Evaluate the effectiveness of the activated sludge process for treating industrial wastewater and assess factors that impact its performance. [5][CO5][BTL5]

Q.5 (a) Define noise pollution. Analyse its long-term effects on human health, as well as its impact on wildlife and ecosystems. [5][CO5][BTL4]

(b) Demonstrate the construction of landfill liner system for industrial waste. Also explain the functional requirement of landfill liner system. [5][CO2][BTL1]

Q.6 (a) Analyse the role of industrial emissions in acid rain formation and assess its environmental, health, and infrastructural impacts. [5][CO3][BTL4]

(b) List the various sources of water suitable for large-scale supply, highlighting the expected quality of water from each source and the necessary treatment processes. [5][CO4][BTL1]

Q.7 Write short notes on

(a) Coagulation [2.5][CO1] [BTL2]

(b) Incineration [2.5][CO4] [BTL1]

(c) Oxygen sag curve [2.5][CO1] [BTL2]

(d) Septic Tank [2.5][CO5] [BTL1]

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Total No. of Pages 2

Roll no.....

Fourth Semester B.Tech. (Environmental Engineering)

END TERM EXAMINATION MAY-2025

EN 202n: Fluid Mechanics & Hydraulic Machines

Time: 3:00 Hours *Max. Marks: 40*

Note: Answer any five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 (a) Describe pressure head? Why is the pressure head expressed in terms of height of liquid column used, for all engineering problems? [2] [CO1, L_1]

(b) Find the depth of liquid having a specific gravity of 1.25 which will produce pressure intensity of $50\,N/cm^2$. Take $g = 10\,m/sec^2$. [3] [CO1, L_3]

(c) Find the total pressure on a rectangular surface $0.6\,m \times 1.0\,m$ placed vertically in water with its shorter edge horizontal. The upper edge being $3.0\,m$ below the free surface of water. [3] [CO2, L_3]

Q.2 (a) Describe a venturimeter with a neat sketch and explain why diverging side is not used for discharge measurement. [3] [CO3, L_1]

(b) Calculate the flow of water in *litre/sec* through a $40\,cm \times 15\,cm$ horizontal venturimeter when the differential manometer connected to the inlet and its throat shows a reading of $25\,cm$ of H_g. Assume coefficient of discharge $C_d = 0.98$ and specific gravity of $H_g = 13.6$. [5] [CO3, L_3]

Q.3 (a) Describe equivalent size of a compound pipe? [3] [CO4, L_2]

(b) A $15\,cm$ diameter G.I. pipe laid horizontally for carrying water shows a drop of $7.7\,m$ per $1000\,m$ in the hydraulic gradient. Find the discharge in *litre/sec*, if Reynold's number $R_e = 1600$. [5] [CO4, L_3]

Q.4 (a) Describe specific energy of flow in an open channel? State in terms of an equation. [3] [CO4, L_2]

(b) Estimate the discharge in *litres/day* in a trapezoidal channel of 2 *m* wide base with side slope 1 *in* 1 and a longitudinal slope 1 *in* 1000 when the depth of water in channel is 45 *m*. Take the value of *C* in Chazy's formula as 60. [5] [CO4, L3]

Q.5 (a) Describe Pelton wheel turbine runner with the help of neat sketch. [3] [CO5, L1]

(b) A city has a population of 1.5 *lac*. Water is to be supplied at the rate of 160 *litres* per capita per day. If the static head of the pump is 40 *m*, calculate the electric power of the motor when rising main is 300 *m* long and its diameter is 50 *cm*. Assume electric motor efficiency as 0.85 and pump efficiency as 0.60. Take coefficient of friction $f = 0.01$ and peak demand as 1.5 *times* the average demand. [5] [CO5, L3]

Q.6 Answer the followings: [4 x 2]

(a) State and prove Archimedes principle. Give examples. [CO1, L2]

(b) Describe the three basic equations from which any problem of fluid in motion can be analysed and solved. Give their expressions. [CO2, L2]

(c) Explain Reynold's number and Froude's number. Give their expression. [CO4, L2]

(d) Show that in order to get more force by a jet impinging tangentially on a fixed curved plate, the curvature of the plate should be such that the outlet angle is an obtuse angle. [CO5, L3]

Total no. of Pages 03

Roll no.....

FOURTH SEMESTER

B. Tech.

END TERM EXAMINATION

May 2025

EN204n AIR POLLUTION AND CONTROL

Time: 3:00 Hours

Max. Marks: 40

Note : Q.7 is compulsory. Attempt any five from the rest.
Assume suitable missing data, if any.

Q.1 (a) Answer the following:

(i) Differentiate between "Hazardous air pollutants" and "Criteria air pollutants".

(ii) For legal compliance of PM, one of the following sampling methods is used:

(a) Grab (b) Continuous (c) Intermittent (d) Integrated

(iii) In elevated inversion condition, the fumigation plume occurs if:

(a) Stack height < Mixing height (b) Stack height > Mixing height
(c) Stack height = Mixing height (d) None of these

[1x3] [CO1][L4,1,3]

(b) Explain the cause and effects of "Inversion of atmosphere".

[3] [CO1][L2]

Q. 2 (a) What are the final chemical forms to which SO_2 and NO_2 convert after reacting with water vapors in ambient air? Explain with equations.

[3] [CO4][CO5][L2]

(b) Write explanatory notes on: Duration of air sampling and location of sampling sites.

[3] [CO2][CO1][L2]

Q.3 (a) Under what conditions the Gaussian dispersion equation for a continuous point source is valid?

[3][CO2][L1]

(b) What is Dry Adiabatic Lapse Rate and show by derivation that Dry Adiabatic Lapse Rate is -1°C/100m.

[3][CO1][L2]

Q.4. (a) 189 g/s of SO_2 is emitted from a stack that is 39.6 m high. What is the SO_2 concentration in μgm^{-3} at a receptor located 1 km downwind, 100 m crosswind from the plume centerline and 50 m above ground? Use the following information: Plume rise at 1 km is 225 m, wind speed at the emission height = 4.02 m/s. Stability class is B having dispersion in the vertical and crosswind directions as 300 m and 220 m respectively.
[3][CO4][L6]

(b) If σ_z = 120 m, at what vertical distance above or below the emission plume centerline will the pollutant concentration be ~15% of the concentration at plume centerline? [3][CO3][L6]

Q.5. What if the stability class of the atmosphere when the measured ambient temperature gradients are as follows:

(i) -25°C per 1000 m of altitude
(ii) +25°C per 1000 m of altitude
(iii) -6°C per 1000 m of altitude
(iv) -10°C per 1000 m of altitude
(v) +5°C per 1000 m of altitude
(vi) No change in temperature with altitude

[6] [CO5][L4]

Q.6. Attempt any two:

(a) Under which conditions should Electrostatic Precipitator be employed as a control device?

(b) Differentiate between the following forms of air pollution control:
i. Strategic Control
ii. Tactical Control
iii. Engineering Control

(c) Explain the principles of absorption and adsorption in controlling gaseous pollutants. Compare their mechanisms, advantages, and limitations.

(d) Discuss the role of air-fuel ratio control in reducing emissions from automobiles. Explain how optimizing air-fuel ratio can improve fuel efficiency and reduce carbon dioxide emissions from internal combustion engines. [3x2][CO2][L2,3]

Q.7 A 1000 MW power plant burns 10,000 metric tons of 1.5% sulphur coal per day. The flue gas are emitted into the atmosphere at the rate of 200 g/s through a stack whose height is 200 m. The diameter of the stack at the plume exit is 5 m. The velocity and the temperature of the plume at the exit are 10 m/s and 120 °C, respectively. What is the downwind SO_2 concentration in the plume centerline on the ground at a distance of 5 km on a thin overcast night. Assume that the ambient air temperature is 15 °C, the wind speed at the stack altitude is 6 m/s, dispersion in the vertical and crosswind directions as 320 m and 200 m respectively. [10] [CO5][L6]

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FOURTH SEMESTER B.Tech. (EN)

END-TERM EXAMINATION May 2025

EN-206N REMOTE SENSING & GEOGRAPHICAL INFORMATION SYSTEM

Duration: 3 Hours Maximum Marks: 40

Note: Assume suitable missing data.
All questions are compulsory and carry equal marks.

	Marks	CO#	BTL#
Q. 1 Attempt the following			
a. Describe spatial, spectral, radiometric, and temporal resolutions and their role in image acquisition.	4	CO1	L2
b. Explain the basic architecture and components of GIS.	4	CO1	L2
Q. 2 Attempt the following			
a. Apply visual interpretation techniques to extract features from aerial images.	4	CO2	L3
b. Use remote sensing techniques to support environmental applications for agricultural assessment.	4	CO2	L3
Q. 3 Attempt the following			
a. Compare preprocessing techniques (geometric vs. radiometric correction) and assess their impact on image quality.	4	CO3	L4
b. Analyze how raster and vector data integration supports comprehensive spatial modeling.	4	CO3	L4
Q. 4 Attempt the following			
a. Evaluate the effectiveness of different remote sensing platforms for environmental monitoring.	4	CO4	L5
b. Evaluate the effectiveness of RS-GIS integration in achieving spatial analysis objectives.	4	CO4	L5
Q.5 Attempt ANY ONE of the following			
a. Develop a workflow for visual image interpretation specific to land use change monitoring.	8	CO5	L6
b. Develop a case-based geospatial solution for addressing socio-economic OR transportation issues (ANY ONE) using RS-GIS integration.	8	CO5	L6

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Total no. of Pages: 01 *Roll no.....*

IV semester

B.Tech Environmental Engineering

End Semester Examination May 2025

EN 208 Solid Waste Management

Duration: 3 Hours Max. Marks 40

Note: Each question carry 8 marks. Answer any five questions

1. Write brief notes on:

a. Material recovery facility (CO3) (L1)

b. Legacy waste (CO4) (L2)

2. What are various types of solid waste? Give example for each type. (CO2)(L3)

3. What are the properties of hazardous substances? Give example for each such properties and explain when a waste can be called hazardous waste. Give examples. (CO3)(L3)

4. What is integrated waste management. Use one type of solid waste to illustrate application of circular economy in WM. (CO4)(L1)

5. Critically comment on n SWM cluster concept with examples Comment on SWM system being used in Delhi. (CO2) (L2)

6. Critically examine the various steps involved in 2016 SWM rules and modifications in rules from time to time. Give examples for each such step. (CO5) (L2)

7. Write notes on

a. Various types of energy recovery from SW (CO5) (L3)

b. Legacy waste (CO5)(L2)

8. Examine role of SBM in ISWM plans. Comment on limitations of this activities.. (CO2) (L2)

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Total no. of Pages: 02 Roll no.....

IV & VI - SEMESTER B.Tech.(Env. Engg.)

END-TERM EXAMINATION May-2025

EN-210n Wastewater Engineering: Design and Applications

Duration: 3:00 Hours Maximum Marks: 40

Note: All questions are compulsory.
Assume suitable missing data, if any.

Q1(a) Explain the principal and design of primary sedimentation tank. [4][CO1][L2]

(b) Design the screen for a sewage treatment plant treating a peak flow of 75 million litres per day of sewage. [4][CO1][L3]

Q 2 A single stage trickling filter for a loading of 12000kg of BOD in a raw sewage per hectare metre & the recirculation ratio is 1. If it is to treat a raw sewage of 5Ml/d having BOD of 250mg/l. Calculate the efficiency and BOD concentration in the effluent if 35% of BOD is remove in primary clarifier. [4][CO3][L3]

(b) Demonstrate the functioning of the conventional activated sludge process (ASP) by labelling each stage in a flow diagram. [4][CO2][L3]

Q3(a) An Average operating Data for conventional Activated Sludge treatment plant is as follows:

1) Wastewater flow=40000 Cubic Meter/day
2) Volume of aeration tank =10500 Cubic meter
3) Influent BOD=250 mg/l
4) Effluent BOD=40 mg/l
5) Mixed Liquor Suspended Solids(MLSS)=2500 mg/l
6) Effluent suspended solids=30 mg/l
7) Waste sludge suspended solids=9500 mg/l
8) Quantity of waste sludge= 250 m^3/day

Based on data above, determine.

(a)Aeration Period(hrs)
(b) Food to micro-organisms (F/M) (kg BOD per day/kg MLSS)
(c)Percentage efficiency of BOD removal
(d) Sludge age (days).

OR

Design the dimensions of a septic tank for a small colony of 160 persons provided with an assured water-supply from the municipal head-works at a rate of 120 litres per person per day. Assume any data, you may need. [5][CO2,CO4][L3]

(b) Build a comparison of septic tanks and Imhoff tanks, analysing their scope, function, and overall performance in the context of wastewater treatment. [3][CO2][L5]

Q4(a) Design a digestion tank for the primary sludge with the help of following data: [4][CO4][L6]

(i) Average flow=300 Mld ;
(ii) Total Suspended Solids in raw sewage =320 mg/l;
(iii) Moisture Content of digested sludge=85%
(iv) Solid removed in primary tank = 65%
(v) Moisture content of fresh sludge = 95%

(b) Sedimentation tank is treating 5 Million litres of sewage per day containing 250mg/l of suspended solids. The tank removes 50% of suspended solids. Calculate the quantity of sludge produced per day in bulk and weight if moisture content of sludge is 95%. [4][CO4][L3]

Q5 Design a circular sewer at a slope of 1 in 500 when it is running half full and with a velocity of 1.9 m/s. used Manning's formula and n = 0.012. At d/D = 0.5, v/V = 1.0, q/Q = 0.50, p/P = 0.5, a/A = 0.5 & r/R = 1.0 respectivly. [5][CO5][L6]

(b) Illustrate any one of the following: -

(i) O & M of wastewater treatment plant
(ii) Concept of common effluent treatment plant(CETP)
(iii) Concept of zero discharge.

[3][CO5][L4]

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Total no. of Pages: 01 *Roll no.....*

6th semester

B.Tech Environmental Engineering

End Semester Examination **May 2025**

EN 302 Solid Waste Management

Duration: 3 Hours **Max. Marks 40**

Note: Each question carry 8 marks. Answer any five questions

1. Write brief notes on:

a. Waste hierchy (CO1) (L1)

b. Legacy waste (CO4) (L2)

2. What are various classifications of solid waste? Give example for each one. CO2) (L3)

3. What are the properties of any waste to be called as hazardous? Give example for each such properties. (CO3) (L3)

4. Analyse the role of circular economy concept in integrated waste management. Use one type of solid waste to illustrate your arguments. (CO4)(L1)

5. Critically comment on Material recovery facility in SWM plan s Give examples for SWM system being used in Delhi. (CO2) (L2)

6. Critically examine the various steps involved in 2016 SWM rules and modifications in rules from time to time. Give examples for each such step. (CO5) (L2)

7. Write notes on

a. Waste to Energy with examples (CO5) (L3)

b. Land fill site selection criteria (CO5)(L2)

8. Examine the concept of SBM and outline limitation in practical implementations of the scheme using at least two urban bodies (CO2) (L2)

Total No. of Page 3

Roll No. .....

Sixth Semester

B.Tech.

END SEMESTER EXAMINATION

EN304 Air Pollution & Control May 2025

Time: 3 Hours *Maximum Marks: 40*

Note: Answer any 4 questions.
Question no.1 is compulsory.
All the questions carry equal marks.
Assume suitable missing data, if any.

1. Explain any five of the following: [M 10] [CO#1, 2] [BTL# 1,2]
   (a) Mixing depth
   (b) Secondary meteorological parameters
   (c) Radiation inversion
   (d) Wind rose diagram
   (e) NCAP
   (f) Significance of Section 19.1 of the Air Act
   (g) Advantages of the cyclone separator
   (h) Liquid particulates

2. (a) Calculate the effective height of a stack by using Holland's equation under the following conditions [M 5] [CO#3] [BTL# 3]
   Physical stack is 200 m tall with a 0.85 m inside diameter.
   Wind velocity is 3.75 m/s
   Air temperature is 30 0C
   Barometric pressure is 1000 millibars
   Stack gas velocity is 10.12 m/s
   Stack gas temperature is 150 ^{0}C
   (b) Discuss the advantages and disadvantages of wet collectors. [M 5] [CO# 3] [BTL# 2]

3. (a) Calculate the standard deviation of horizontal and vertical plume concentration, if [M 5] [CO# 3] [BTL# 2]
   a = 120, b = 0.58, c = 65, x = 4, d = 0.52 and f = -6

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(b) What is the drawback of the Air Act, and how do sections 24,5 and 26 play a significant role in controlling the air pollution problem by any industry?
[M 5] [CO# 5] [BTL# 2]

4. (a) Draw and explain the stability class under the following conditions
[M 5] [CO# 2] [BTL# 2,3]

(i) DALR>NLR

(ii) ELR>DALR

(b) A coal-fired power plant releases particulates at the rate of 4.5 g/s at 180 °C. The stack height is 85 m. The stack diameter and stack gas velocity are 4 mt and 6 m/s, respectively. The atmospheric pressure is 1.003 bar. The wind speed at 10 m height from the ground is 2.05 m/s. Considering the atmospheric stability class F, estimate the ground level concentration at 2 km downwind distance. [M 5] [CO#3] [BTL# 4]

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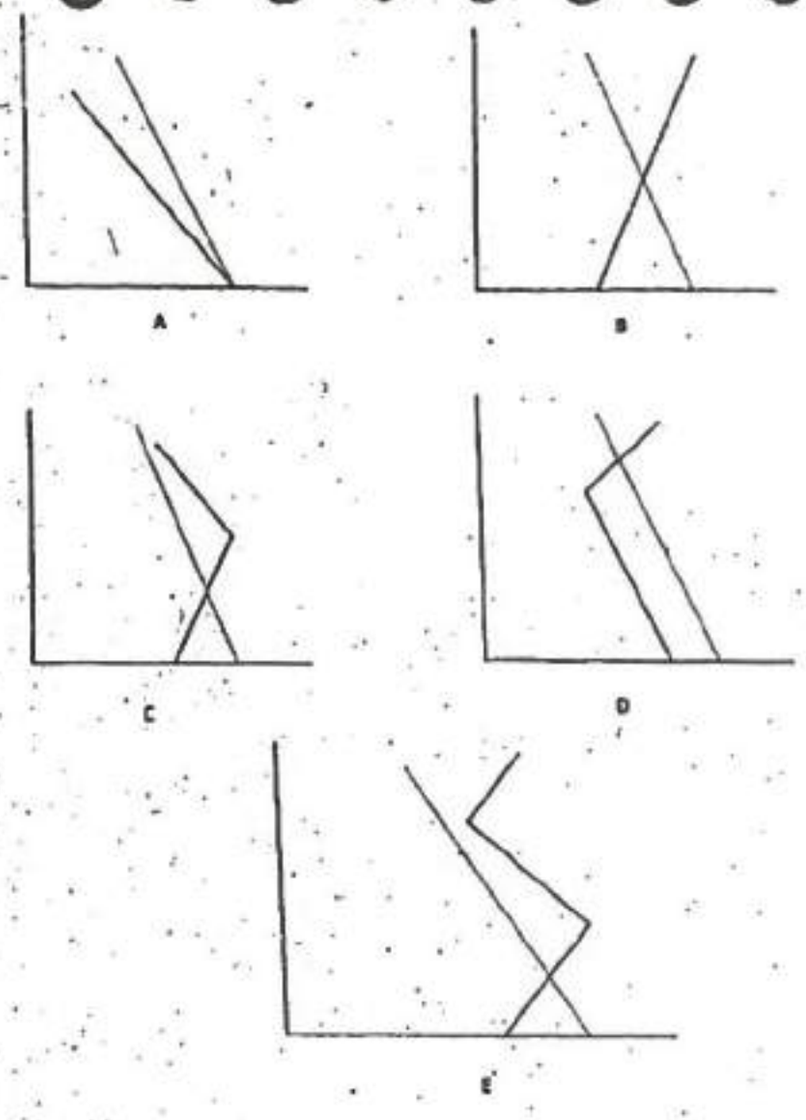
			x<1 km			x>1 km		
Stability	a	b	c	d	f	c	d	f
A	213	0.894	440.8	1.941	9.27	459.7	2.094	-9.6
B	156	0.894	106.6	1.149	3.3	108.2	1.098	2
C	104	0.894	61.0	0.911	0	61.0	0.911	0
D	68	0.894	33.2	0.725	-1.7	44.5	0.516	-13
E	50.5	0.894	22.8	0.678	-1.3	55.4	0.305	-34
F	34	0.894	14.35	0.740	-0.35	62.6	0.180	-48.6

5. (a) What are those objectives that an AQI in India can serve? Explain how to calculate it with the help of equations. [M 5] [CO# 2] [BTL# 2]

(b) Mention the common methods of control of gaseous pollutants and describe any two of them. [M 5] [CO#4] [BTL# 1, 2]

6. (a) What are the major pollutants found in Delhi's ambient air and list their associated human health risks of any two pollutants.
[M 5] [CO#1, 4] [BTL# 3]

(b) Describe the plume behaviour based on the following diagram
[M 5] [CO#2] [BTL# 1,2]



Total No. of Pages:- 03 *Roll No. .....*

VI - SEMESTER **B.Tech.(Env. Engg.)**

END-TERM EXAMINATION **May-2025**

EN306 HYDROLOGY & GROUNDWATER ENGINEERING

Duration: 3:00 Hours **Maximum Marks: 50**

Note: All questions are compulsory.

Assume suitable missing data, if any.

Q1(a) Explain the types of Precipitation. **[4][CO1,CO2][L2]**

(b) Tabulated below are the ordinates at 24 has interval for a hydrograph, the area of the catchment 4200 km^2. Separate the base flow from the total flow by any method & measure the depth of direct run-off. **[6][CO4][L5]**

Time (Days)	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Flow (m3/s)	50	700	630	450	265	160	110	96	70	65	58	52	44	30

Q 2 An isolated storm in a catchment produced a runoff of 4.0 cm. The mass curve of the average rainfall depth over the catchment was as below:

Time from beginning of the storm (h)	0	1	2	3	4	5	6
Accumulated average rainfall (cm)	0	0.50	1.65	3.55	5.65	6.80	7.85

Calculate the ϕ index for the storm. **[5][CO2][L3]**

(b) Define Rain gauge. Explain the working any one type of automatic rain gauge with diagram. **[5][CO2][L2]**

Q3(a) Illustrate Snyder's Method with diagram.

OR

Illustrate stream gauging & the types of streams gauging. **[4][CO1, CO4][L4]**

(b) The mean monthly rainfall & temperature of a catchment near Banglore are given below. Develop the rainfall run-off correlation equation for this catchment & also find the correlation coefficient and the value of K.

[6][CO2,CO3][L6]

Year	2000	2001	2002	2003	2004	2005	2006	2007
Annual rainfall (cm)	100	98	40	130	145	50	140	100
Yield (cm)	30	50	16	62.1	33.1	40.1	65	7.5

Q4(a) The ordinates of a 2-h unit hydrograph are given:-

Time (h)	0	2	4	6	8	10	12	14	16	18	20	22
2-h UH ordinate (m^3/s)	0	25	100	160	190	170	110	70	30	20	6	0

Drive and plot the ordinates of 6-h unit hydrograph. **[5][CO4][L6]**

(b) Flood-frequency computations for the river Chambal at Gandhisagar dam, by using Gumbel's yielded the following results:

Return Period T (years)	Peak flood (m^3/s)
50	30,500
100	35,100

Estimate the flood magnitude in this river with a return period of 500 years.

OR

Using 30 years data and Gumbel's method the flood magnitudes, for return periods of 100 and 50 years for a river are found to be 1500 and 1050 m3/s respectively. For N=30, the value of S_n = 1.1124 & Y_n = 0.5362.

(i)Determine the mean and standard deviation of the data used and

(ii)Estimate the magnitude of a flood with a return period of 500 years.

[5][CO3][L3]

Q5 Explain the following terms

a. Aquitard
b. Aquiclude
c. Aquifuge
d.Aquifer

[4][CO1,CO5][L2]

(b) A 30-cm well completely penetrates an unconfined aquifer of saturated depth 40 m. After a long period of pumping at a steady rate of 800 l/s, the drawdown in two observation wells 35 and 75 m from the pumping well were found to be 3.5 and 2.5 m respectively. Determine the transmissivity of the aquifer. What is the drawdown at the pumping well?

[6][CO5][L3]

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Total No. of pages: 01 *Roll No:*_____

EVEN SEMESTER

B. Tech.

END-TERM EXAMINATION

May 2025

EN308 HAZARDOUS AND BIOMEDICAL WASTE MANAGEMENT

Duration: 3 Hours Maximum Marks: 50

Note: Assume suitable missing data.

All questions are compulsory and carry equal marks.

	Marks	CO#	BTL#
Q. 1 Attempt the following			
a. Explain the different types of hazardous waste based on classification.	5	CO1	L2
b. Define e-waste and identify its major sources.	5	CO1	L2
Q. 2 Attempt the following			
a. Apply disposal methods for low-level and high-level radioactive wastes.	5	CO2	L3
b. Apply biomedical waste classification in healthcare facilities.	5	CO2	L3
Q. 3 Attempt the following			
a. Interpret the relevance of the Basel Convention in analyzing global hazardous waste issues.	5	CO3	L4
b. Identify the components in e-waste that contribute to environmental pollution.	5	CO3	L4
Q. 4 Attempt the following			
a. Evaluate public awareness and enforcement mechanisms for e-waste management.	5	CO4	L5
b. Compare the treatment methods - incineration and autoclaving - based on health risk and environmental safety.	5	CO4	L5
Q.5 Attempt ANY ONE of the following			
a. Develop a cradle-to-grave hazardous waste tracking framework.	10	CO5	L6
b. Develop a safety training module for radioactive waste handlers.	10	CO5	L6

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Six Semester

Roll No. .....
B.Tech.

END TERM EXAMINATION
MAY 2025
EN 316 Environmental Law and Policy

Time: 3:00 Hours

Maximum Marks: 50

Note: Attempt any five questions.
Question no. 7 is compulsory.
All questions carry equal marks.

1. Which sections of Wildlife Protection Act represents different conditions where hunting of wildlife animals are allowed, describe those conditions also. In addition to this, also discuss about Wild Life Advisory Board, their constitution and functions. [M 10] [CO#1, 2] [BTL# 3]
2. Write the powers of central government with reference to EPA. What is the significance of Section 8.2, 9.3, 12 and 14 under EPA. [M 10] [CO#1] [BTL# 2]
3. What are the drawbacks of Air Act? Which section of Water Act deals with the constitution of CPCB members, explain the hierarchy in detail. Write the significance of section 16-A of water act. [M 10] [CO# 2] [BTL# 4]
4. Describe in detail about the constitution and functions of Central Zoo Authority. Throw some light on the powers of the state government regarding Forest Conservation Act. [M 10] [CO# 3] [BTL# 4]
5. Discuss the functions and limitations of NGT along with a detailed Landmark Judgement case. [M 10] [CO# 3] [BTL# 4]
6. What are the major threats to Tigers in India and what kind of strategies have been taken by Indian Government to protect them. [M 10] [CO# 2] [BTL# 3]

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7. Write short notes on any two of the followings: [M 10] [CO#1] [BTL# 2]

a) National Elephant Action Plan

b) Types of Rights under FRA

c) Challenges in Implementation of Bio-Medical Waste Management Rules in India

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Eight Semester

Roll No. .....

B.Tech.

END SEMESTER EXAMINATION
May 2025

EN – 404 Environmental Impact Assessment & Audit

Time: 3 Hours

Maximum Marks: 50

Note: Attempt any 5 questions. All questions carry equal marks. Question no. 1 is compulsory.

1. Answer any five questions in brief: **[M 10] [CO#1] [BTL# 1,2]**

   (a) EIS

   (b) Rapid EIA

   (c) Maas-balance approach

   (d) Audit protocol

   (e) AQI

   (f) Water budgeting

   (g) Ad-hoc Method for EIA

2. (a) Discuss the various factors that need to be considered in making assessment decisions. **[M 5] [CO#1,2] [BTL# 2]**

   (b) How will you assess the socio-economic impacts due to a highway development project in a medium-sized city in India? **[M 5] [CO#3] [BTL# 5]**

3. (a) How do the different analytical functions affect the EIA? **[M 5] [CO#1,2] [BTL# 1,2]**

(b) Discuss various phases involved using six-step conceptual model for the study of biological impacts of any developmental activity. **[M 5] [CO#3] [BTL# 2]**

4. (a) Rank the Impact interpretation and evaluation criteria for the selection of EIA methodology. **[M 5] [CO#2] [BTL# 4]**

(b) Suggest an EIA framework for the noise impact assessment in DTU. **[M 5] [CO#3] [BTL# 6]**

5. (a) Develop a generalized approach for assessing the impact of air pollution in Delhi. **[M 5] [CO#2,3] [BTL# 6]**

(b) Discuss how Remote Sensing can be advantageously used for EIA of Transportation projects. **[M 5] [CO#2] [BTL# 2]**

6. (a) Mention the general characteristics of non-point source water pollution. **[M 5] [CO#1] [BTL# 1]**

(b) Discuss the checklist method of impact assessment. **[M 5] [CO#3] [BTL# 2]**

7. (a) Based on your exposure to noise, suggest different methods to mitigate noise impacts in an urban city. **[M 5] [CO#3] [BTL# 3]**

(b) Discuss the significance of environmental standards in the context of EIA. **[M 5] [CO#4] [BTL# 2]**

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VI & VIII - SEMESTER

B.Tech.(Env. Engg.)

END-TERM EXAMINATION

May-2025

EN416 NON – CONVENTIONAL ENERGY SYSTEMS

Duration: 3:00 Hours

Maximum Marks: 50

Note: All questions are compulsory.

Assume suitable missing data, if any.

Q1(a) Compare solar photo-thermal system with photovoltaic system. [5][CO1,CO2][L5]

(b) What are the reason for variation in solar radiation reaching the earth than received at the outside of the atmosphere? [5][CO2][L3]

Q 2(a) Explain the tidal energy potential in India. [5][CO4][L2]

(b) Describe a rotor for relative low velocity wind. What are the advantages of vertical axis wind machines over horizontal axis wind machines? [5][CO3][L4]

Q3(a) What is the basic principal of Geothermal energy conversion? Describe the Main considerations in selection a site for Geothermal energy generators. [5][CO4][L2]

(b) Illustrate "Global Energy Crisis". [5][CO1,CO4][L4]

OR

Illustrate prospects of geothermal energy in context to India. [5][CO4][L4]

Q4(a) What is the basic principal of tidal energy conversion? Describe the Main considerations in selection a site for tidal energy generators. [4][CO1,CO5][L2]

(b) Compare Hydro-electric energy with tidal energy. [3][CO1,CO2][L5]

OR

Compare the techniques of collection of solar energy.

(c) Explain the tidal energy potential in India. [3][CO1][L2]

Q5(a) What is the basic principal of Nuclear energy conversion? Write the advantages & disadvantages of Nuclear energy. [5][CO1,CO5][L2]

(b) Illustrate present status and future possibilities of Nuclear energy. [5][CO1,CO5][L4]

Total No. of Pages 02 3°9 Roll No. .....

B.Tech (All) SIXTH/EIGHTH SEMESTER

End Term Examination (May-2025)

EV-302 Energy Storage Systems for Electric and Hybrid Vehicles

Time: 3 Hours *Maximum Marks: 40*

Note : Question No. 1 is compulsory. Answer Any FOUR questions from remaining.
Write your roll no. on question paper
Assume suitable missing data, if any.

[1] Answer in brief.

(a) List two differences between Li-ion and Li-Sulfur batteries.

(b) What is cycling stability in super capacitors?

(c) Define battery efficiency. How is it measured?

(d) Mention two critical performance parameters of super capacitors used in EVs

(d) Define parameterization in battery simulation.

(f) What are the main obstacles in commercializing fuel cell vehicles?

(g) What fuels are used in fuel cells, and what reaction occurs?

(h) What is a battery management system? [CO1,CO2,CO3,CO4] (1x8)

[2] (a) A battery for an electric scooter is rated at 48 V and 20 Ah.
Calculate
(i) the total energy stored in Wh and kWh.
(ii) If the motor runs at 800 W continuously, estimate how long it can operate.

(b) A battery has an internal resistance of 0.05 ohm and delivers 30 A current.
Calculate
(i) the voltage drop and power lost due to internal resistance.
(ii) If the open-circuit voltage (OCV) is 360 V, find the terminal voltage. (CO3) 4+4

[3] (a) Design a battery pack using Li-ion cells (Nominal voltage = 3.7 V, Capacity = 2.5 Ah each) to meet 5 kWh and 3 kWh output requirements.
(i) Determine the number of cells in series and parallel.
(ii) Calculate time for charging/discharging at C-rate, 0.5, 1, 2, and 3. (CO5) 4

(b) A supercapacitor bank has a total capacitance of 500 F charged to 48 V.
Calculate (i) the total energy stored.
(ii) Compare this to a battery storing 0.8 kWh. Which stores more energy? (CO3) 4

[4](a) Explain with help of neat diagram the structure, working principle and relevant half reactions of a Proton Exchange Membrane (PEM) fuel cell. (CO4) 4

(b) Discuss with help of a neat diagram Alkaline Fuel Cell (AFC) structure and its working principle. Why PEMFC is preferred over AFC? Explain Fuel cell I-V characteristics and efficiency curve. (CO4) 4

[5] (a) Explain the working of a hybrid electrochemical supercapacitor. (CO3) 4

(b) Describe the key factors influencing battery design in EVs and how its performance levels are determined. Write four steps of battery installation in an electric car.

(CO2) 4

[6] (a) What is the trade-off between battery energy density and safety? How is the energy density optimized without compromising safety in Lithium ion battery? Define State of Safety in Li-ion Battery.

(CO2) 4

(b) Explain with help of a schematic diagram and reaction operation of a Nickel Cadmium battery? What are its advantages and disadvantages?

(CO1,CO2) 4

7(a) You are CEO of a company and you have to expand your business abroad, which factors you will consider while deciding the location for expansion. 5[CO 4]

7(b) Consider the following data of a company, 'X' for the year 2023-24 5[CO4]

Fixed Cost= ₹ 20,00,000
Variable Cost per unit =₹ 1,00
Selling Price per unit = ₹ 2,00

Calculate the following

1) Break Even quantity and sales
2) If the actual production quantity is 60,000;
   i. Contribution
   ii. Margin of Safety Level.

Total Number of Pages: 04 Roll No.----------

Sixth Semester
B. Tech
HU-302- Engineering Economics
End Term Examination **May 2025**

Time: 3 Hour **Max. Marks: 50**

Note: Answer any five questions.
Assume suitable missing data, if any
Interest rate table is allowed

1(a) Distinguish between Microeconomics and Macroeconomics with examples. [CO2,CO3] [5]

1(b) In the design of a jet engine part, the designer has a choice of specifying either an aluminum alloy casting or a steel casting. Either material will provide equal service, but the aluminum casting will weigh 1.2 Kg. as compared with 1.35 Kg. for steel casting. The aluminum can be cost ₹ 80.00 per Kg. and the steel one for ₹ 35.00 per Kg. The cost of machining per unit is ₹ 150.00 for aluminum and ₹ 170.00 for steel. Every Kilogram of excess weight is associated with a penalty of ₹ 1300 due to increased fuel consumption. Which material should be specified and what is the economic advantage of the selection per unit? [CO2][2]

1(C) The chief engineer of refinery operation is not satisfied with the preliminary design for storage tanks to be used as part of a plant expansion programme. The engineer who submitted the design was called in and asked to reconsider the overall dimensions in the light of an article in the "Chemical Engineer", entitled "How to size future process vessels"? [CO2][3]

The original design submitted called for 4 tanks 5.2 m in diameter and 7 m in height. From a graph of the article the engineer found that the present ratio of height to diameter of 1.35 is 111% of the minimum cost and that the minimum cost for a tank was when the ratio of height to diameter was 4:1. The cost for the tank design as originally submitted was estimated to be ₹ 9,00,000. What are the optimum tank

dimensions if the volume remains the same as the original design? What total savings may be expected through the redesign? [2+3][CO4]

2(a) Define Balance of Payments. Discuss its components. [CO2][2]

2(b) What amount of money saved today will yield ₹40,000/- in third year and ₹ 55,000/- after five year at the 12% rate of interest compounded annually.

2(c) A company has to replace a machine in the production line after 11 years at the cost of ₹ 60,00,000/-. It plans to deposit an equal amount at the end of every year for the next 11 years at an interest rate of 11 per cent which is compounded annually. Find the equivalent amount that must be deposited at the end of every year for next 11 years. [3][[CO2]

3(a) Discuss the nature of semi-conductor market in India. What incentive may be given by the Government to encourage Indian semi-conductor industry? [CO5][5]

3(b) Complete the table. [CO4][5]

Units of output	AVC (₹)	Total Cost (₹)	Marginal Cost (₹)
1	-	35	15
2	12.50	-	-
3	-	-	5
4	-	55	-
5	9	-	-

4(a) Discuss reasons for the increase in government expenditure in recent years. 5[CO3]

4(b) Below are the details of expenditure during 2024 incurred by Ansh Industries which produces X. Prepare Cost Sheet. [5] [CO4]

Opening Stock of Raw Materials	₹ 1,16,200
Salary of the PA to CEO	₹ 57,400
Raw Materials Purchased	₹ 9,06,900
Direct Labour	₹ 3,26,400

Freight on Raw Materials Purchased	₹ 55,700
Indirect Labour	₹ 1,21,600
Other Factory Overheads	₹ 3,17,300
Stock of Raw Materials on 31-12-2024	₹ 96,400
Advertisement cost	₹ 38,200
Indirect Materials	₹ 2,13,900

5(a) Are environmental problems macroeconomic problems? Discuss fiscal policies to control environmental hazards. [2+3=5] [CO4]

5(b) A firm, Prime Manufacturing is planning to expand its production operation. It has identified three machines which are technologically capable to serve the purpose. The initial outlay and annual revenues with each of the machines are given below: [5][CO3]

	Initial Outlay (₹)	Annual revenue (₹)	Life (in years)
Machine I	5,45,000	2,50,000	15
Machine II	6,14,000	3,30,000	12
Machine III	6,00,900	3,50,000	10

If the rate of interest is 12%, which machine the company should opt for? Find out the result by Present Worth method.

6(a) Define Money. Discuss the functions of Money. [2+3=5] [CO6]

6(b) A person, Mr. G, is planning for his retirement. He has 10 more years of service. He would like to deposit 20% of his salary, which is ₹ 4000, at the end of the first year, and thereafter he wishes to deposit the amount with an annual increase of ₹ 500 for the next 9 years with an interest rate of 15%. Find the total amount Mr G will get at the end of the 10th years. [5]

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Total no. of Pages: 1

Roll no .....

SEMESTER- 6th & 8th

B.Tech.

May-2025

END TERM EXAMINATION

HU- 306 Money, Banking and Finance

Time: 03:00 Hours

Max. Marks: 50

Note : Attempt only five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 What is the Barter System. Explain the inconvenience faced in barter system. How did money solve the problems of Barter system? [10] [CO#1]

Q.2 What are the causes and consequences of financial crises? Explain with reference to recent scenario. [10] [CO#2]

Q.3 Define Monetary Policy. Explain the tools of Monetary Policy. [10] [CO#5]

Q.4 Define Rate of Interest. What are the factors affecting Rate of Interest. [10] [CO#3]

Q.5 What do you mean by Financial Market? Explain the role of Financial Market. [10] [CO#2]

Q.6 Explain the structure and role of the Indian banking system. [10] [CO#4]

Q.7 Write a short note on any two [10] [CO#2,4,5]

(a) SEBI (b) RBI

(c) Moral Hazard

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Total no. of Pages- 02 Roll no. ----------

VI__SEMESTER

B.Tech.

END TERM EXAMINATION ***May-2025***

COURSE CODE :HU308 COURSE TITLE: Mathematical Economics

Time: 3:00 Hours *Max. Marks: 50*

Note : Answer any five questions
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 a What do you mean by Mathematical Economics? How can it be used in making business decisions? Discuss. [2+3= 5][CO#2&4]

Q.1 b A finance company has offices located in every division, every district and every taluka in a certain state in India. Assume that there are five divisions, 30 districts and 200 talukas in a state. Each taluka office has one head clerk (HC), one cashier (C), one clerk and one peon. Both, district and division office has 2 peons. There are 2 and 3 clerks in each district, and division offices respectively. A division office has, in addition, an office superintendent(OS) and 1 typist. Salary (given in Rs) of each office staff is as below:

OS	HC	C	typist	Clerk	Peon
15000	12000	11750	11500	11500	750

Using Matrix Algebra, find

i. The total number of posts of each kind in all offices taken together
ii. Total basic monthly salary bill of each kind of office.
iii. Total basic monthly salary bill of all offices taken together.

[1+2+2==5][CO#3]

Q.2 a Prove that the rate of change in marginal revenue (MR) is twice the rate of change in average revenue (AR). [5][CO#3]

Q.2 b Let $p = \beta - \alpha x$, where $\alpha, \beta > 0$, be a demand function facing a monopolist. Find total revenue, average revenue, marginal revenue, and price elasticity of demand as a function of the output level x.
[1+1+1+2=5][CO#3]

Q3 a Discuss Consumer Surplus mathematically? How is it dependent on the change in price and the price elasticity of demand? Discuss mathematically. [2+3=5][CO#2&3]

b. [i] The rate of investment is given by $I(t) = 6\sqrt{t}$. Calculate the capital growth between the 4th and 9th years.
[ii]The marginal revenue of a company is given by
$MC = 100+20X+3X^2$, where X is the number of units sold.
Find out the fixed cost when the Total cost = 260 and X =2.
(2+3=5) [CO# 4]

Q.4 a Discuss the theory of Demographic Transition with a hypothetical example. [5][CO#3]

b Find the firm's expansion path expressed in terms of its total expenditure on its inputs, given the production functions.
$X = 8\log L + 20\log K$
and the price $P_L = 1$ and $P_K = 5$. [5][CO#4]

Q.5 a Discuss the difference between Comparative Statics and Dynamic Economic Analysis with real world examples. [5][CO#4]

b A company manufactures two types of agricultural machine – electrical (E) and manual (M). The revenue function of the company, in thousands, is:
$TR = 8E + 5M + 2EM - E^2 - 2M^2 + 20$,
Determine the quantity of electrical and manual agricultural machines which lead to maximum revenue. Also calculate the maximum revenue.
[2+3=5][CO#4]

Q.6 a How difference equation may be used in Economic Analysis? Discuss. [5][CO#4]

b. Suppose the supply and demand curve are as follow;
$Q_{dt} = 6-2P_t$
$Q_{st} = -4+2P_{t-1}$
Where Qdt and Qst = demand and supply of onion at time t
Pt = Price at t
When Qdt =Qst,
i. Write down the equation that represents the time path of price.
ii. Find out the steady state price (where the demand and supply curve cut each other
iii. $P_0 = 4$; the time path of price is convergent or divergent
[1+2+2=5][CO#4]

Q.7 a How can differential equations be used in Economics? Discuss. [5][CO#4]

Q.7 b (i) Obtain the demand function for which elasticity of demand is one.

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Total no. of Pages: 1 *Roll no .....*

SEMESTER-VI & VII

B.Tech.

END TERM EXAMINATION

May-2025 **HU 310**

INTERNATIONAL ECONOMICS

Time: 03:00 Hours ***Max. Marks: 50***

Note: Attempt only five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 What is International Economics? What is its subject matter and why do we need to study it? [2+4+4] [CO 1, 2 & 4] [L1]

Q.2 (i) What is a trade policy and what are its various instruments?

(ii) What is infant-industry argument for protectionism?

[5+5] [CO 3 & 5][L2,3]

Q.3 What is IMF and what are its functions? What is its significance today? 5+5] [CO 4 & 5][L1,4]

Q.4 Mention some ethical issues in international business using examples. [10] [CO 5] [L6]

Q.5 What is globalization? Explain the various dimensions of globalization. [5+5] [CO4] [L5]

Q.6 (i) What did Uruguay Round of GATT accomplish?

(ii) What is Flexible Exchange Rate System and how is it determined? [5+ 5] [CO 3] [L2,5]

Q.7 Write a short note on

a) Leontief Paradox

b) Bretton Woods System [5+5] [CO 2][L2]

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Total No. of Pages- 2 *Roll No.* _____

B.Tech

END TERM EXAMINATION **May, 2025**

COURSE CODE: HU312
COURSE TITLE: Micro Economics

TIME: 3:00 HRS. **MAX. MARKS: 50**

NOTE: Attempt any five questions from the following.

1. a) Define price elasticity of demand. Explain the different degrees of price elasticity with the help of diagrams. **(5Marks) (CO1)(BLT1)**
   b) The quantity demanded of tea increases from **200 units to 260 units** when the price of coffee rises from **₹50 to ₹60** per packet. Calculate the **cross elasticity of demand** for tea with respect to the price of coffee.
   Also, interpret whether tea and coffee are **substitutes** or **complements** based on your result. **(5Marks) (CO1)(BLT3,5)**

2. a) Define the concept of utility in economics. Distinguish between total utility and marginal utility with the help of a schedule and diagram. **(5Marks) (CO2) (BLT4)**

   b) A consumer's total utility schedule for consuming a good is given below:

Unit consumed	Total utility
1	30
2	50
3	65
4	75
5	80
6	82

Calculate the **Marginal Utility (MU)** for each additional unit.At which unit does the **Law of Diminishing Marginal Utility** start operating? **(5Marks)(CO2)(BLT5,6)**

3. a) Explain the **Law of Variable Proportions** with the help of an example. Discuss the different stages of production in the short run as described by this law. **(5Marks)(CO3)(BLT2)**

b) A farmer uses labor to produce wheat on a fixed piece of land. The output produced by different units of labor is given below:

Labour	Total Production
1	5
2	12
3	18
4	22
5	24

Find the **Marginal Product of Labor (MPL)** for each level of labor. **(5Marks)(CO3)(BLT5)**

4. a) Define an Indifference Curve. Explain the main properties of Indifference Curves with the help of diagrams. **(5Marks)(CO4)(BLT2)**

b) A consumer has a utility function:

$$U(X, Y) = X + Y$$

The price of X is ₹3 per unit and the price of Y is ₹3 per unit. The consumer's income is ₹18. Write the budget equation. Find two different combinations of X and Y that the consumer can buy by spending all his income. **(5Marks)(CO4) (BLT5,6)**

5. Define perfect competition. Explain with the help of a diagram how a firm in perfect competition achieves equilibrium in the short run under:
(a) Abnormal profits,
(b) Losses.

(10Marks)(CO3)(BLT2,5)

6. a) What is a Monopoly? Explain how a monopoly firm determines price and output in the short run. Illustrate your answer with a diagram. **(5Marks)(CO4)(BLT4,5)**

b) Explain under what condition the monopolist earns abnormal profits or incurs losses in the short run. **(5Marks)(CO4)(BLT5,6)**

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Total No. of Pages: 1

Roll no.....

6th & 8th Semester
B.Tech

END TERM EXAMINATION
COURSE CODE: HU 318 COURSE TITLE: Professional Writing Skills MAY-2025
Time: 3 hours
Max Marks (50 marks)

Note: All questions are compulsory. Each carries 10 marks.
Assume suitable missing data if any.

1. Discuss the role of language sensitivity and cultural adaptation in professional communication. How can professionals overcome language barriers in a multicultural workplace? [CO2][BT4]

2. Explain the key principles of effective business letter writing. How do tone, structure, and clarity impact professional correspondence? Provide an example of a well-structured business letter. [CO3] [BT3]

3. Bring out the major essentials for interviewer and interviewee. [CO2] [BT4]

4. What are the major email principles? Also, discuss office etiquettes in detail. [CO1] [BT5]

5. Project writing requires careful planning and execution. Discuss the importance of feasibility studies in project writing and provide an example of how they help in decision-making. [CO4] [BT3]

OR

What are the components of format of a project? Explain. [CO4] [BT3]

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Total No. of Pages: 01 *Roll No.....*

SEMESTER- 6TH & 8th

B.Tech.

END TERM EXAMINATION ***May-2025***

HU326 RHETORIC AND PUBLIC SPEAKING

Time: 3:00 Hour **Max. Marks: 50**

Note: All questions carry equal marks.
Attempt all questions.
Assume suitable missing data, if any.

Q.1 What are the essential skills required for public speaking? Mention in detail. [10] [CO1] [BTL 2]

Q. 2 What are Aristotle's three rhetorical appeals, and how does each function in persuasive communication? [10] [CO3] [BTL 2,3]

Q. 3 What are the symptoms of stage fright? What are the effective strategies to overcome stage fright? [10] [CO2] [BTL 1,2]

Q. 4 Critically evaluate at least five rhetorical and persuasive strategies used by good orators to form convincing arguments. (Use any speech as an example) [10] [CO4] [BTL 4,5]

Q.5 Write a speech on "Space exploration: Need or Curiosity". [10] [CO5] [BTL 6]

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Total No. of Pages: 01

Roll No.....

6/8th Semester

B.Tech

End-Term Examination **May 2025**

HU 328 THEATRE AND STAGECRAFT

Time: 3 hours **Total Marks: 50**

Note: All questions are compulsory

1. Elaborate on the techniques of drama. **(10 marks) (BTL3) (CO1)**

2. Evaluate the concept of universality as portrayed through *The Merchant of Venice*. **(10 marks) (BTL5) (CO 4)**

3. State various elements to be kept in mind while creating dialogue for a play. **(10marks) (BTL1) (CO 2)**

4. Give arguments for a G.D. on 'stage presentation V/S real life, role. **(10 marks) (BTL1) (CO 4)**

5. What points would you keep in mind while setting a stage for drama? **(10 marks) (BTL1) (CO 2)**

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Total No. of Pages: 02
Semester: VI
END TERM EXAMINATION

Roll no .....
Course: B.Tech.
May-2025

HU- 404: Public Finance and Policy

Time: 03:00 Hours

Max. Marks: 50

Note: Attempt any five questions

All questions carry equal marks. Marks are indicated at the end of each question

Assume suitable missing data, if any

Q.1. Discuss the functions of government in an economic system. Explain different instruments to perform these functions?

(5+5), [CO-1]

Q.2. What do you understand by public goods? Distinguish between pure and impure public goods.

(3+7), [CO-2]

Q.3. Distinguish between direct and indirect taxes. Discuss the economic effects of taxation.

(4+6), [CO-3]

Q.4. What do you understand by optimal income taxation? In this context explain the linear and non-linear income taxation.

(4+6), [CO-3]

Q.5. What is GST? Discuss the proposed benefits and concerns regarding Goods and Services Tax (GST) in India.

(2+8), [CO-4]

Q.6. Discuss the key issues in managing fiscal data system in India.

(10), [CO-4]

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Q.7. Write short notes on any two of the following:

(i) The free rider problem (ii) Coase theorem (iii) Salient features of India's union Budget 2025-26.

(5+5), [CO-2, 3, 4]

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Total No. of Pages: 01

Roll No.....

SEMESTER- 6TH & 8th

B.Tech.

END TERM EXAMINATION

May-2025

HU-426 LANGUAGE AND SOCIAL MEDIA

Time: 3:00 Hour

Max. Marks: 50

Note: All questions carry equal marks.
Attempt all questions.
Assume suitable missing data, if any.

Q.1 Why is it important for modern brands to have a strong presence on multiple social media platforms? Give examples. [10][CO 3] [BTL 2,4]

Que. 2 What do you understand by Digital Culture? Discuss the opportunities and challenges associated with it? [10][CO 1] [BTL 3,4]

Que.3 Discuss how modern communication has changed through the use of emoji and emoticons. Critically evaluate the role played by emotional expression in online formal communication? [10] [CO 4] [BTL 3,5]

Ques.4 Effective communication skills are required on social media platforms. Explain in detail. [10] [CO 2] [BTL 1,3]

Que.5 You are the brand manager of "Edu-Tech Excellence" startup company. You are launching its flagship program in 3 weeks. Design and elaborate the steps you would take to increase online participation and social media engagement to attract the target audience. [10][CO 5] [BTL 6]

Total No. of Pages: 01

Roll No.....

6th/8th Semester

B.Tech

End-Term Examination

May-2025

Time: 3 hours

HU 428 Adaptation & Translation

Total Marks: 50

Note: All questions are compulsory

1. Elucidate the debate of originality in translation. Elaborate.
(10 marks) (BTL3)(CO1)

2. Present critical review of any adaptation that you have gone through.

Or

Evaluate *Raag Darbari* as a successful adaptation of the original text.
(10 marks) (BTL5)(CO 4)

3. State and explain the difference between translation, transcreation and adaptation.
(10 marks)(BTL1) (CO 1)

4. Describe the different forms of translation. (10 marks) (BTL1)(CO 1)

5. Discuss the challenges of translation and adaptation.

Or

Compare and contrast between Othello and Omkara keeping in view as the latter being the adaptation of the former emancipated from geographical and cultural location.
(10 marks)(BTL2)(CO 2)

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Total no. of Pages: 02

Roll no.....

2nd SEMESTER
B.Tech (IT)
END TERM EXAMINATION, *May-2025*
IT102n Discrete Structures

Time: 03:00 Hours *Max. Marks: 50*

Note : Attempt any five questions.
All questions carrying equal marks
Assume suitable missing data, if any.

Q.1 a) Four premises related to the how five friends plan to spend their weekend is given below. Using these premises, prove or disprove that it can be concluded that Rohit will go for rock climbing?

1) If the weather is pleasant and Tina goes to her sister place, then Rohit will go for rock-climbing or Sumit will go for skating.
2) Queene will go for jogging alone only if Tina is at her sister place and Urvashi is at her brother place
3) Urvashi will go to her brother's place only if the weather is pleasant.
4) Queene will go for jogging alone and Sumit will not go for skating.

(5) [CO1][L4]

b) Draw the combinational circuit using minimum number of logical gates for the propositional statement given below.

$(p \wedge q \wedge \neg r) \vee (p \wedge \neg q \wedge \neg r) \vee (p \wedge \neg q \wedge r) \vee (\neg p \wedge q \wedge \neg r) \vee (\neg p \wedge \neg q \wedge \neg r)$

(5) [CO1][L3]

Q.2 Prove that:

(5) [CO2][L4]

$H_2^n \geq 1 + n/2.$

using principle of mathematical induction, showing each and every step.

If $H_n = 1 + 1/2 + 1/3 + ¼ + \ldots\ldots\ldots\ldots + 1/n$

b) Find the particular solution for the following recurrence relation.

(5) [CO2][L4]

$a_n - 6\,a_{n-1} + 9\,a_{n-2} = 3^n$

Q.3 a) Find A, B and N in the expression of $(A + B)^N$ If The first three terms are 729,7290 and 30375 respectively. (5) [CO3][L3]

b) The letter of the word "Zenith" is written in all possible orders. How many words are possible if all these words written out as in dictionary? What is the rank of word "Zenith" (5) [CO3][L3]

Q. 4 a) Let f, g:R-R be defined respectively by f(x)=x+1, g(x)=2x-3

Find f+g, f-g and f/g . (5) [CO4][L5]

b) Construct a labelled positional binary tree for fully parenthesized algebraic expression.

[(a+b)-c]*[e+(f+g)]. Assuming that visiting a vertex v prints the label of v, show the result of performing a post- order search on the constructed binary tree. (5) [CO4][L5]

Q.5 a) Design a logical expression for the following: (8) [CO5][L6]

$Y = \Sigma m\{0,1,5,6,7,8,9,11,12,15\}$

Using

1) One 16:1 multiplexer
2) Only one 8:1 multiplexer
3) Four 4:1 multiplexer and one OR gate

b) Define lattice and po-set with one example.

(2) [CO:5][L6]

Q .6) a) Using the master theorem finds the time complexity of the following relation.

$T(n) = 16\,T(n/4) + n^3 \log^2 n$ (5) [CO6][L3]

b) Without drying the graph, prove that the graph whose adjacency matrix is given by.

$$X = \begin{bmatrix} 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 \end{bmatrix}$$

Is connected (5) [CO6][L4]

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II SEMESTER

B.Tech.

END TERM EXAMINATION ***May-2025***

IT104 OBJECT ORIENTED PROGRAMMING

Time: 03:00 Hours ***Max. Marks: 40***

Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Answer **any 5** of the following: [2x5][CO#1-5][1,2,3]

I. What is abstraction in OOP?
II. Why is private inheritance rarely used?
III. List two strictly Java-based features.
IV. Explain the role of the scope resolution operator ::
V. What is the purpose of access specifiers in a class?
VI. Differentiate between shallow copy and deep copy.
VII. What do you mean by static data members?

Q.2 Answer **any 3**: [3x3][CO#2,4][4,3]

I. Explain early binding and late binding. How does virtual function help in late binding?
II. JVM is critical for Java programs. Justify
III. How does Java support multiple inheritance? Explain in detail with complete code.
IV. Using new and delete operators, show dynamic allocation and deallocation in a C++ code.

Q3. Answer the following using C++ code.

I. Create a template class Calculator that performs basic operations like add, subtract, multiply, and divide for int and float types. [4][CO#3,4][4,3]

II. How are exceptions handled in C++? How is rethrowing an exception different from a catch-all block? Explain with code. [4][CO#4][4,6,5]

Q4. Differentiate between (any 4) [4x2.5][CO#1,2,3][1,6,4,3]

I. Interface in JAVA and abstract class in C++ with the help of code
II. Package in JAVA and namespace in C++. Create either a user-defined package or a user-defined namespace.
III. JRE vs JDK vs JVM
IV. Virtual destructor and virtual functions in C++
V. Default in JAVA vs private in JAVA

Q5. What is multithreading in JAVA? Implement using any one of the options. [3][CO#3,4][2,3,4,5,6]

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IV SEMESTER B.Tech.

END TERM EXAMINATION MAY -2025

COURSE CODE IT202 COURSE TITLE SOFTWARE ENGINEERING

Time: 03:00 Hours Max. Marks: 40

Note: All questions carry equal marks.
Assume suitable missing data, if any.
Internal choice, if any, is indicated using OR

Q1. A company is developing a hospital management system for a government hospital. The project involves strict regulatory compliance, well-defined requirements, and minimal chances of major changes once development begins. The client has clearly documented all functional requirements in advance. Based on the above scenario:

(a) Identify the most suitable Software Development Life Cycle model for this project. Justify your answer. [1][CO1][BTL3]

(b) Explain two advantages and two disadvantages of using the selected SDLC model in this case. [2][CO1][BTL2]

(c) Would your model choice change if requirements were expected to change frequently during development? Why? [2][CO1][BTL4]

Q2. A mobile banking app needs to manage user login states (Logged Out, Logging In, Logged In, Session Timeout). Develop a simple State Machine Diagram to represent these states and the transitions between them. Briefly explain the key transitions. [5][CO2][BTL6]

OR

Q2. Design two versions of a software module for an Online Library System and Present pseudocode and class structure for both. [5][CO2][BTL6]

Version A: Poor cohesion and high coupling

Version B: High cohesion and low coupling

Q3. You are working in a start-up that follows Agile practices. The team collaborates closely, delivers working software every two weeks, and welcomes requirement changes even late in development.

a) Identify and describe any three Alphas relevant to this Agile development process. [2][CO3][BTL2]

b) How does the Essence Kernel help in tailoring Agile methods to the specific needs of the project? [1][CO3][BTL3]

c) Explain how the concepts of Competencies and Activity Spaces are applied in the Agile context using one example each. [2][CO3][BTL3]

Q4. You are given the following simple login validation module:

```
If (username is not empty and password is not empty)
        If (username == "admin" and password == "admin123")
                display "login successful"
        else
                display "invalid credentials"
else
        display "username/password cannot be empty"
```

Use Equivalence Partitioning and Boundary Value Analysis techniques to design a set of test cases. Also explain how these techniques help in reducing the number of test cases while ensuring adequate coverage. [5][CO4][BTL2,4]

Q5. Write a simple code to check for a valid triangle based on the values of sides (say *a, b, c*) with range (20,50) inclusive. The program output may be one of the following words: [*Valid Triangle, Not a triangle*]. Design the flow graph & DD Path graph. Also find the independent paths from the DD Path graph.
[5][CO4][BTL5,6]

Q6. Differentiate between the following: [2.5*2=5][CO4][BTL2]
a) Validation and Verification
b) Structural testing and functional testing.

Q7. A software product is estimated to have 50 KLOC (50,000 lines of code). It is categorized as an organic type project.
a) Estimate the effort (in person-months) required to complete the project using the Basic COCOMO model. [2][CO6][BTL3]
b) Estimate the development time (in months). [2][CO6][BTL3]
c) Mention any two limitations of using the Basic COCOMO model in modern software development practices. [1][CO6][BTL1]

Q8. What is configuration management? List various activities involved in it along with the documents required. [5][CO5][BTL1,2]

OR

Q8. What is Risk management? What are the various Risk Management Activities? Does risk avoidance always help us? [5][CO5][BTL1,2]

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Roll No.....

4th SEMESTER

B.Tech. (IT)

END TERM EXAMINATION

May-2025

IT204/IT204n Operating Systems

Time: 3:00 Hours

Max. Marks: 40

Note: All questions are compulsory. Kindly check the paper code before start your exam.

All questions carry equal marks. Assume suitable missing data, if any.

[M]: Marks allocated to the question. [CO#]: Course Outcome number. [BTL#]: Bloom's Taxonomy Level

Q. No.	Question Description	[M] [CO#] [BTL#]
Q.1	a) Distinguish between the following terms. i. Multiprogramming and Multitasking ii. Multiprocessor System and Clustered System	[4] [CO1] [BTL1]
	b) With a neat diagram, explain the states of a process with a transition diagram and process control block.	[4] [CO1] [BTL2]
Q.2	a) What is inter-process communication? Discuss message passing and the shared memory concept of IPC.	[2] [CO2] [BTL2]
	b) Calculate the average waiting time and the average turnaround time by drawing the Gantt chart using SRTF and the Priority scheduling algorithm with following data:	[6] [CO2] [BTL5]

Processes	Arrival Time	Burst Time	Priority
P1	0	8	3
P2	1	4	2
P3	2	9	1
P4	3	5	4

Q3.	a) What is a resource allocation graph? Consider an example to explain how it is very useful in describing a deadly embrace.		[3] [CO3] [BTL3]
	OR		
	What is a semaphore? State a Dining Philosopher problem gives a solution using semaphore.		[5] [CO3]
	b) Consider the following snapshot of the system:		

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[BTL6]

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_0	0	0	1	2	0	0	1	2	1	5	2	0
P_1	1	0	0	0	1	7	5	0				
P_2	1	3	5	4	2	3	5	6				
P_3	0	6	3	2	0	6	5	2				
P_4	0	0	1	4	0	6	5	6				

Answer the following questions using Banker's algorithm:

i. What is the content of the need matrix?
ii. Is the system in a safe state? If yes, mention the safe sequence.
iii. If a request from process P1 arrives for (0,4,2,0) can the request be granted immediately?

Q4. a) What is TLB? Explain TLB in detail with a paging system with a neat diagram. [3] [CO4] [BTL2]

OR

Discuss the structure of the page table with a suitable diagram.

b) Consider the page reference string: 1,0,7,1,0,2,1,2,3,0,3,2,4,0,3,6,2,1 for a memory with three frames. Determine the number of page faults using the FIFO, Optimal, and LRU replacement algorithms. Which algorithm is most efficient? [5] [CO4] [BTL5]

Q5. a) Given the following sequences 95,180,34,119,11,123,62,64 with the track 50 and ending track 199. What is the total disk travelled by the disk arm using FCFS, SSTF, LOOK and CLOOK algorithm? [6] [CO5] [BTL4]

b) What is a file? What are its attributes? Explain few file operations. [2] [CO5] [BTL2]

OR

Explain the access matrix method of system protection with the domain as objects and its implementation.

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4th SEMESTER

B.Tech. [IT]

END TERM EXAMINATION May-2025

IT206 COMPUTER ORGANISATION & ARCHITECTURE

Time: 3:00 Hours **Max. Marks: 50**

Note: All questions are compulsory. Kindly check the paper code before start your exam.
All questions carry equal marks. Assume suitable missing data, if any.
[M]: Marks allocated to the question. [CO#]: Course Outcome number.

Q. No.		Question Description	[M] [CO#] [BTL#]
Q.1	a)	Illustrate processor organisation using a single bus with help of a diagram. Also explain how register transfers and ALU operations are carried out in the single bus organisation.	[5] [CO1] [BTL1]
		OR	
		Write Register Transfer Logic format for conditional control statement. Give an example and explain the same.	
	b)	Draw the circuit diagram and function table for one stage of the logic unit for a 4-bit ALU with following logic operations - AND, OR, XOR and NOT. Also explain the working of the it in brief.	[5] [CO1] [BTL3]
Q.2	a)	Design an adder circuit with one selection variable S and 2 inputs A and B. When S=0 circuit performs A+B, when S=I it performs A-B by taking twos complement of B?	[5] [CO2] [BTL4]
	b)	With the help of a flowchart for sign-magnitude addition/subtraction, explain the steps involved in developing a hardwired control unit?	[5] [CO2] [BTL3]

OR

With the help of a diagram explain the functioning of a micro-program sequencer in a micro-programmed controlled processor?

Q3. a) Draw the flowchart of Booth's multiplication algorithm and multiply -5 X -4 using booths algorithm? [5] [CO3] [BTL4]

b) Draw a neat block diagram of a microprogram sequencer and explain its working. [5] [CO3] [BTL5]

Q4. a) Define addressing mode. Discuss the following modes with example: i) Register ii) Direct iii) Indirect iv) Index. [4] [CO4] [BTL3]

b) Register R6 is used in a program to point to the top of a stack containing 32-bit numbers. Write a sequence of instructions using the Index, Autoincrement, and Autodecrement addressing modes to perform each of the following tasks: [6] [CO4] [BTL5]

i. pop the top two items of the stack, add them, then push the result onto the stack.

ii. Copy the fifth item from the top into register R3.

For each case, assume that the stack contains ten or more elements.

Q5. a) The cache block size in many computers is in the range of 32 to 128 bytes. What would be the main advantages and disadvantages of making the size of cache blocks larger? [5] [CO4] [BTL6]

b) A computer system has a main memory consisting of 1M 16-bit words. It also has a 4K-word cache organized in the block-set-associative manner, with 4 blocks per set and 64 words per block. Calculate the number of bits in each of the Tag, Set, and Word fields. [5] [CO4] [BTL6]

End

Total no. of Pages: 03 Roll no.....

IV SEMESTER **B.Tech**

END TERM EXAMINATION ***May-2025***

COURSE CODE IT206/IT202 (Old scheme) COURSE TITLE Database Management Systems

Time: 03:00 Hours ***Max. Marks: 40***

Note : All questions carry equal marks.
Assume suitable missing data, if any.
Internal choice, if any, is indicated using **OR**

Q.1(a) Describe any two the following: [5=2.5*2][CO1][BTL2]

i) Aggregation in EER

ii) Types of attributes in ER diagram.

iii) Various keys in Database

(b) Consider the following schema: [5][CO2][BTL3,4]

STUDENT(SID, Name, Age, Dept_ID)

DEPARTMENT(Dept_ID, Dept_Name)

COURSE(CID, Course_Name, Dept_ID)

ENROLLMENT(SID, CID, Grade)

Write SQL queries for:

i) List names of students enrolled in the 'DBMS' course.

ii) Retrieve the average grade per department.

iii) Find students who are not enrolled in any course.

iv) Display the number of students in each department.

v) List all courses along with names of students enrolled (if any).

Q.2(a) You are given a relation R(A, B, C, D, E, F) with set of functional dependencies F as: [5=2+3][CO3][BTL3]

$$F = \{A \rightarrow B;\ C \rightarrow D, E;\ \{A, C\} \rightarrow F\}$$

The relation R is decomposed into R1, R2 and R3 as:

R1= (A, B) R2= (C, D, E) R3= (A, C, F)

i) Determine the candidate key(s) as well as the normal form of the original relation R.

ii) Apply the Non-additive Join Test and determine if the decomposition is lossless.

(b) A database designer is considering whether to use hashing or indexing to optimize the performance of a large table containing millions of employee records. [5=2+2+1][CO4][BTL3,5]

i) Determine the primary use cases and performance trade-offs of indexing and hashing in query processing.

ii) In what situations would hashing outperform indexing, and vice versa? Justify.

iii) Should modern database systems use both hashing and indexing together instead of relying solely on one? Justify.

OR

(b) A hash table has size = 11. The hash function used is:

$h(k)=k \bmod (11)$.

Collision resolution is handled by function $h(k)=(h(k)+i^2) \bmod (11)$, where $i=0,1,2,\ldots$ You are given the following list of keys to insert (in order): [5=3+1+1][CO4][BTL3,5]

27, 18, 29, 28, 39, 13

i) Show the contents of the hash table for each insertion. Which collision resolution technique is used above?

ii) For each key, list the probing sequence (indexes tried).

iii) What would happen if you now try to insert key 22? Will it be successfully inserted or not? Justify your answer.

Q.3(a) Construct a B+ tree of order 4 for the following entries:

13,12, 14, 1, 11, 10, 5, 6, 7, 144, 145, 148, 23, 24, 27, 20, 2, 3

Show all the intermediate steps. Further, discuss how nodes are different in B trees and B+ trees. [5=4+1][CO4][BTL6,2]

(b) Explain 2PL protocol? Justify if 2PL ensures serializability as well as deadlock prevention. Describe all variants of 2PL along with their special features. [5=2+2+1][CO5][BTL2,5]

Q.4(a) Consider the following schedule S involving three transactions: T1, T2, and T3 where R is read, W is write, R1(A) indicates T1 reads item A.

S: R1(A), W2(A), R3(B), W1(B), R2(C), W3(C), W2(B), R1(C)

Identify all pairs of conflicting operations in the schedule and also mention the condition used for conflicting operations. Determine whether the schedule S is conflict-serializable. If yes, provide an equivalent serial schedule, and if not, then how can the deadlock be handled in this situation? [5=2+2+1][CO4][BTL1,3]

(b) Consider timestamp ordering concurrency control protocol for transactions T1 and T2 having timestamp TS(T1)=5 and TS(T2)=10 occurring in the given order: [5=2+1+1+1][CO5][BTL3,4,5]

T1: Read(X)

T2: Write(X)

T1: Write(X)

i) According to the basic timestamp ordering protocol, will T1's write be allowed after T2's write? Justify.

ii) Describe the impact of Thomas' Write Rule on this schedule.

iii) Illustrate a scenario where the basic protocol would cause starvation.

iv) How is strict timestamp ordering different from basic timestamp ordering?

Total No. of Pages: 03 Roll No.....

4TH SEMESTER

[B.TECH. – IT]

END TERM EXAMINATION MAY- 2025

IT208n/IT208 : ALGORITHMS DESIGN AND ANALYSIS

Time: 3 Hours Max. Marks: 50

Note:	Attempt any 5 Questions. Each Question Carries Equal Marks. Assume suitable missing data, if any.

Q1

a) Explain asymptotic notations. and solve each of the following recurrences [5][CO1,2] [BTL 2,3]

i. $T(N) = 4T(n/2) + n^2$ (using recursion tree)

ii. $T(n) = 2T(n/4) + n^{1/2}$ (using master method)

b) Define the **Divide and Conquer** paradigm. Explain how it differs from other algorithm design paradigms like Dynamic Programming and Greedy algorithms. Sort the following array using Merge Sort:

[5][CO 2] [BTL 2,3]

arr[] = {38, 27,43,3,9,82,10}

Q2

a) Write an algorithm for longest common Subsequence problem using dynamic programming techniques and use it to solve for the following X and Y subsequences, X= [A,B,C,B,D,A,B], Y=[B,D,C,A,B,A]. Use the algorithm to construct the tables for calculating the **length** and the **path** of the longest common subsequence. [5][CO 3] [BTL 2,3]

b) Apply Dijkstra's algorithm to find the shortest path from source vertex A to all other vertices in the following graph, the graph is represented as an adjacency matrix with edge weights (INF indicates no direct edge): [5][CO 4] [BTL 2,3]

	A	B	C	D	E
A	0	4	2	INF	INF
B	4	0	5	10	INF
C	2	5	0	3	9
D	INF	10	3	0	2
E	INF	INF	9	2	0

i) Show the step-by-step execution of the algorithm, including the distance table at each iteration.

ii) List the final shortest paths from A to each vertex along with their costs.

OR

b) Explain the greedy approach for finding an optimal solution and how is it different from the dynamic approach? Show that the activity selection problem has an optimal substructure property and greedy choice property. [5][CO 4] [BTL 2,3]

Q3

(a) Define backtracking phenomenon? Draw the state space and cut the state space for the 4- queen problem by applying backtracking? Explain the various constraints with examples. A salesman needs to visit 4 cities (A, B, C, D) starting and ending at city A. The distances between the cities are given in the following cost matrix (where INF represents no direct path): [5][CO 3] [BTL 2,3]

	A	B	C	D
A	INF	10	15	20
B	10	INF	35	25
C	15	35	INF	30
D	20	25	30	INF

Use the **Branch and Bound technique** to find the minimum cost to complete the tour, the path of the optimal tour. Also Show the bounding process at each level, including the reduced cost matrix and the cost of each node.

Q4

(a) Briefly list out the principles of dynamic programming and explain the how it can be used to solve the Rod Cutting Problem. [5][CO 3] [BTL 2,3]

OR

(a) Explain prefix codes and their need. Give Huffman algorithm to obtain prefix codes for the following instance and analyze complexity of Huffman algorithm. [5][CO 3] [BTL 2,3]

Character	a	b	c	d	e	f
No of occurrences (in thousands)	5	9	12	13	16	45

(b) Given N items with weights **W[0..n-1]**, values **V[0..n-1]** and a knapsack with capacity **C**, select the items such that

i. The sum of weights taken into the knapsack is less than or equal to C.

ii. The sum of values of the items in the knapsack is maximum among all the possible combinations.

Use Least Cost Branch and Bound to solve the below problem and calculate the Maximum Profit using State Space Diagram.
N = 4 , C = 15 [5][CO 5] [BTL 2,3]

W	2	4	6	9
V	10	10	12	18

Q5. Briefly explain with the help of examples (any two):- [10][CO 5,6] [BTL 2,3]

(a) P, NP and NP-complete problems

(b) Naïve and Rabin-Karp method of string matching.

(c) Backtracking and branch & bound approach

.....End.....

Total no. of Pages:03 Roll no.....

4th SEMESTER B.Tech

END TERM EXAMINATION ***May-2025***

COURSE CODE: IT 210n COURSE TITLE: Machine learning

Time: 03:00 Hours ***Max. Marks: 40***

Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 [CO#1,2] [BTL#2,3][4x2=8]

[a] Discuss the main differences between classification and regression models in terms of their objectives, types of output, and evaluation metrics. Define data diversity and How can diversity in data help mitigate overfitting and improve generalization in machine learning models?

[b] A retail chain uses simple linear regression to forecast monthly sales based on advertising (Ad) spend trends.

Months	Jan	Feb	Mar	Apr	May
Money spent on Ad x 1000 (₹)	2	3	5	6	8
Sales x1000 (₹)	220	260	330	360	400

Predicts the sales items when spent on advertisement is ₹ 7000.

Q.2 [CO#2][BTL#4][4x2=8]

[a] Explain why logistic regression uses the sigmoid function instead of a linear function for binary classification tasks. Given a dataset where 15 % of borrowers defaulted, and for a particular applicant, you compute the log-odds score $z = -1.2 + 0.04 * Credit\ Score - 0.03 * Income$, derive the probability of default, and decide if the applicant (with credit_score = 600, income = 50) is likely to defaulter or not.

[b] A streaming service classifies users as "active" (label) if they watch ≥ 60 movies per month. The service uses k-NN with L2- Norms to classify new users based on their monthly watch time (in hours) and the number of movies watched based on the data existing Users as shown in the table:

User	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10
Monthly watch time (hrs)	20	30	25	35	22	28	32	24	26	27
Number of Movies Watched	50	70	60	65	55	58	68	62	59	61

New User (Q): (25 hrs, 45 movies) , Task: Classify user Q as "Active" or "Inactive" use k = 3.

Q.3 [CO#2,3][BTL#4,5][4x2=8]

[a] A retail chain clusters customers by annual spending on groceries and electronics to tailor loyalty offers. Given the following customer spending data (in USD):

Customer	C1	C2	C3	C4	C5	C6
Groceries	2000	1500	3000	3200	1800	3100
Electronics	500	800	1200	1500	700	1300

Perform agglomerative hierarchical clustering using the complete linkage method until two clusters remain. Provide a step-by-step mathematical solution, including distance calculations (Euclidean distance) and dendrogram merges. Also, discuss why Euclidean distance is preferred mostly.

[b] Consider a Class +1: {(2, 2), (4, 4)}, and Class -1: {(4, 0), (6, 2)}, find the optimal hyperplane separating two classes and maximize the margin between the classes.

Q.4 [CO#4][BTL#4,5][4x2=8]

[a] A company aims to predict whether a customer will purchase a product based on their browsing behaviour. Input Features: Two features representing time spent on two different product pages Input Vector (x): [0.5,0.9]. Actual Output (y): 1 (Customer made a purchase). Neural Network Architecture: Input Layer: 2 neurons, Hidden Layer: 2 neurons with sigmoid activation, Output Layer: 1 neuron with sigmoid activation.

Given: Weights from Input to Hidden Layer $(W^1) = \begin{bmatrix} & \\ 0.3 & 0.4 \end{bmatrix}$, Biases for Hidden Layer $b^1 = \begin{bmatrix} 0.1 \\ 0.1 \end{bmatrix}$, Weights from Hidden to Output Layer $W^2 = [0.5 \quad 0.6]$, and Bias for Output Layer $b^2 = [0.1]$.

Compute followings:

I) Input and output of the hidden layer, and output layer in forward propagation case.

II) Binary Cross-Entropy loss.

[b] Apply Gradient Descent to a Linear Regression problem to iteratively minimize the loss function (Mean Squared Error) to find the optimal parameters. Initial Parameters: Slope (m) = 1, Intercept (b) = 1, Learning Rate (α) = 0.01, Number of Iterations = 2. Data points are (X, Y): (1,2), (2,4), (3,6), (4,8).

Q.5 [CO#3][BTL#5][4x2=8]

[a] Predict whether a new student (S9) will Pass or Fail an exam based on their attributes using the Naïve Bayes classifier. New Student (S9): Study Hours: High, Attendance: Good, Class Participation: Passive.

Student	S1	S2	S3	S4	S5	S6	S7	S8
Study Hours	High	High	Low	Low	High	Low	High	Low
Attendance	Good	Good	Poor	Good	Poor	Poor	Good	Good
Class Participation	Active	Passive	Active	Passive	Active	Passive	Active	Active
Result	Pass	Pass	Fail	Fail	Pass	Fail	Pass	Fail

[b] Demonstrate how to construct decision trees using the ID3 algorithm by calculating entropy and information gain to determine the best attribute for splitting the data at each node.

Instance	1	2	3	4	5	6	7	8
Credit History	Good	Good	Good	Bad	Bad	Bad	Good	Bad
Income Level	High	Medium	Low	High	Medium	Low	High	Medium
Loan Approved	Yes	Yes	No	No	No	No	Yes	No

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_Sixth__ SEMESTER

B.Tech [IT]

END SEMESTER EXAMINATION

May-2025

IT-302 COMPILER DESIGN

Time: 3:00 Hours

Max. Marks : 40

Note : Answer **any four** questions out of five
Assume suitable missing data, if any.

Q.1 Design a semantic analyzer (detailed steps of syntax directed translation: SDD, and parsing of annotated parse tree) for processing the input HLL code: **a=b+c×d**
(Formulate an appropriate grammar for constructing the SDD, for the given input; Also it is given that b, c are integers, while a, d are of type float)
(10)[CO5]

Q.2 Implement the SLR(1) parser by constructing the LR(0) automaton, parsing table and table of sequence of moves, detailing each step, for the given grammar and the test string **p=q-r+t**
E→id=ABF A→F- A→F× B→F+ B→F× F→id
(10)[CO4]

Q.3. Write the SDD for three-address code generation (SDD **only**), assuming a suitable grammar that will generate the code in Fig. 1. Perform

code optimization using DAG, for the given block of IR code (*Assume all temporary variables are dead*):

```
t1 = a * 3
t2 = t1 + d
t3 = t2 * 4
d = t3 - b
t4 = t1 + d
p = c + d
t5 = c + d
y = p * a
t6 = t5 + y
t7 = y - t6
z = p + t7
```

Fig. 1: IR Code

(10) [CO5, CO6]

Q.4 a) Store each line of the given IR code in Fig. 1 in *indirect triple* structure, and compare the advantages and disadvantages of this form of storage.

b) Differentiate between canonical LR and LALR parsers.

(5+5) [CO6, CO4]

Q. 5 Describe the following in brief:

a) Basic blocks and flowgraphs, and examine their role during code optimization

b) Different error recovery strategies during parsing

(5+5) [CO6, CO3]

Total No. of Pages : 03

VI SEMESTER

Roll No. .....

B.Tech.(IT)

END SEMESTER EXAMINATION *May-2025*

IT-304Software Engineering

Time:3:00 Hours

Max. Marks: 50

Note: Answer any *FIVE* questions.
Assume suitable missing data, if any.

1.a) Define software crisis. Explain the need of software engineering.

b) Briefly explain Aim and Procedure of Facilitated Application Specification Technique?

c) Quality and reliability are related concepts but are fundamentally different in number of ways. Discuss?

d) Explain the significance of Capability Maturity Model (CMM)? Why is it suggested that CMM is the better choice than ISO-9001?

e) Explain cyclomatic complexity. With a suitable example?

[10][CO1,2,4,5][BTL1,2,3]

2. You are hired as a system analyst for OLA, aiming to upgrade their system to support intelligent ride-hailing in smart cities. The goal is to modernize how riders, drivers, and internal teams interact.Functional scenario for OLA:

a) Users (can be Regular Riders or Corporate Riders) must log in and can book rides, track drivers, and pay fares.Corporate Riders can also book rides for others and get monthly invoices.Both are generalizations of a User actor.

b) Book Ride use case includes:Check Driver Availability, Estimate Fare, Suggest Best Vehicle (e.g., Auto, Mini, and Prime).

c) Users may choose to extend the ride (like changing destination mid-ride) – this is an extend of the main ride.

d) Track Driver includes Live Location and Notify Arrival functionalities.

e) Pay Fare excludes Issue Receipt if payment fails or is incomplete.

f) Drivers can accept/reject rides, update trip status, and view earnings.

g) Driver actor is required to complete a KYC verification before activation (only then can they interact with the system).

h) Admin can:Manage Users, Monitor Rides, Control Pricing, Ban Drivers or Users. This role generalizes permissions from multiple roles (Support Staff + Finance Team).

i) Fleet Manager oversees Manage Vehicle Inventory, which is an aggregated use case containing:Add Vehicle, Update Vehicle Info, and Remove Vehicle.

j) The Support Staff handles:User Complaints, Refund Requests, and Trip Disputes.

a)Using the scenario above, draw a use case diagram for the OLA Smart Ride System, mentioning all actors (primary and secondary) use cases, and relationships (include, extend, generalization, aggregation, and exclusion). Also, label the system boundary and provide a short explanation for why each relationship is used.

b) What are the challenges in implementing cohesion metrics in large software projects?

[8+2][CO3][BTL5,6]

3. a) The Taute Maintenance Model outlines a structured approach to software maintenance. Describe the purpose and activities involved in each phase of this model. How do different types of software maintenance (corrective, adaptive, perfective, and preventive) align with these phases? Additionally, discuss the importance of change impact analysis, documentation, and maintainability in ensuring long-term software quality.

b) What tools are commonly used for automatic re-engineering?

[8+2][CO6][BTL2,5]

4. Consider the following cases:

a) A function that calculates the square of a number.

b) Login form that requires a username and password.

c) User's credit score can range between 300 and 800.

d) A text field that accepts alphanumeric characters and has a maximum length of 10 characters.

Write all the possible classes of Test Cases using Equivalence Class Partitioning and Boundary Value Analysis techniques to design test cases.

[10][CO5][BTL6]

5. a) A software development project is estimated to have 10000000 lines of code. The project is classified as a semi-detached project with a moderately experienced development team. The project schedule is not very tight. Calculate the effort, development time, average staffing, and productivity levels using the COCOMO model.

b) Distinguish between error, fault, bug, failure, exception, and defect.

c) How do fault injection techniques enhance validation?

[5+3+2][CO4,5][BTL4,2]

6. a)A software application is deployed in a real-time industrial monitoring system. During the initial 100 hours of usage, 25 failures were observed. However, as the development team continues fixing issues, the rate of new failures is steadily decreasing, but each new failure fix is more complex and harder to detect than the last. The project manager reports that: Failures are still occurring but at a decelerating rate, each subsequent failure takes longer to appear, even with continued usage. The software is expected to stabilize logarithmically over time due to diminishing returns from debugging efforts. Given that the failure intensity decay rate is estimated to be $\theta = 0.015$, estimate: The total number of failures expected after 200 hours. The failure intensity at the 200-hour mark.

b) What are the long-term effects of high code complexity on software systems?

[8+2][CO4][BTL5]

Total no. of Pages:3

Roll no.....

VI SEMESTER

B.Tech.

END TERM EXAMINATION *MAY -2025*

IT306 - ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Time: 03:00 Hours *Max. Marks: 40*

Note: Attempt any **Five questions.**
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 a) Briefly explain Mean End Analysis (MEA). Compare and contrast MAE with Best-First Search, A* Search, and AO* Search, highlighting their key differences in terms of the search strategy; use of heuristics, and applications. [3][CO2][BTL2,3,4]

b) In the MYCIN expert system, a neural network is used to detect bacterial infection based on two symptoms: high fever (x_1) and stiff neck (x_2). The neuron has weights $w_1 = 2$, $w_2 = 3$, a bias $b=-4$ and uses a linear activation function: $f(z) = z$. If threshold value is 1. Calculate the output of the neuron and determine whether the system classifies the patient as infected (Yes/No) for the input value (0, 1) and (1, 1). [2.5][CO1,6][BTL3]

c) In the R1 expert system for computer configuration, suppose the system detects a faulty power supply. The probability of this fault given that the motherboard is defective is 0.8. The prior probability that the motherboard is defective is 0.3. The probability of detecting a faulty power supply overall is 0.5. Using Bayes' Theorem, calculate the probability that the motherboard is defective given that the power supply is faulty. [2.5][CO5,6][BTL3,4]

Q.2 a) In the famous Towers of Hanoi problem, we begin with a stack of n disks arranged from largest on the bottom to smallest on top placed on a rod and two additional empty rods (one as a goal rod and another one as an auxiliary rod). A disk is allowed to move from one rod to another, but a larger disk is not allowed to move on top of a smaller

disk. The goal is to move all the disks to the rightmost rod of the following figure. Formulate this problem as a search problem specifying: i) a state representation for the problem. ii) The size of the state space. iii) The valid set of actions for a given state. iv) Draw the state transition diagram, showing transitions from an initial state to the goal state. [5][CO1][BTL 3,4]

b) Explain production system and problem characteristics for Tower of Hanoi. [3][CO1][BTL 5]

Q.3 Consider the following knowledge base (KB):

i. All doctors are professionals.
ii. Every professional who works in a hospital is required to have a medical license.
iii. John is a doctor who works in a hospital.
iv. Mary is a doctor but does not work in a hospital.
v. Some doctors have medical licenses.

(a) Using predicate logic and resolution, prove whether John has a medical license.
(b) Determine whether Mary is required to have a medical license?
(c) Is it logically possible for a doctor to work in a hospital and not have a medical license? [4+2+2][CO3]BTL3,4]

Q.4 a) Discuss the key conceptual differences between LISP and Prolog with respect to their programming paradigms, problem-solving strategies, and suitability for AI applications. Support your answer with relevant example. [4][CO4][BTL3,4]

b) What are uncertainty factors? Briefly explain its types and mechanism to handle it. List down application of uncertainty factors. [4][CO5][BTL1,2]

Q.5 A Genetic Algorithm is applied to maximize the fitness function: $f(x)= x^2+2x$, where $x \in [0,31]$. Each individual in the population is represented using a 5-bit binary chromosome. The initial population consists of the following chromosomes:

Chromosome	Binary
A	01011
B	10010
C	00101
D	11100

a) Convert each chromosome into its decimal value and compute the fitness f(x). [2][CO5][BTL2,3]
b) Calculate the selection probability of each individual using roulette wheel selection. [2][CO5][BTL2,3]
c) Select two parents based on fitness and perform a single-point crossover at bit position 3 (0-based indexing). [2][CO5][BTL2,3]
d) Apply bit-flip mutation at bit position 1 on both offspring and write the resulting offspring in binary and compute their fitness. [2][CO5][BTL2,3]

Q.6 (a) What is fuzzy logic? How is it different from classical logic?

(b) Given the fuzzy set Tall = {(160, 0.2), (170, 0.5), (180, 0.9), (190, 1.0)}.

i) Find the degree of membership of a person who is 180 cm tall.

ii) If height 175 cm is not given in the set, explain how you would estimate its membership using interpolation.

c) Given another fuzzy set:

Athlete = {(160, 0.3), (170, 0.6), (180, 0.7), (190, 0.8)}. Find the intersection of the sets Tall and Athlete. Represent the resulting fuzzy set.

d) Discuss Fuzzy logic importance in Artificial Intelligence Expert Systems. Explain one real-world application of fuzzy logic in AI-based decision-making or expert systems, such as medical diagnosis. [2+2+2+2][CO5,6][BTL2,1,3]

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Total no. of Pages: 01 Roll no.....

VI SEMESTER

B.Tech.

END TERM EXAMINATION ***May-2025***

COURSE CODE IT-312 COURSE TITLE Cyber Forensics

Time: 03:00 Hours *Max. Marks: 40*

Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 What is the role of digital forensics in combating cybercrime? How does email forensics assist in tracking and investigating cyber fraud? **[8][CO1][BTL3]**

Q.2 Define and differentiate between cyber warfare and cyber terrorism. List three types of cyber-attacks and describe how they can impact an organization. **[8][CO2][BTL2]**

Q.3 What is the purpose of Windows Registry analysis in digital forensics? List three tools that can be used to create a response toolkit for a windows environment and explain their purposes. **[8][CO3][BTL2]**

Q.4 Design and develop an incidence report on "Cryptocurrency Airdrop Scam". What are some of the common ways used to trick users. Write guidelines/remedies to protect potential victims. **[8][CO4][BTL6]**

Q.5 How does the DroidKungFu malware operate, and what makes it a significant threat to Android devices? Discuss one case study of Android Malware of your choice(except DroidKungFu) in detail. **[8][CO5][BTL4]**

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Total No. of Pages 2

VI SEMESTER

Roll No. .....

B.Tech.(IT)

END SEMESTER EXAMINATION **May-2025**

High Speed Networks

IT316

Time:3:00 Hours *Max. Marks: 50*

Note: Answer any *FIVE* questions.
Assume suitable missing data, if any.

1. a) Illustrate the general implementation architecture of Integrated Services (IntServ) within a router, and provide an explanation of each component. [5][CO5][BTL1,2,]
   b) Explain the various queuing disciplines used for traffic scheduling in Integrated services? [5][CO5][BTL1,2,]

2. a) Explain, with the help of a diagram of the header, how the IPv6 protocol is more efficient and useful for the Internet. [5][CO6][BTL3]
   b) The Internet uses OSPF as the interior routing protocol. Justify the given statement. [5][CO4][BTL5]

3. a) What are the goals of Random Early Detection (RED), and how does the RED algorithm work to achieve them? [5][CO3][BTL1,5]
   b) What are the key characteristics of Distributed Services, and how do they contribute to improved efficiency and ease of deployment? [5][CO4][BTL3,5]

4. a) What are the goals and key characteristics of Resource Reservation Protocol (RSVP) ? Justify with working of the protocol. [5][CO5][BTL6]
   b) RTP, along with RTCP, offers an effective solution for soft real-time communication over transport layer protocols. Do you agree or disagree, give reasons. [5][CO5][BTL6]

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5. a) Explain the Border Gateway Protocol (BGP) and its function in interdomain routing. Discuss the scalability challenges and security concerns associated with deploying BGP in large-scale networks.

[5][CO4,5][BTL4,2]

b) What are the various traffic and congestion-related attributes in ATM, and how do they contribute to the overall traffic management framework?

[5][CO4,5][BTL4,2]

6. Write a short note on

a) Queuing analysis and single server queues. [5][CO2][BTL5]

b) TCP traffic control mechnisms [5][CO4][BTL3]

******END******

Q.4 a) The sinusoidal positional encoding for a Transformer model is defined as: $PE_{(pos,2i)} = \sin\left(\frac{pos}{10000^{\frac{2i}{d_{model}}}}\right)$ and $PE_{(pos,\ 2i+1)} = \cos\left(\frac{pos}{10000^{\frac{2i}{d_{model}}}}\right)$.

Consider a sentence "*I am a Robot*" having a word embedding of each word of the sentence is given as: ***I***=[0.1, 0.2, 0.3, 0.4] ***am***=[0.5, 0.6, 0.7, 0.8] ***a***= [0.9, 1.0, 1.1, 1.2] ***Robot***= [0.3, 0.1, 0.6, 0.8]. Compute the position encoding vectors of the given sentence with $d_{model} = 4$. What will be the output of the positional encoding layer in the transformer model.

[4][CO4][BTL3]

b) Explain the term Intersection over Union (IOU) and Non-Maximum Suppression. Discuss the limitation of the RCNN object detection model and explain how Fast RCNN and Faster RCNN address these issues with detailed diagram. **[6][CO3][BTL2]**

Total no. of Pages: 4 *Roll no.....*

VI/VIII SEMESTER

B.Tech

END TERM EXAMINATION ***May-2025***

COURSE CODE _IT324 COURSE TITLE__Deep Learning__

Time: 03:00 Hours ***Max. Marks: 40***

Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 a)You are given an input sequence of 3 tokens, each represented as a 3-dimensional vector. The self-attention layer uses single-head scaled dot-product attention. Let the input vector x_1, x_2, x_3 is defined as x_1=[1, 0, 1], x_2=[0, 1, 1], x_3= [1, 1, 0]. The weight matrix to compute the query, key and value is defined as:

$$W_Q = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix} \quad W_K = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix} \quad W_V = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

i. Compute the **Q, K, and V** matrices for the input.
ii. Calculate the attention scores using the scaled dot-product attention where d_k=4
iii. Show the final output of the self-attention mechanism.

[6][CO4][BTL3]

b) Explain the concept of transfer learning and fine tuning through diagram. Discuss the advantages of transfer learning and fine-tunning in deep neural network? ***[4][CO2][BTL2]***

OR

b) Write any two benefits of using convolutional layers instead of fully connected layers for visual tasks. Why Convolutional Neural Network is better than Recurrent Neural Network for Image Classification.

[4][CO2][BTL2]

Q.2 a) Suppose you want to compress large images using autoencoders to reduce storage costs and transmission time. I have used a convolutional autoencoder to reduce 256×256 RGB images to a latent representation. Discuss following questions in detail: **[5][CO4][BTL2]**

i. Why is a convolutional autoencoder preferred over a dense autoencoder for image compression?
ii. How can the size of the bottleneck layer affect compression quality and reconstruction error?
iii. If compression artifacts are visible in the reconstructed images, how can the model architecture or training procedure be improved?

(b) In a medical imaging application, a grayscale CT scan image of size 5×5 is processed using a convolutional kernel designed to detect horizontal edges, which may indicate anomalies such as tissue boundaries or fractures. **[5][CO2][BTL4]**

$$\text{Input } I=\begin{bmatrix}52 & 55 & 61 & 66 & 50\\ 54 & 56 & 60 & 64 & 60\\ 53 & 54 & 59 & 63 & 56\\ 50 & 52 & 57 & 61 & 54\\ 51 & 60 & 62 & 60 & 53\end{bmatrix} \quad \text{Kernel } k=\begin{bmatrix}1 & 2 & 1\\ 0 & 0 & 0\\ -1 & -2 & -1\end{bmatrix}$$

i. Compute the convolution result at the center pixel of the image (use valid padding and assume stride = 1).
ii. Explain how convolutional operation could assist in identifying structural abnormalities in medical diagnostics.
iii. Modify the given kernel to detect vertical edges instead of horizontal edges. Compute the convolution result at the same center pixel using this new kernel. Explain the difference in the outcome compared to the horizontal edge detection.

3 (a) You are developing a CNN-based sentiment analysis system that classifies user reviews into three categories: Positive, Negative, Neutral. Each review is represented as a 3×3 matrix of word embeddings (each word is embedded in 3 dimensions), producing a 2D "image-like" feature map that is processed using a CNN. The result of the CNN is flattened into a 1D vector F=[0.6 0.9 0.4 0.3]. After flattening the CNN output, a fully connected layer computes the raw scores z_j for 3 class using $z = w.F^T + b$ and softmax function is applied to obtain the class probabilities. Assume the weights matrix w and biases b is given below. Calculate the following: **[6][CO3][BTL4]**

$$w=\begin{bmatrix}.5 & -.2 & .3 & .4\\ .1 & .8 & -.5 & -.3\\ -.4 & .3 & .7 & .2\end{bmatrix} \text{ and } b=[.2 \quad -.1 \quad 0].$$

i. Compute the raw score vector z_j for three sentiment classes.
ii. Apply the softmax function to convert these raw scores into class probabilities.
iii. Determine the predicted sentiment class.

b) Assume, as a model developer you are developing a deep learning model to predict student academic performance based on features such as study hours, attendance, previous grades, and participation. You have developed two predictive models and trained using the same dataset and the performance of the model as follows: **[4][CO1][BTL2]**

Model A: Training Accuracy = 96%, Validation Accuracy = 68%
Model B: Training Accuracy = 72%, Validation Accuracy = 70%
Explain each of following:
i. Identify which model suffers from high variance and which from high bias.
ii. Determine whether each model is overfitting, underfitting, or well-generalized.

OR

b) A deep neural network consisting of dense layers, wherein three hidden layers (128, 64, 32 neurons) and input layer of 16 neurons, is trained on 50,000 images (Output class: 4, batch size: 100) for 20 epochs. Each batch takes 40ms to process, then calculate the following:
i. Total model parameters in the model
ii. Batches per epoch
iii. Total training time for 20 epochs.

[4][CO1][BTL3]

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Total no. of Pages: 1

Roll no.....

6th & 8th SEMESTER

B.Tech.

END TERM EXAMINATION

May-2025

COURSE CODE: IT428 **COURSE TITLE: Mobile & Digital Forensics**

Time: 03:00 Hours ***Max. Marks: 50***

Note: All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 a.) Define mobile forensics and explain how it differs from traditional digital forensics.
b.) Differentiate logical, file system, and physical extraction methods in mobile forensics. **[5, 5][CO3][L2, L5]**

Q.2 a.) Explain the forensic steps to preserve and extract the data from a seized smartphone suspected of containing illegal images.
b.) How would you approach recovering deleted whtsapp messages from an Android phone? **[5, 5][CO3][L4, L6]**

Q.3 a.) Explain the role of hashing (e.g., MD 5, SHA-1) in verifying data integrity.
b.) List three commonly used digital forensic tools and describe their functions. **[5, 5][CO4][L1, L2]**

Q.4 a.) Describe a situation with legal challenges related to solving a cybercrime in digital forensic investigation.
b.) Define metadata and explain its relevance in digital investigations. **[5, 5][CO4][L6, L2]**

Q.5 a.) Describe a real-world scenario where both digital and mobile forensics would be needed.
b.) How does cloud synchronization complicate investigations in mobile forensics compared to digital forensics? **[5, 5][CO5][L3, L4]**

Total no. of Pages: 04

Roll no.....

2nd SEMESTER

B.Tech.

END TERM EXAMINATION

May-2025

COURSE CODE: ME102/AE102/PE102

COURSE TITLE: BASICS OF ELECTRONICS FOR MECHANICAL ENGINEERS

Time: 03:00 Hours

Max. Marks: 40

Note: ***Attempt any 5 questions.***
All questions carry equal marks
Assume suitable missing data, if any.

Q1. (a) Draw the enhancement- type MOSFET structure and plot its drain and transfer characteristics.

(b) Derive the expressions for the current gain, voltage gain, input resistance and output resistance for a CE BJT amplifier using the small signal equivalent hybrid-pi model. [CO2][4+4][L3,L3]

Q2. (a) Minimise the following Boolean function using K-map and draw the resultant logic circuit diagram:

$$F(ABCD) = \sum(3,5,7,9,11,13,15) + d(4,14)$$

(b) Obtain the simplified Boolean expressions for output F and G in terms of the input variables in the circuit of Fig.1 given below.
[CO4][4+4][L4,L3]

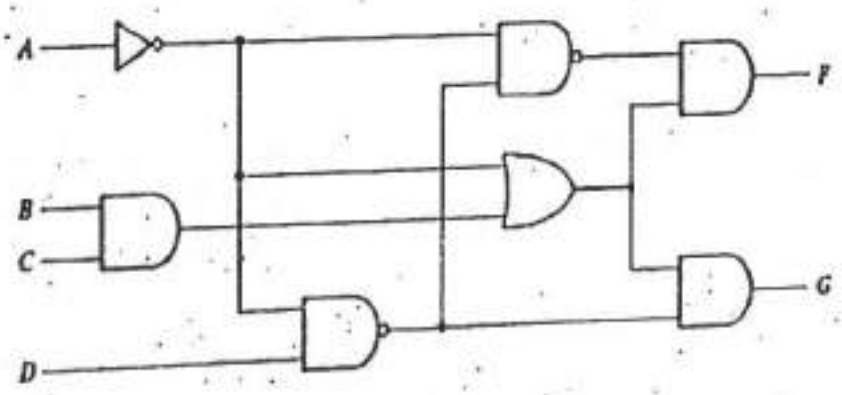

Fig.1

Q3. (a) Determine the simplified expression for Y for the Boolean function given in Fig.2.

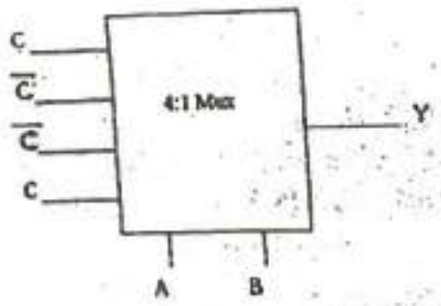

Fig.2

(b) Draw the schematic circuit of JK, D and T flip-flop and draw their truth table. [CO4][4+4][L4,L3]

Q4. (a) Determine the value of feedback resistance R_F if the voltage gain of the OPAMP amplifier given in Fig.3 is -50 and $V_{in} = 5\,V$.

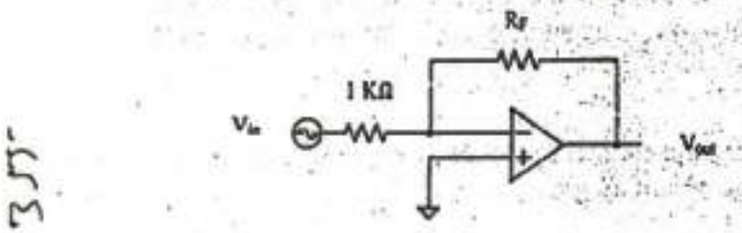

Fig.3

(b) Determine the mathematical expression for voltage gain for the integrator and differentiator circuit using OPAMP. [CO3][4+4][L4,L4]

Q5. (a) Define the term thermocouple and explain its working using the Seebeck effect.

(b) Explain the operating principle of a Linear Variable Differential Transformer (LVDT) and illustrate how core displacement affects output voltage. [CO5][4+4][L1,L2]

Q6. (a) For the circuit given in Fig.4, $V_{BE,active} = 0.7\,V$, $V_{BE,sat} = 0.8\,V$ and $\beta = 75$. Calculate the collector current I_{CQ} and V_{CEQ}. [CO2][4]

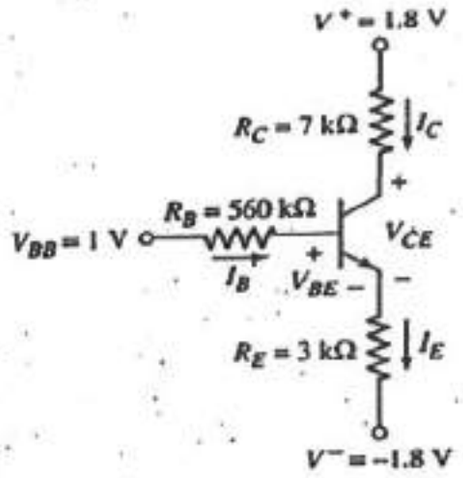

Fig.4

(b) Explain the working of centre tapped full wave rectifier and calculate its ripple factor. [CO1][4][L3,L2]

Q7. Write short notes on the following:

(a)Difference between zener breakdown and avalanche breakdown. [CO1][2][L2]

(b) Early effect or base width modulation. [CO1][2][L2]

(c)Difference between combination circuits and sequential circuits. [CO4][2][L2]

(d) Solenoids [CO4][2][L2]

END

Total No. of Pages 01

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II SEMESTER

Roll No. .....

END SEMESTER EXAMINATION MAY 2025

B.Tech.

ME-104 BASIC MECHANICAL ENGINEERING

Time: 3:00 Hours

Max. Marks: 50

Note: Use the single Answer sheet. Answer any 5 questions from part A and any 5 questions from part B. Each question carries 5 marks. Assume suitable missing data, if any.

Part A

1 (a) State first law of thermodynamics for a process and cycle. Derive the expression for work done in an isentropic process.

(b) Draw the P-V and T-S diagram of the Otto cycle and derive its efficiency in terms of compression ratio. (2.5, 2.5)

2 Explain the working principle of Thermal power plant with block diagram (5)

3(a) State and explain: Bernoulli's Theorem

(b) A mass of 8 kg expands in a container so that PV relationship is of the form $PV^{1.2} = C$. The initial pressure is 1000 kPa and initial volume is 1 m^3. The final pressure is 5 kPa. If the specific internal energy of the gas decreases by 40 kJ / kg, find the final volume, work transfer and heat transfer. (2.5, 2.5)

4 (a) Draw the P-V and T-S diagram of the Diesel cycle and derive its efficiency in terms of Compression ratio.

(b) Draw the P-V and T-S diagram of the otto cycle and Dual cycle with all notations. (2.5, 2.5)

5 (a) State and Prove Pascal's Law

(b) Derive an expression for the Pressure variation in a fluid at rest. (2.5, 2.5)

6(a) State and Explain (i) Carnot theorem (ii) Principle of increase of entropy.

(b) State Newton's law of viscosity with units of measurement. (2.5, 2.5)

PART B

1. Explain any five types of cast iron with composition, properties and applications. (5)
2. Discuss any types of copper alloys with composition, properties and uses. (5)
3. Explain the green sand moulding process with figure. (5)
4. Explain the working principle of shielded metal arc welding process with block diagram. (5)
5. Differentiate between the line standard and End Standard. Draw the Vernier calliper and briefly explain about uses and least count measurement. (5)
6. Write short notes on (a) Lathe operations (b) welding defects

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Total no. of Pages:02 *Roll no.....*

II SEMESTER B.Tech.

END TERM EXAMINATION *MAY-2025*

ME104n THERMAL ENGINEERING I

Time: 03:00 Hours *Max. Marks:40*

Note: Answer ANY FIVE Questions in all.
Q no. 5 and Q no. 6 have internal choice.
Assume suitable data, if missing.
Use of STEAM TABLE & MOLLIER CHART is permitted.

Q.1 What do you understand by Thermodynamic Properties and differentiate between the Intensive and extensive properties using suitable examples ? The piston of an oil engine, of area 0.0045 m2, moves downwards 75 mm, drawing in 0.00028 m3 of fresh air from the atmosphere. The pressure in the cylinder is uniform during the process at 80 kPa, while the atmospheric pressure is 101.325 kPa, the difference being due to the flow resistance in the induction pipe and the inlet valve. Estimate the displacement work done by the air finally in the cylinder ? [L 3,2][08][CO1]

Q.2 Discuss the microscopic view of Inernal Energy in thermodynamics ? Derive the Steady Flow Energy Equation (SFEE) for a compressor ? [08][CO2] [L 1,2]

Q.3 Critically analyse the two statements of second law of thermodynamics and comment whether the two statements are 'Equivalent', i.e. violation of one statement implies violation of the other statement or *vice versa* ? [08][CO4] [L 4]

Q.4 a) What is the importance of a steam condenser in a rankine power cycle ? How would you classify Steam condensers, Draw neat labelled diagram of any two types of condensers ? [04][CO3] [L 2,4]

b) Draw a neatly labelled Mollier Chart representing following properties/ curves: [04][CO2] [L 1]

i. Constant Presseure Lines
ii. Dryness Fraction/ Moisture Lines
iii. Constant Temperature Lines
iv. Critical Point.

Q.5 Discuss the flow of steam in a convergent divergent nozzle and highlight the effects of super saturation in the steam nozzle? [L 5]
In case of a steam Nozzle , Prove that:

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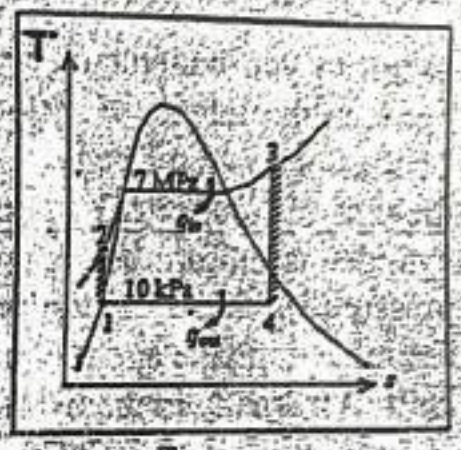
$C_2 = 44.72 \sqrt{(h_1 - h_2)}$
(where, h = specific enthalpy and C_2 = Exit Fluid velocity) ? [08][CO3]

OR

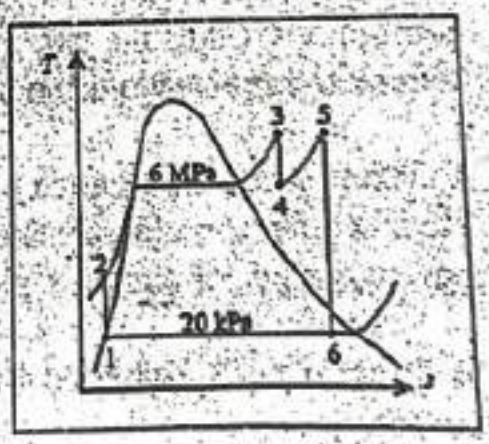
Explain the principal of compounding in steam turbine? Estimate the Mass Flow rate of the steam flowing through a convergent – divergent nozzle with inlet pressure 10 bar and inlet temperature 220 °C, the back pressure is 0.5 bar, and throat diameter is 12 mm ? [L 5, 4][08][CO4]

Q.6 A steam power plant operating on a ideal Rankine cycle, as shown in T-S diagram, between the specified pressure limits of 7 MPa and 10 kPa. Operating temperature at exit of turbine is 500°C. Calculate the thermal efficiency of the cycle and the mass flow rate of the steam, if initial enthalpy (h_1) is 191.81 KJ/Kg and sp. Vol. (v_1) is 0.00101 m^3/kg. *(assuming steady flow conditions and neglecting PE, KE effects)* [08][CO5] [L 5]



OR

A steam power plant operating on an ideal *Reheat* Rankine cycle, as shown in T-S diagram, between the specified pressure limits of 6 MPa and 20 kPa. Operating temperature at bleeding point/ reheating is 400°C and operating pressure at reheating stage is 2 Mpa. Calculate the Turbine Work output and the thermal efficiency of the cycle, *if* initial enthalpy (h_1) is 251.42 KJ/Kg and sp. Vol. (v_1) is 0.001017 m^3/kg.
(assuming steady flow conditions and neglecting PE, KE effects) [08][CO5]
[L 5]



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Total no. Of pages : 2

FOURTH SEMESTER B.Tech. *Roll No.* (Branch -Mechanical-)

END SEMESTER EXAMINATION MAY 2025 (Old scheme)

ME 202 THERMAL ENGINEERING-II

Time : 3 hr Max Marks: 40

Answer any FIVE questions. Assume missing data suitably if any.

1(a) Define the terms: compression ratio and cut off ratio. Show that for same heat supplied and compression ratio

$\eta_{otto} > \eta_{dual} > \eta_{diesel}$. Explain with pV and Ts diagram.

(b) In an air standard diesel cycle the compression ratio is 16 and at the beginning of isentropic compression the initial pressure and temperature of air are 1 bar and 330 K respectively. Heat added at constant pressure to air is 1250 kJ / kg. Determine (i) pressure and temperature at all salient points (ii) Cut off ratio (iii) air standard cycle efficiency (iv) mean effective pressure.

(4,4) [CO1][BTL3,BTL5]

2(a) Discuss the effect of pressure ratio on work output of gas turbine cycle.

(b) An open cycle gas turbine power plant takes in air to the compressor at 1 bar and 300 K and the maximum temperature in the cycle is limited to 975 K. The pressure ratio is 6. A reheater is used between two stages of turbines. Assuming the following data, find (i) thermal efficiency of plant (ii) power developed. Take air flow rate 1.2 kg/s; compressor efficiency 85% ; both turbine efficiency 90%; Neglect the fuel quantity.

(4,4) [CO2][BTL4,BTL5]

3(a) Derive the expression for work done required on (i) single stage reciprocating compressor (ii) multi stage reciprocating compressor

(b) Air is compressed in a single stage reciprocating compressor from a pressure at 1 bar and 30 C and delivers 0.6 kg of air per min at 8 bar. The bore and stroke of the compressor are 10 cm and 15 cm and the clearance volume is 4% of swept volume. Determine (i) volumetric efficiency of the compressor (ii) the power required and (iii) speed of the compressor in rpm. Assume n= 1.3

(4,4) [CO3][BTL3,BTL5]

4(a) Name the main components of a centrifugal compressor and state the function of each component. Draw the velocity diagrams for centrifugal compressor.

(b) Explain the phenomenon of surging and choking in compressors.

(4,4)[CO4] [BTL1,BTL4]

5(a) Derive the adiabatic energy equation and show the various regions of flow.

(b) An air jet at 480 K has sonic velocity. Determine (i) jet velocity (ii) maximum velocity of jet (iii) stagnation temperature of jet and (iv) stagnation enthalpy.

(4,4) [CO5][BTL3,BTL5]

6(a) Derive the expression for area ratio as a function of Mach number in a variable area duct.

(b) Explain the working of a ramjet engine with the help of a diagram.

(4,4)[CO5,CO6][BTL4,BTL2]

7 Explain the following with neat sketch

(a) Liquid Propellant rocket engine

(b) Gas turbine cycle with regeneration

(4,4)[CO2,CO6][BTL3,BTL3]

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Total No. of Pages 2 *Roll No. .....*

FOURTH SEMESTER **B.Tech (ME)**

END SEM. EXAMINATION **[MAY 2025]**

ME 202n: MACHINE TOOLS AND MANUFACTURING

Time: 3 Hrs. *Max. Marks: 40*

Note: Question no. 1 is compulsory and answer *any three* questions from the rest. Assume suitable missing data, if any.

1 [a] Give the brief distinction between the following.
(i) BSW thread and Metric thread (ii) Positive rake and negative rake angle (iii) High carbon steel and High-speed steel (iv) Drive plate and face plate (v) Plain milling machine and universal milling machine
5 [CO 1,2,5]

[b] Explain the specific function/applications of the following.
(i) Speed lathe (ii) Half-nut (iii) T slots (iv) Gang drilling machine
(v) Wheel trueing. 5 [CO 2,3,5,6]

2 (a) Sketch three views of a 18mm×18mm, single point, RH turning tool having tool signature 8,10,6,7,15,14,1.5. Also discuss the significance of various elements and angles. 5 [CO 2]
(b) Distinguish between right hand and left-hand twist drills. In a C60 steel plate of 40 mm thickness, 5 holes of 15 mm diameter each are to be drilled by a LH twist drill having point angle 130^0. The cutting speed for the drilling can be taken as 25 m/min and feed rate as 0.15 mm/rev. Over travel and approach can be taken as 5 mm each. Calculate the machining time and the metal removal rate for the operation.
5 [CO 3]

3 (a) How are shapers classified? With a neat sketch explain the construction and working of a standard mechanical shaper. Describe, how cutting speed, feed and depth of cut can be changed in this shaper.
5 [CO4]

PTO

(b) Describe the step-by-step process for making a spur gear with the following specifications using a milling machine: Module = 1.5, Number of teeth = 18, Pressure angle = 14.5°. Include the necessary calculations for the gear blank diameter and the total tooth depth and suggest an appropriate type of cutter and cutter number. 5 [CO 5]

4[a] Classify Grinding Machines. With a neat sketch discuss the construction, working and applications of an external centreless grinder. 5 [CO6]

[b] What is meant by the term grinding wheel specification? Explain each component involved in specification with their significance. 5 [CO 6]

[5] Write short notes on the following [*Any Four*]

(i) Cutting tool materials

(ii) Automatic feed mechanism of a standard shaper

(iii) Various operations on a drilling machine

(iv) Mechanism of universal indexing head

(v) Lapping and honing 10 [CO 1,3,4,5,6]

END

Total no. of pages: 03

FOURTH SEMESTER

END SEMESTER EXAMINATION

Roll No. .....

B.Tech. [ME]

May- 2025

ME-204: Fluid Mechanics

Time: 3:00 Hours ***Max. Marks: 40***

Note: Answer all questions by selecting any two parts from each question.
All questions carry equal marks.
Assume suitable missing data, if any.

1 [A] What is the difference between U-tube differential manometer and inverted U-tube differential manometer?

[4] [CO1] [L3]

[B] Explain the conditions of equilibrium of floating and submerged bodies.

[4] [CO1] [L3]

[C] Drive an expression for time-period of the oscillation of a floating body in terms of gyration and metacentric height of the floating body.

[4] [CO1] [L4]

2 [A] Drive three dimension Navier stokes equation in partial differential form with neat diagram.

[4] [CO2] [L4]

[B] Drive an expression for the discharge through Venturimeter meter with neat diagram.

[4] [CO2] [L4]

[C] What is meant by geometric, kinematic, and dynamic similarity? Are these types of similarity truly attainable in practice? If not, why?

[4] [CO2] [L3]

3 [A] In the laminar flow of a fluid in a circular pipe, the velocity profile

is exactly a parabola. The rate of discharge is then represented by volume of a paraboloid. Prove that for this case the ratio of the maximum velocity to mean velocity is 2.

[4] [CO3] [L3]

[B] Explain the working of the capillary tube viscometer with neat diagram.

[4] [CO3] [L3]

[C] A capillary tube viscometer of diameter 40 mm is used to measure the viscosity of an oil of specific gravity 0.86. The difference of pressure head between two points 1.4 m apart is 0.4 m of water. If the mass of oil collected in a measuring tank is 50 kg in 100 seconds, then determine the viscosity of the oil.

[4] [CO3] [L5]

3 6 4

4 [A] Explain hydrodynamically smooth and rough boundaries with neat diagram.

[4] [CO4] [L3]

[B] A pipe of diameter 0.25 m and length 450 m carries oil with mass density 860 kg/m^3 and dynamic viscosity 0.006 Ns/m^2. Determine the head lost due to friction and the power required maintaining the oil flow at a rate of 0.08 m^3/s.

[4] [CO4] [L5]

[C] A rough pipe of diameter 80 mm carries water. If the velocity at a point 3 cm from the wall is 24% more than the velocity at a point 1 cm from the pipe wall, then determine the average height of the roughness.

[4] [CO4] [L5]

5 [A] Define laminar and turbulent boundary layer with neat diagram.

[4] [CO5] [L3]

[B] Drive Von-Karman's momentum integral equation with neat sketch.

[4] [CO5] [L3]

[C] Atmospheric air with kinematic viscosity of 15.5 × 10-6 m^2/s flows parallel to a flat plate at a velocity of 2.5 m/s. Determine the boundary layer thickness and the local skin friction coefficient at x = 1.2 m from the leading edge of the plate using Blasius solution. Also compare the corresponding values obtained for these parameters by Von-Kármán integral technique for cubic velocity profile.

[4] [CO5] [L5]

-----END-----

Roll No.____

Total no. of pages: 2

IV SEMESTER
B.Tech.[ME]

MAY- 2025

END SEM EXAMINATION
ME204n HEAT TRANSFER

Time: 3:0 Hours

Max. Marks: 40

Note: Answer All five questions (Internal choice is There). All questions carry equal marks. Draw neat diagram wherever necessary. Assume suitable missing data, if any.

1. The temperature distribution across a wall, 1 m thick at a certain instant of time is given as: $T(x) = 900 - 300\,x - 50\,x^2$, where T is in degree Celsius and x in metres. The uniform heat generation of 1000 W/m^3 is present in wall of area 10 m^2 having the properties $\rho = 1600$ kg/m^3, $k = 40$ W/m.K. [8]
(a) Determine the rate of heat transfer entering the wall ($x = 0$) and leaving the wall ($x = 1$ m).
(b) Determine the rate of change of internal energy of the wall.
[BL4] (CO2)

OR

Derive an expression for one dimensional time dependent heat conduction with internal heat generation and constant thermal conductivity in cartesian coordinate system. Reduce it as: [8]
(i) Poisson equation,
(ii) Fourier equation,
(iii) Laplace equation.
[BL4] (CO2)

2. (a) Differentiate between hydrodynamically developed flow and thermally developed flow in a circular pipe with the help of suitable diagram. What do you mean by thermal entry length and hydrodynamic entry length? [4]
[BL2, BL3] (CO3)
(b) Define and explain critical thickness of insulation. Also, show that the critical radius of insulation in cylinder is the ratio of conductive heat transfer coefficient to the convective heat transfer coefficient. [4]
[BL3] (CO2)

3. Discuss in detail with the help of suitable diagram the mechanism of following: [8]
   (i) Filmwise and dropwise condensation
   (ii) Subcooled and saturated boiling
   (iii) Nucleate and film boiling

   [BL2,BL3] (CO4)

   OR

   Find the functional expression for forced convection heat transfer between a fluid flowing through a tube and its wall in terms of Nuuselt number as a function of Reynolds number and Prandtl number, the parameters are as follows: [8]
   Tube diameter (D), fluid density (ρ), fluid viscosity (μ), fluid velocity (u), thermal conductivity (k), convective heat transfer coefficient (h), fluid specific heat C_p.

   [BL3,BL4] (CO3)

4. What are the limitations of LMTD method? How is ε-NTU method superior to LMTD method? [8]
   Steam in a condenser of a steam power plant is to be condensed at a temperature of 30°C with cooling water from a nearby lake, which enters the tubes of condenser at 14°C and leaves at 22°C. The surface area of the tubes is 45 m^2 and overall heat transfer coefficient is 2100 $W/m^2.K$. Calculate the mass flow rate of cooling water needed and rate of steam condensation in the condenser. (consider C_p of water as 4.18 and latent heat of vaporization at 30°C as 2430.5 kJ/kg)

   [BL3] (CO6)

5. (a) A cubical room 4 m by 4 m by 4 m is heated through the ceiling by maintaining it at uniform temperature of 350 K, while walls and the floor are at 300 K. Assuming that the all surfaces have an emissivity of 0.8, determine the rate of heat loss from ceiling by radiation. [4]

   [BL3] (CO5)

   (b) Discuss a black body and its properties? Why (explain with a suitable diagram) does a cavity with a small hole behave as a black body? What do you mean by spectral and total emissivity? [4]

   [BL3] (CO5)

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Total No. of Pages:02

Roll No.....

FOURTH SEMESTER

B.Tech. [ME]

END TERM EXAMINATION

MAY-2025

ME208n/ME208: MANUFACTURING TECHNOLOGY

Time: 3Hrs.

Max. Marks: 40

Note: Answer any four questions. Assume suitable missing data, if any.

1[a] Explain the following briefly.
[i] GFN [ii] Tumbling [iii] Duty cycle [iv] HAZ [v] Spring-back

5 [CO1,2,5] L1

[b] Differentiate the following briefly.
[i] Runner and riser [ii] Direct polarity and reverse polarity [iii] Laser beam and electron beam [iv] Stress strain curve for ductile materials and brittle materials [v] Direct extrusion and indirect extrusion

5 [CO1,2,3,4,5] L4

2[a] With the help of neat sketches, explain the operating principles of the casting methods employed in the production of the following items.
(i) Billets and blooms (ii) Hollow pipes of large diameters **5 [CO 1] L6**

[b] With A neat sketch discuss the working principle of PAW. Additionally, discuss its advantages, disadvantages, and applications.

5 [CO 2] L2

3[a] Explain Ultrasonic welding with a neat diagram, highlighting the following: (i) Working principle (ii) A brief description of the main equipment components such as the generator, transducer, booster, and welding horn (iii) Limitations (iv) Various industrial and practical applications.

5 [CO 3] L3

[b] Compare hot rolling and cold rolling processes. With neat sketches, describe the operation of 2-high and 3-high rolling mill stand arrangements, distinguishing between reversing and non-reversing types. Also, mention their typical applications.

5 [CO 5] L4

P.T.O.

4[a] With neat sketches describe the working principle of the following processes with their specific applications.

(i) Press forging

(ii) Wire drawing **5 [CO 5] L2**

[b] Briefly explain the working principle of powder metallurgy process with a block diagram. Describe any two methods by which powder suitable for powder metallurgy can be produced. **5 [CO 6] L2**

[5] Write short notes on the following *[Any Four]*

[i] Foundry mechanization

[ii] Oxy fuel gas cutting operation

[iii] Welding defects

[iv] Mechanical properties

[v] Sheet metal operations **10 [CO 1,2,3,4] L1,2]**

END

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Total No. of Pages: 02 *Roll No. ... .*

B. Tech. (PE) Back Paper *Fourth Semester*

End Semester Examination *(May-2025)*

ME262(old) MACHINE DESIGN

Time: 3 hrs *Max. Marks: 40*

Note: Attempt any FIVE questions. Assume suitable missing data, if any. Use of Design data hand book is permitted.

(1) (a)What are factors that govern selection of materials while designing a machine component. [2] [CO1] [BTL1,2]

(b) Define stress concentration factor. [2] [CO1] [BTL1,2]

(c) What are unilateral and bilateral tolerances? [2] [CO1] [BTL31,2]

(d)Write and explain different parts of screw Jack. [2] [CO1] [BTL1,2]

(2)(a) Explain the failure of cotter in bending. Also, write related equations. [2] [CO2] [BTL1,3,4]

(b) What is the difference between clutch and flange coupling? [2] [CO6] [BTL1,2]

(c) A shaft of diameter d is subjected to a torque T and a bending moment M. Find expressions for an equivalent bending moment and equivalent torque. [2] [CO4] [BTL3]

(d)Explain different types of brakes and give at least one practical application of each. [2] [CO6] [BTL3]

(3) Design a spigot-socket cotter joint for an axial load of 80kN in tension and compression. It is assumed that all parts are made of the same material with the permissible stress of 70MPa,50MPa, and 90Mpa in tension, shear and compression respectively. Also, sketch the joints. [8] [CO2] [BTL1,2,3]

(4) Design a triple riveted double strap butt joint with unequal covers for, longitudinal joint. The boiler shell having a 1.25m internal diameter to withstand maximum pressure 2.5N/mm^2. Assume that shell plate and rivets are made of C20 steel having following allowable stresses, σ_t=86N/mm^2 ,τ=52 N/mm^2 and σ_c=129N/mm^2 . Also, sketch the joints. [8] [CO2] [BTL2,3,5]

(5) A solid shaft is subjected to a twisting moment of 800N-m, a bending moment of 200N-m. If the maximum allowable values of normal and shear stresses are 140N/mm^2 and 80N/mm^2 respectively, determine the diameter of the shaft.

[8] [CO4] [BTL2,3,5]

(6) A motor shaft rotating at1500 rpm to transmit 15kw power to a low-speed shaft rotating at 500rpm. A 20^0 pressure angle involute tooth gear pinion is used. The pinion has 25 teeth. Both gear and pinion are made of cast iron having the allowable strength of 55N/mm^2.Design a spur gear on static strength and check it on wear criteria. The allowable surface endurance strength is 500N/mm^2.

[8] [CO5] [BTL2,3,5]

(7) Design and draw a cast iron protected type flange coupling to connect two shafts of 36mm diameter (made of steel 40C8, FOS=2.5) transmitting 15kW at 720rpm. The overload capacity is 1.25 times average torque. The bolts and keys are made of 30C8 steel (Yield strength=400N/mm^2, FOS=2.5) and the flange is made of FG200(ultimate strength=200N/mm^2, FOS=6).

[8] [CO4] [BTL2,3,5]

-END-

Q7 a) A cubical room (each side = 4m) is heated through the ceiling by maintaining it at uniform temperature of 350 K, while walls and the floor are at 300 K. Assuming that the all surfaces have an emissivity of 0.8, determine the rate of heat loss from ceiling by radiation. [4][CO5][L4]

Q7 b) A cryogenic fluid flows through a long tube of 20 mm diameter, the outer surface of which is diffuse and gray ($\varepsilon_1 = 0.02$) at 77 K. This tube is concentric with a larger tube of 50 mm diameter, the inner surface of which is diffuse and gray ($\varepsilon_2 = 0.05$) and at 300 K. The space between the surfaces is evacuated. Calculate the heat gain by cryogenic fluid per unit length of tubes. If a thin radiation shield of 35 mm diameter ($\varepsilon_3 = 0.02$, both sides) is inserted midway between the inner and outer surfaces, calculate the percentage change in heat gain per unit length of the tube. Consider infinitely long tubes. [4] [CO5][L5]

Total No. Pages 04

Roll no.....

VIth SEMESTER

[B.Tech.]

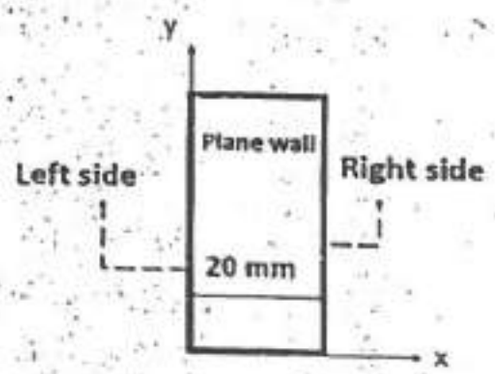
END TERM EXAMINATION ***May-2025***

ME302 HEAT AND MASS TRANSFER

Time: 3:00 Hours ***Max. Marks: 40***

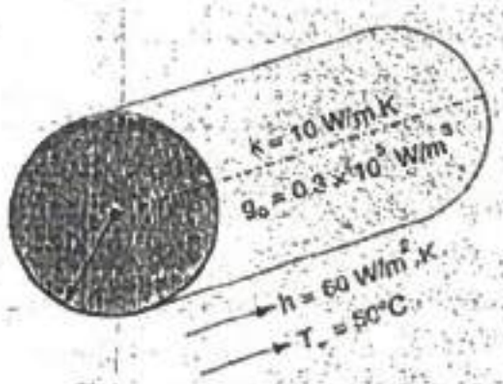
Note : Attempt any five questions. All questions carry equal marks. Assume suitable missing data, if any.

Q.1a) The temperature distribution in a plate of thickness 20 mm is given by $T(x) = 6x^2 + 10x + 4$. Where T(x) is in ^{0}C and 'x' is in meter, measured from left side of the wall. Assume no heat generation in the plate, calculate heat flux on two sides of the plate. Also calculate rate of temperature change with respect to time, if thermal conductivity of plate material(k) = 300 W/m.K, density of plate material (ρ) = 580 kg/m^3 and specific heat of plate material (C) = 420 J/kg.K. [4] [CO1][L4]



Q.1 b) A long cylindrical rod of radius 12 cm and length 1m, consists of nuclear reacting material (k = 2 W/m.K) generating 30 kW/m^3 uniformly throughout its volume. The rod is encapsulated within another cylinder (k = 5 W/m.K) whose outer radius is 24 cm and surface is surrounded by air at 30°C with heat transfer coefficient of 20 W/m^2.K. Find the temperature: i) at the interface between the two cylinders and, ii) at the outer surface. Assuming no contact resistance, steady state heat conduction in radial direction. [4][CO1] [L3]

Q.2 a) A long rod of radius 50 cm with thermal conductivity of 10 W/m.K contains radioactive material, which generates heat uniformly within the cylinder at a rate of 0.3×10^5 W/m^3. The rod is cooled by convection from its cylindrical surface by the fluid at $T_\infty = 50°C$ with a heat transfer coefficient of 60 W/m^2.K. Determine the temperature at the centre and at the outer surface of the cylindrical rod. Assuming steady state heat conduction in radial direction. [4][CO2][L5]



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Q.2 b) What is the Lumped system analysis and when it is applicable.

An aluminum sphere weighing 6 kg and initially at temperature of 350°C is suddenly immersed in a fluid at 30°C with convection coefficient of 60 W/m^2.K. Estimate the time required to cool the sphere to 100°C. Take thermophysical properties as $C = 900$ J/kg.K, $\rho = 2700$ kg/m^3, $k = 205$ W/m.K. [1+3] [CO2][L2]

Q3 a) With the help of neat sketch, Explain velocity and thermal boundary layer. How does the relative thickness of boundary layers change with Prandtl number?

Atmospheric air at 400 K flows with a velocity of 4 m/s along a flat plate, 1 m long, maintained at a uniform temperature of 300 K. The average heat transfer coefficient is estimated to be 7.75 W/m^2.K. Using Reynolds Colburn analogy, calculate the drag force exerted on the plate per meter width. Take air properties at mean film temperature as, $C_p = 1009$ J/kg.K, $\rho = 0.998$ kg/m^3, $Pr = 0.697$. [2+2][CO3][L1]

Q3 b) Air stream at 27°C moving at 0.3 m/s across 100 W incandescent bulb, glowing at 127°C. If the bulb is approximated by a 60 mm diameter sphere, estimate the heat transfer rate and the percentage of power lost due to convection. Use correlation $Nu = 0.37 (Re_D)^{0.6}$. The properties of air at mean film temperature are, $\nu = 2.09 \times 10^{-5}$ m^2/s, $k_f = 0.03$ W/m.K. [4][CO3][L3]

Q.4 a) Explain the followings: **Filmwise Condensation, Dropwise Condensation, Pool boiling, Forced convection boiling** [4][CO3][L1]

Q.4 b) The oil at 20°C flows at an average velocity of 2 m/s through a pipeline, 30 cm diameter. A 200 m long section of the pipeline passes through icy water of a lake at 0°C. The measurements reveal that the surface temperature of the pipe is very near to 0°C. Neglecting the thermal resistance of the pipe material, determine, (i) Temperature of oil when pipe leaves the lake, (ii) The rate of heat transfer from the oil. Assume thermally developing flow, take properties of oil at 20°C as: $\rho = 888$ kg/m^3, $k_f = 0.145$ W/m.K, $\mu = 0.8$ N-s/m^2, $\nu = 901 \times 10^{-6}$ m^2/s, $C_p = 1880$ J/kgK, $Pr = 10400$, $\mu_s = 3.85$ N-s/m^2 (at 0°C). Use correlation:

$$Nu_D = 1.86 \left(Re_D \, Pr \frac{D}{L} \right)^{1/3} \left(\frac{\mu}{\mu_s} \right)^{0.14}$$

[4][CO3][L4]

Q5 a) A heat exchanger is required to cool 55,000 kg/h of alcohol from 66°C to 40°C using 40,000 kg/h of water entering at 5°C. Calculate the surface area required for **(i) parallel flow type, (ii) counter flow type** of heat exchanger. Take overall heat transfer coefficient = 580 W/m^2.K **[Given:** Specific heat (water) = 4180 J/kg-K, Specific heat (alcohal) = 3760 J/kg-K]. [4] [CO4][L5]

Q5 b) Consider the following **parallel flow heat exchanger** specification: cold flow enters at 40°C (Heat capacity, $C_c = 20{,}000$ W/K), hot flow enters at 150°C (heat capacity, $C_h = 10{,}000$ W/K), area of heat exchanger(A) = 30 m^2, overall heat transfer coefficient (U) = 500 W/m^2.K. Determine: i) heat transfer rate and, ii) exit temperatures of hot and cold fluids. [4][CO4][L5]

Q6 a) **Define:** Spectral emissive power, total emissive power, Kirchhoff's law, Gray surface [4][CO5][L2]

Q6 b) A plane, gray, diffuse and, opaque surface (absorptivity = 0.7) with a surface area of 0.5 m^2, is maintained at 500°C and receives radiant energy at a rate of 10,000 W/m^2. Determine per unit time (i) The energy absorbed, (ii) The radiant energy emitted, (iii) The total energy leaving the surface per unit area, (iv) The radiant energy emitted by the surface in the wave band 0.2 μm to 4 μm. (v) The net radiative heat transfer from the surface.

[Given: At, $\lambda T = 90$ μm-K, blackbody radiation function = 0.0;
At, $\lambda T = 154.6$ μm-K, blackbody radiation function = 0.0;
At, $\lambda T = 3092$ μm-K, blackbody radiation function = 0.294;
At, $\lambda T = 14500$ μm-K, blackbody radiation function = 0.96597]
[4][CO5][L3]

Total No. of Pages _3

Roll No. .....

SIXTH SEMESTER

B.Tech (ME)

END SEMESTER EXAMINATION *May -2025*

ME304a & Design of Machine Elements

Time: 3:00 Hours *Max. Marks: 40*

Note: Answer any five questions.
All questions carry equal marks. Assume suitable missing data, if any.
***Design Data H/Book is allowed ***

Q.1[a] How localised stresses in machine component be avoided? Explain with diagrams. CO-1 [2x4=8][L1]

[b] Explain the following types of fits, with examples:(i) Clearance fit (ii) Transition fit and (iii) Interference fit (iv) 25H8d11.

[c] Explain distortion energy theory in design of a machine component. Why is this theory preferred in design?

[d] Differentiate between a key and a cotter with design equations.

Q.2 Design a screw and nut with square threads for a vertical screw jack on strength basis to raise or lower a load of 4kN to a safe height of 250mm. Assume that screw is made of AISI1035 steel with permissible stresses of 100MPa, 50MPa and 75MPa in compression, shear and tension respectively. Nut is made of Phosphor Bronze with permissible stresses of 40MPa in shear and 50MPa in tension. Let the bearing pressure between screw and nut is 14MPa and a static friction of 0.15 at nut screw interface and collar- screw interface. CO-3 [8][L2,3]

Q.3 A transmission shaft carrying two pulleys at B and C and supported on bearings at A and D as shown in fig.1. Power is supplied to the shaft by means of a vertical belt on the pulley B, which is then transmitted to the pulley C carrying a horizontal belt. The maximum tension in the belt on the pulley B is

2.5 kN. Let the angle of wrap for both the pulleys is 180° and the coefficient of friction is 0.24. The shaft is made of plain carbon steel 30C8 (yield = 400 MPa) and the factor of safety is 3. Determine the shaft diameter on strength basis using ASME shafting code with K_m and K_t as 1.5. (in Fig all dimensions in mm) CO-4 [8][L4]

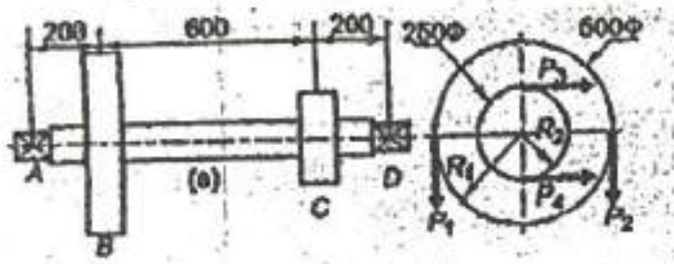

Fig.1

Q.4 A pair of spur gears is to transmit 20kW. The teeth are 15° full depth involute. The Cast steel pinion (σo=150MPa) is to drive a cast iron gear (σo=55MPa) at 450 r.p.m., and the velocity ratio is 1:3. If the pinion is surface hardened to 270BHN determine the proper module, number of teeth and face width for these gears from the standpoint of strength, dynamic load and wear. Assume a first class commercial gear having an error of 0.07mm for which C=283kN/m. CO-7[8][4]

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Q.5 Design a rigid type flange coupling for transmission of 30kW from a motor to a centrifugal pump at 1448rpm. The following data is given:
No. Of bolts=6 nos. Allowable Shear stress for the bolts, keys and shaft=55MPa, Allowable shear stress for the flanges=12MPa. Assume crushing stress twice the shearing stress in all cases. CO-6 [8][L5]

Q.6 Design a triple riveted butt joint with zig-zag fashion with five rivets in one pitch length and with double cover plates of equal widths for a boiler drum. The thickness of the main plate is 15mm. The allowable tensile stress, compressive stress and shearing stress of the steel used are 75MPa, 100MPa and 58MPa respectively. The efficiency of the joint should not be less than 75%. Assume that the boiler plate and rivets are made of the same steel. CO-2 [8][L5]

Q.7 Explain the key features to select a material for a spring. One helical spring is nested inside another; The dimensions are as tabulated. Both springs have the same free length and carry a total maximum load of 2500 N.

Spring details	Inner spring	Outer spring
Active no. of coils	10	6
Wire diameter	9mm	12.5mm
Mean coil diameter	70mm	100mm

Determine (i) the maximum load carried by each spring (ii) the total deflection of each spring (iii) the maximum stress in the two springs. Take G = 83 GN/m². CO-5 [8][L3]

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Total no. of pages: 2 *Roll No.*_____

SIXTH SEMESTER B. Tech (ME)

END SEMESTER EXAMINATION MAY- 2025

ME-306 MANUFACTURING TECHNOLOGY - II

Time: 3 Hours Max. Marks: 40

Note: Attempt all questions.
Each question carries equal marks.
Assume missing data , if any

1 (a) Name important tool materials. Describe the desirable properties of tool material. [CO1] [BTL2]

(b) What is chip thickness ratio? Describe an experimental method of determining shear plane angle. Also discuss the effect of rake angle, cutting speed, feed and depth of cut on shear plane angle. [CO2] [BTL3]

2 (a) Name various methods for determining tool-chip contact temperature in metal cutting. Describe the infrared photographic technique for measuring temperatures in metal cutting. [CO3] [BTL3]

(b) Determine temperature rise at shear plane from the following experimental data in orthogonal cutting of mild steel of density $7.87 gm/cm^3$ and specific heat of 0.44J/gm taking that $\lambda=1$ Cutting force component=1600N, Force component normal to machine surface=500N, depth of cut=0.3mm, width of cut=5mm, chip thickness ratio=0.42, tool rake angle=10^0 cutting velocity=35m/min.[CO5] [BTL4]

3 (a) Describe working principle of electrochemical machining (ECM). Briefly discuss the mechanics of material removal in ECM. Explain the effect of process parameters on material removal rate. [CO4] [BTL3]

(b) Describe the working principle of ultrasonic machining (USM) with neat sketch. Explain the function of slurry, horn and oscillator in USM. [CO3] [BTL2]

4 (a) Differentiate between interchangeable manufacturing and selective assembly. Also discuss about various fits used for the purpose of assembly of machine parts. [CO2] [BTL2]

(b) Determine the tolerances on the hole and the shaft for a fit designated by 50H7/g6. 50 mm lies between the range 30 -50 mm. Fundamental deviation for g shaft = $-2.5D^{0.34}$. Also calculate maximum and minimum sizes of hole and shaft and type of fit. [CO5] [BTL4]

5 (a) Name the factors on which the accuracy of sine bar depends. Explain why it is not preferred to use sine bar to measure angle more than 45^0. [CO3] [BTL2]

(b) A 100 mm sine bar have to be setup at an angle 40^0, determine

(i) slip gauges needed

(ii) In setting the sine bar to above angle, what error be introduced if 100mm separation is actually 100.005mm. [CO5] [BTL4]

6. Write short notes on any four of the following: [CO1] [BTL1]

(a) Jig and fixture

(b) Plasma arc machining

(c) Design of machine tool spindle

(d) Kinematic drives of machine tools

(e) Design requirements of machine tools

(f) Cutting fluids

Total no. of pages: 03

SIXTH SEMESTER

END SEMESTER EXAMINATION

Roll No. .....

B.Tech.

May- 2025

ME-308 GAS DYNAMICS AND JET PROPULSION

Time: 3:00 Hours

Max. Marks: 50

Note:	Answer all questions by selecting any two parts from each question. All questions carry equal marks. Use of gas tables are allowed. Drawn neat diagram wherever necessary. Assume suitable missing data, if any.

1 [A] Drive three dimensional continuity equation in partial differential form with help of neat diagram.

[5] [CO1] [L3]

[B] Explain the pressure distribution along a convergent nozzle for different values of pressure ratio across the nozzle, with a neat diagram. Also, show the variation of the nozzle pressure ratio and the mass flow parameter for $\gamma = 1.4$.

[5] [CO1] [L4]

[C] Compare the final values of the pressure in a duct generated by sudden closure of the exit valve with:

i). Hydrogen, $\gamma = 1.4$, R = 4125 J/kg.K.

ii). Air $\gamma = 1.4$, R = 287 J/kg.K.

iii). Freon $\gamma = 1.2$, R = 135 J/kg.K.

The initial flow conditions in each case are pressure 10 bar, temperature 400K and velocity 100 m/s.

[5] [CO1] [L5]

2 [A] Drive an equation describing a Fanno curve. Shows three Fanno curves on the temperature-entropy coordinates at three mass flow densities.

[5] [CO2] [L3]

[B] Obtain an equation representing the Rayleigh line. Draw Rayleigh

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lines on the enthalpy-entropy and pressure-volume planes for two different values of the mass flux.

[5] [CO2] [L3]

[C] A combustion chamber in a gas turbine plant receives air at 350K, 0.55 bar and 75 m/s. the air-fuel ratio is 29 and calorific value of the fuel is 41.87 MJ/kg. Taking γ=1.4 and R=0.287 kJ/kg.K for the gas determine:

i). Initial and final Mach number.
ii). Final pressure, temperature and velocity of the gas.
iii). Present stagnation pressure loss in the combustion chamber.
iv). The maximum stagnation temperature attainable.

[5] [CO2] [L5]

3 [A] Explain the working of the claw-type yawmeter and the wedge probe, used to measure the direction of flow, with neat diagrams.

[5] [CO3] [L3]

[B] Explain the working of closed circuit continuous type supersonic wind tunnel with neat diagram.

[5] [CO3] [L3]

[C] Air enters a circular duct (D=40 cm) through a measuring nozzle; then it passes through a Venturimeter and a Orificemeter located at suitable distances. Determine from the following data the mass flow rate through the duct.

	Nozzle	Venturimeter	Orifice meter
Area ratio	0.500	0.5625	0.700
Coefficient of discharge	0.935	0.990	0.617
Head across the device	----	----	100 mm W.G.

Also determine the head in millimeters of water column across the

nozzle and the Venturimeter. Take ambient conditions as p=1.013 bar, T=295K. Changes in density at the various devices may be considered negligible.

[5] [CO3] [L5]

4 [A] Explain the working principle of supersonic ramjet engine with Oswatitsch type annular diffuser with neat sketch.

[5] [CO4] [L3]

[B] Explain the working principle of pulse jet engine with neat sketch. Write down its main advantages and disadvantages.

[5] [CO4] [L3]

[C] An aircraft flies at 960 kmph. One of its turbojet engines takes 40 kg/s of air and expands the gases to the ambient pressure. The air-fuel ratio is 50 and the lower calorific value of the fuel is 43 MJ/kg. For maximum thrust power determine (a) jet velocity, (b) thrust, (c) specific thrust, (d) thrust power, (e) propulsive, thermal and overall efficiencies and (f) thrust specific fuel consumption.

[5] [CO4] [L3]

5 [A] With neat diagram explain the working of the nuclear rocket.

[5] [CO5] [L3]

[B] Explain the working of the hybrid propellant rockets with neat diagram.

[5] [CO5] [L3]

[C] Explain ten important properties of liquid propellants.

[5] [CO5] [L4]

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Total No. of Pages _2__ 6 th SEMESTER

B.Tech. Mechanical Engg

END TERM EXAMINATION ***May-2025***

ME 310 Automation In Manufacturing

Time: 3:00 Hours ***Max. Marks : 50***

Note : Answer ***any FIVE full*** question.
Assume suitably missing data, if any.

Q.1.a. Define Automation. With neat diagram explain Open Loop CNC system and Closed Loop CNC System. [05][CO1,2][L1,L2]

b. With neat diagram explain the basic principle, construction and working of Gear Pump used in Hydraulic system. [05][CO2] [L2]

Q.2.a Explain with neat diagram the Hydraulic circuit/system used in automated system in manufacturing comprising of :

i. Oil Reservoir ii. Filter iii. Pump and motor iv. Pressure Regulator v. Directional control valve vi. Actuator. [07][CO2,6][L3,L4]

b. Write a note on APT part programming language used in CNC machines of an Automated Manufacturing System. [03][CO1,7][L3,L5]

Q.3.a. With neat diagram explain the working of following Hydraulic circuits used for automation in manufacturing:

i. Meter-In Hydraulic Circuit. Ii. Meter-Out Hydraulic Circuit. [07][CO4,6][L3,L6]

b. Explain with diagram Air filter used in Pneumatic circuits. [03][CO3][L2]

Cont. Page2

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Q.4.a With diagram explain :

i. Overhead Trolley Conveyor system. ii. Skate roller conveyor system used for material handling in an automated manufacturing system [06][CO1,5][L2]

b. Explain with diagram Articulated Joint robot and it's salient features while using in automated industry [04][CO2,5][L4]

Q.5.a. Explain with neat diagram i. Pneumatic Linear Actuator ii. Pneumatic Rotary actuator. [06][CO3,4][L2,L3]

b. Explain the working of Hydraulic circuit containing Quick Return motion. [04][CO4][L3,L4]

Q.6.a. What is FMS in automated manufacturing set up?. Explain various types of FMS layouts. [05[CO1,6][L1,L4,L5]

b. Explain with diagram Automated Storage and Retrieval System (AS/RS) used in automated material handling set up during implementation of automation in manufacturing. [05][CO1,5][L3]

Q.7 Write short notes on:

a. Classic , Cascade Pneumatic circuits

b. PLC Microprocessor uses

c. Directional Control valve: 2-way

d. Karmaugh, Vetch mapping method.

e. Transfer Lines. [10][CO2,3,4,6][L1,L2,L3,L4]

otal no. of Pages:4 Roll no.....

END SEMESTER EXAMINATION MAY-2025 VI SEM B.Tech.

ME312 Quality Management and Six-Sigma Applications

Time: 3:00 Hours *Max. Marks: 50*

Answer ANY FIVE questions
Assume suitable missing data, if any.

Q.1(a) Briefly explain about the Quality gaps with the help of flow diagram.
(b) In a printing company, data from the previous month show the following types of errors, with the unit cost (in Rs) of rectifying each error in Table 1. Construct a Pareto chart and discuss the results. (a) [Marks=5+5=10] [CO#1][BTL#1]

Table 1

Error categories	Frequency	Unit cost
Inadequate binding	120	100
Paper misalignment	80	50
Paper tension	100	30
Proof reading	4000	0.5
Typographical	5000	0.2

Q.2 (a) What are the benefits of ISO 9000 certification? How does it help to improve the quality in organisation?
(b) As natural resources become scarce, discuss the role of ISO14000 in promoting good environmental management practices. [Marks= 5+5][CO#1,4][BTL#4]
Q. 3 (a) Describe in brief the evolution of six sigma quality approach.
(b) Discuss in detail about Six sigma and Indian industries approach in detail. [Marks= 5+5][CO#5][BTL#5]
Q.4 (a) A soft drink bottling company is interested in controlling its filling operation. Random samples of size 4 are selected and the fill weight is recorded. Table 2 shows the data for 24 samples. The specifications on fill weight are 350±5 grams(g). Daily production rate is 20,000 bottles. (i) Find the trial control limits for the X-and R-charts. (ii) Draw the X and R chart. (iii) Find the process capability [Marks= 10][CO#4][BTL#3] (use Table 3 and Table 4 for data's)
Q.5 (a) Write about Producer and consumer risk.
(b) Construct OC and AOQ curves for following attributes single sampling plans.
(i) n=20, c=1 (ii) n=50, c=2 [Marks=3+7][CO#2][BTL#2](Use Table 5 & 6)
Q.6 Write short notes on Any TWO
(a) Quality Function deployment (b) Control chart patterns (c) Malcom Baldrige Quality Award [Marks= 5x2=10][CO#4][BTL#1,3]

Table 6

c	np_a				
	2.1	2.2	2.3	2.4	2.5
0	0.123 (0.123)	0.111 (0.111)	0.100 (0.100)	0.091 (0.091)	0.082 (0.082)
1	0.257 (0.380)	0.244 (0.355)	0.231 (0.331)	0.218 (0.309)	0.205 (0.287)
2	0.270 (0.650)	0.268 (0.623)	0.265 (0.596)	0.261 (0.570)	0.256 (0.543)
3	0.189 (0.839)	0.197 (0.820)	0.203 (0.799)	0.203 (0.773)	0.214 (0.757)
4	0.099 (0.938)	0.106 (0.926)	0.117 (0.916)	0.125 (0.904)	0.134 (0.891)
5	0.042 (0.980)	0.048 (0.976)	0.054 (0.970)	0.060 (0.964)	0.067 (0.958)

c	np_a				
	2.6	2.7	2.8	2.9	3.0
0	0.074 (0.074)	0.067 (0.067)	0.061 (0.061)	0.055 (0.055)	0.050 (0.050)
1	0.193 (0.267)	0.182 (0.249)	0.170 (0.231)	0.160 (0.215)	0.149 (0.199)
2	0.251 (0.518)	0.245 (0.494)	0.238 (0.469)	0.231 (0.446)	0.224 (0.423)
3	0.213 (0.736)	0.221 (0.715)	0.223 (0.692)	0.224 (0.670)	0.224 (0.647)
4	0.141 (0.877)	0.149 (0.864)	0.156 (0.848)	0.162 (0.832)	0.168 (0.815)
5	0.074 (0.951)	0.080 (0.944)	0.087 (0.935)	0.094 (0.926)	0.101 (0.916)

c	np_a				
	3.1	3.2	3.3	3.4	3.5
0	0.045 (0.045)	0.041 (0.041)	0.037 (0.037)	0.033 (0.033)	0.030 (0.030)
1	0.140 (0.185)	0.130 (0.171)	0.122 (0.159)	0.113 (0.146)	0.106 (0.136)
2	0.216 (0.401)	0.209 (0.380)	0.201 (0.360)	0.193 (0.339)	0.185 (0.321)
3	0.224 (0.625)	0.223 (0.603)	0.222 (0.582)	0.219 (0.558)	0.216 (0.537)
4	0.173 (0.798)	0.176 (0.781)	0.182 (0.764)	0.186 (0.744)	0.189 (0.726)
5	0.107 (0.905)	0.114 (0.895)	0.120 (0.884)	0.126 (0.870)	0.132 (0.858)

c	np_a				
	3.6	3.7	3.8	3.9	4.0
0	0.027 (0.027)	0.025 (0.025)	0.022 (0.022)	0.020 (0.020)	0.018 (0.018)
1	0.098 (0.125)	0.091 (0.116)	0.085 (0.107)	0.079 (0.099)	0.073 (0.091)
2	0.177 (0.302)	0.169 (0.285)	0.161 (0.268)	0.154 (0.253)	0.147 (0.238)
3	0.213 (0.515)	0.209 (0.494)	0.205 (0.473)	0.200 (0.453)	0.195 (0.433)
4	0.191 (0.706)	0.193 (0.687)	0.194 (0.667)	0.195 (0.648)	0.195 (0.628)
5	0.138 (0.844)	0.143 (0.830)	0.148 (0.815)	0.152 (0.800)	0.157 (0.785)

c	np_a				
	4.1	4.2	4.3	4.4	4.5
0	0.017 (0.017)	0.015 (0.015)	0.014 (0.014)	0.012 (0.012)	0.011 (0.011)
1	0.068 (0.085)	0.063 (0.078)	0.058 (0.072)	0.054 (0.066)	0.050 (0.061)
2	0.139 (0.224)	0.132 (0.210)	0.126 (0.198)	0.119 (0.185)	0.113 (0.174)
3	0.190 (0.414)	0.185 (0.395)	0.180 (0.378)	0.174 (0.359)	0.169 (0.343)
4	0.195 (0.609)	0.195 (0.590)	0.193 (0.571)	0.192 (0.551)	0.190 (0.533)
5	0.160 (0.769)	0.163 (0.753)	0.166 (0.737)	0.169 (0.720)	0.171 (0.704)

c	np_a				
	4.6	4.7	4.8	4.9	5.0
0	0.010 (0.010)	0.009 (0.009)	0.008 (0.008)	0.008 (0.008)	0.007 (0.007)
1	0.046 (0.056)	0.043 (0.052)	0.039 (0.047)	0.037 (0.045)	0.034 (0.041)
2	0.106 (0.162)	0.101 (0.153)	0.095 (0.142)	0.090 (0.135)	0.084 (0.125)
3	0.163 (0.325)	0.157 (0.310)	0.152 (0.294)	0.148 (0.281)	0.140 (0.265)
4	0.188 (0.513)	0.185 (0.495)	0.182 (0.476)	0.179 (0.460)	0.176 (0.441)
5	0.172 (0.685)	0.174 (0.669)	0.175 (0.651)	0.175 (0.635)	0.176 (0.617)

Table 2

Sample	Observations (g)			
1	352	348	350	351
2	351	353	351	350
3	351	346	342	350
4	349	353	352	352
5	351	350	351	351
6	353	351	346	346
7	348	344	350	347
8	350	349	351	346
9	344	345	346	349
10	349	350	352	352
11	353	352	354	356
12	348	353	346	351
13	352	350	351	348
14	356	351	349	352
15	353	348	351	350
16	353	354	350	352
17	352	348	347	348
18	352	352	346	352
19	346	348	347	349
20	351	348	347	346
21	348	352	351	352
22	356	351	350	350
23	352	348	347	349
24	348	353	351	352

Table 3

Number of observations in Sub-group (n)	Factors for X bar chart (A_2)	Factors for R chart	
		(D3)	(D4)
2	1.88	0	3.27
3	1.02	0	2.57
4	0.73	0	2.28
5	0.58	0	2.11
6	0.48	0	2.00
7	0.42	0.08	1.92

Table 4

Number of observations in Sub-group (n)	Factors for estimate from R (d_2)	Factors for estimate from σ c_2	
2	1.88	0	3.27
3	1.02	0	2.57
4	0.73	0	2.28
5	0.58	0	2.11
6	0.48	0	2.00
7	0.42	0.08	1.92

Table 5

c	np_0				
	0.1	0.2	0.3	0.4	0.5
0	0.905 (0.905)	0.819 (0.819)	0.741 (0.741)	0.670 (0.670)	0.607 (0.607)
1	0.091 (0.996)	0.164 (0.983)	0.222 (0.963)	0.268 (0.938)	0.303 (0.910)
2	0.004 (1.000)	0.016 (0.999)	0.033 (0.996)	0.054 (0.992)	0.076 (0.986)
3		0.010 (1.000)	0.004 (1.000)	0.007 (0.999)	0.013 (0.999)
4				0.001 (1.000)	0.001 (1.000)

c	np_0				
	0.6	0.7	0.8	0.9	1.0
0	0.549 (0.549)	0.497 (0.497)	0.449 (0.449)	0.406 (0.406)	0.368 (0.368)
1	0.329 (0.878)	0.349 (0.845)	0.359 (0.808)	0.366 (0.772)	0.368 (0.736)
2	0.099 (0.977)	0.122 (0.967)	0.144 (0.952)	0.166 (0.938)	0.184 (0.920)
3	0.020 (0.997)	0.028 (0.995)	0.038 (0.991)	0.049 (0.987)	0.061 (0.981)
4	0.003 (1.000)	0.005 (1.000)	0.008 (0.999)	0.011 (0.998)	0.018 (0.997)
5			0.001 (1.000)	0.002 (1.000)	0.003 (1.000)

c	np_0				
	1.1	1.2	1.3	1.4	1.5
0	0.333 (0.333)	0.301 (0.301)	0.273 (0.273)	0.247 (0.247)	0.223 (0.223)
1	0.366 (0.699)	0.361 (0.662)	0.354 (0.627)	0.345 (0.592)	0.335 (0.558)
2	0.201 (0.900)	0.217 (0.879)	0.230 (0.857)	0.242 (0.834)	0.251 (0.809)
3	0.074 (0.974)	0.087 (0.966)	0.100 (0.957)	0.113 (0.947)	0.126 (0.935)
4	0.021 (0.995)	0.026 (0.992)	0.032 (0.989)	0.039 (0.986)	0.047 (0.982)
5	0.004 (0.999)	0.007 (0.999)	0.009 (0.998)	0.011 (0.997)	0.014 (0.996)
6	0.001 (1.000)	0.001 (1.000)	0.002 (1.000)	0.003 (1.000)	0.004 (1.000)

c	np_0				
	1.6	1.7	1.8	1.9	2.0
0	0.202 (0.202)	0.183 (0.183)	0.165 (0.165)	0.150 (0.150)	0.135 (0.135)
1	0.323 (0.525)	0.311 (0.494)	0.298 (0.463)	0.284 (0.434)	0.271 (0.406)
2	0.258 (0.783)	0.264 (0.758)	0.268 (0.731)	0.270 (0.704)	0.271 (0.677)
3	0.138 (0.999)	0.149 (0.907)	0.161 (0.892)	0.171 (0.875)	0.180 (0.857)
4	0.055 (0.994)	0.064 (0.971)	0.072 (0.964)	0.081 (0.956)	0.090 (0.947)
5	0.018 (0.976)	0.022 (0.993)	0.026 (0.990)	0.031 (0.987)	0.036 (0.983)
6	0.005 (0.921)	0.006 (0.999)	0.008 (0.998)	0.010 (0.997)	0.012 (0.995)
7	0.001 (0.763)	0.001 (1.000)	0.002 (1.000)	0.003 (1.000)	0.004 (0.999)
8					0.001 (1.000)

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SIXTH SEMESTER B.Tech (Elective Subject)

END SEMESTER EXAMINATION May 2025

ME-316 POWER PLANT ENGINEERING

Time : 3 hours **Max. Marks: 50**

Note: Attempt any FIVE questions in full. Assume missing data, if any. Draw the relevant diagrams wherever it is necessary

1. (a) Describe the Indian energy scenario with percentage of each installed capacity. (5 marks)[CO#2](BTL2)

   (b) Differentiate between (i) base load and peak load power stations (ii) coking and non-coking coal.

   (5 marks)[CO#1,2](BTL2)

2. (a) Why excess air is needed in steam generators. Give the justifications. (5 marks)[CO#1,2,3](BTL4)

   (b) Describe cyclone furnace combustion process with diagram and write their advantages and disadvantages.

   (5 marks)[CO#3,4](BTL1)

3. (a) What is meant by binary vapour cycles? Explain suitable with diagrams (5 marks)[CO# 3](BTL2)

   (b) Describe the working of combined cycle power plant with diagram. (5 marks)[CO# 3,4](BTL2)

4. (a) Explain with diagram, the working of fast breeder nuclear reactor. (5 marks)[CO#3,4](BTL1)

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(b) State the essential elements of a hydroelectric power plant. Explain its working. (5 marks)[CO#2,3](BTL3)

5. (a) Describe the working of any two methods of controlling the superheat steam temperature with diagrams. (5 marks)[CO#3,4](BTL1)

(b) List out different losses happening in steam power plant. (BTL2) (5 marks)[CO#3]

6. (a) What is energy auditing? Give the procedure used for the same. (5 marks)[CO#3,4](BTL4)

(b) With the help of diagram, explain the significance of load–duration curve. (5 marks)[CO#5](BTL3)

7. Write short notes on any TWO

(a) Diesel power plant

(b) Economizer

(c) Energy conservation

(d) Water treatment in power plant

(10 marks)[CO#2,3](BTL4)

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VI SEMESTER
B.Tech

END SEMESTER EXAMINATION May 2025

ME318 COMPUTER AIDED MANUFACTURING

Time: 3:00 Hrs Max. Marks: 50

Note: Attempt ANY FIVE Questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q1 a) Define with examples NC,CNC, DNC,NCMT,CIDM,CIM.
b) Discuss the parameters to be considered by the Production engineering director to adopt CAM technology for the first time in the industry.
c) Discuss advantages and limitations of using CAM technology in the industries. 10[CO1][L1]

Q2. a) Describe in details the construction of CNC JIG BORING machine tool with a neat sketch giving specific emphasis upon the types of bearings, design of slides, types of materials which can be machined, design of magazine etc.
b) Discus the difference between CNC jig boring and CNC milling machine
c) Elaborate the applications of CNC JIG BORING machine and CNC milling machine. 10 [CO2][L2]

Q3. a) Describe various types of programming with examples used for CNC machine tools.
b) What are G codes and M codes? Give eight example of each.

c) Write APT program to turn a cylindrical component of total length of 450mm and diameters as20,30,50mm at an equidistance of 150mm. Turning is to be done in two passes and material of component of mild steel. 10[CO3][L3]

Q4. a) Discuss in detail FMC and FMS with all the basic elements involved.
b) Elaborate typical control cycle used in FMS along with neat sketch.
c) Discuss various types of flexibilities.
d) Discuss various advantages and limitations of FMS used in Indian industries 10 [CO4] [L4]

Q5 a) Discuss various types of sensors used in industrial robots.
b) Explain the various configurations of industrial robots.
c) Elaborate the applications of industrial robots.
d) Discuss computer aided design and the benefits of its integration with computer aided manufacturing. 10[CO5][L5,6]

Q6 Write short notes on the following :(any five)
a) Computer aided Process planning and its types.
b) Parallel programming and its advantages.
c) Group technology and its benefits.
d)Advantages and disadvantages of point to point and continuous path control systems.
e) Reverse engineering and its applications.
f) Open loop and closed loop systems. 10[CO2 & CO4][L4,5,6]

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SIXTH SEMESTER **B.Tech. (ME)**

END-TERM EXAMINATION *May-2025*

ME-320 RELIABILITY & MAINTENANCE ENGINEERING

Time: 3:00 Hours *Max. Marks: 50*

Note: Answer any FIVE questions. All questions carry equal marks. Assume suitable missing data, if any. ***Use of statistical tables is allowed.***

1[a]. Probability density function with (t) as hours is given by:

$$f(t) = \begin{cases} 0.002e^{-0.002t} & t \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

Determine (i) Reliability for t hours (ii) MTTF [5] (CO3)[L-4]

[b] The wear out of a machine part is normally distributed with 90 percent of the failures occurring 200 and 270 hr of use i.e. 5 percent below 200 hr and 5 percent above 270 hr).

(i) Find the MTTF and the standard deviation of failure times.

(ii) Compute reliability for a 10-hr use if the part has been operating for 200 hr (i.e., find the conditional reliability). [5] (CO3)[L-5]

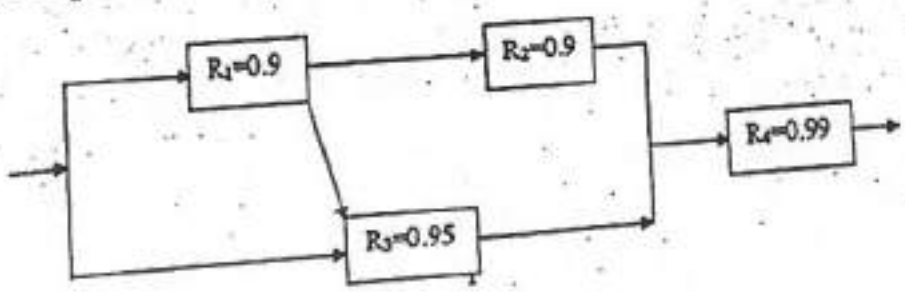
2 [a]. An automobile engine has four belts each showing the identical wear out effect with a Weibull shape parameter of 1.34. However, their scale parameters are 2500, 3400, 8000, and 6100 operating hours.

(i) If the automobile is new, determine the probability of a belt failure on a 72-hr trip.

(ii) If the car (with the belts) has had 4000 hr of use, what is the probability of a belt failure during the next 72 hr of use? [5](CO2)[L-4]

[b] Derive an expression for the MTTF in terms of reliability function. [5](CO4)[L-5]

3[a]. Determine the reliability of the following linked system using the Decomposition method. [5](CO4)[L-3]



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[b] Derive an expression for the reliability function in case of a two-component standby system with failures in standby. [5](CO4)[L-5]

4 [a]. Differentiate between cut sets and path sets. Explain cut set method for reliability evaluation. [5] (CO1)[L-1]

[b].Discuss the role of modularization and accessibility in maintainability. [5] (CO2)[L-2]

5[a] Find the steady-state availability for two active, identical components having a constant failure rate and sharing a single repair crew with a component repair rate of r. [5] (CO4)[L-5]

[b] Compare and contrast preventive maintenance with predictive maintenance. Additionally, describe two condition-based maintenance strategies. [5] (CO3)[L-2]

6[a]. Four units are connected in the series, with reliability, R_1=0.85, R_2=0.9, R_3=0.8 and R_4=0.95. Calculate the system's reliability. If their reliability is to be increased to a value of 0.65, how should this be apportioned among four units according to the minimum effort method. [5] (CO3) [L-4]

[b]The time to repair an engine module is lognormal with s =1.21. Specifications require 90 percent of the repairs to be accomplished within 10 hr. Determine the necessary median and mean-time to repair. [5] (CO3) [L-2]

7. Write short notes on any four topics out of the following:

[a] Fault tree method
[b] Reliability centered maintenance
[c] Maintainability
[d] Monte Carlo simulation
[e] Practical application of RAM engineering
[f] Reliability of repairable systems [5X2] (CO2)[L-1]

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VI SEMESTER

B.Tech (ME)

END SEMESTER EXAMINATION *May-2025*

ME328 COMPOSITE MATERIALS TECHNOLOGY

Time: 3:00 Hours *Max. Marks : 50*

Note : Answer all questions by selecting any two parts from each questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 [a] What is composite? How do you classify composite materials and mention its advantages and limitations. [5] [CO1,5][BTL1,2]

[b] Explain the graphite fiber structure. Explain pyrolysis process for graphite fibers and types of precursor used for graphite fibers [5] [CO1] [BTL1,2]

[c] Derive and show 13 elastic constants for monoclinic materials in stress strain relations. [5][CO2] [BTL3]

Q.2[a]Reduced stiffness matrix of an orthotropic lamina is given by

$$[Q]=\begin{bmatrix}150.81 & 4.027 & 0\\ 4.027 & 20.11 & 0\\ 0 & 0 & 5\end{bmatrix} GPa$$

Determine E_1, E_2, G_{12} and ν_{12} of the orthotropic lamina [5][CO2] [BTL3]

[b]Find the in-plane shear modulus of a glass/epoxy lamina with a 70% fiber volume fraction. Given Young's modulus for fibers and matrix are E_f=85GPa, $\nu_f = 0.2$, E_m =3.4 and ν_m=0.3. [5] [CO3] [BTL2]

[c] Derive the expression for Transverse Young's Modulus for composite materials, when applied loads are perpendicular to the fibre direction in terms of (E_f, E_m, V_f & V_m) [5] [CO3] [BTL3]

Q.3 [a] Explain Tsai-Hill failure theory and Tsai-Hu failure theory for composite material with mathematical expression. [5][CO4] [BTL6]

[b] For the lamina shown in figure 1, the value of $\alpha=45^0$, E_1=12GPa, E_2=4GPa, G_{12}=4.5GPa, ν_{12}=0.4. Find the stresses and strain in longitudinal and transverse direction. [5] [CO2] [BTL3]

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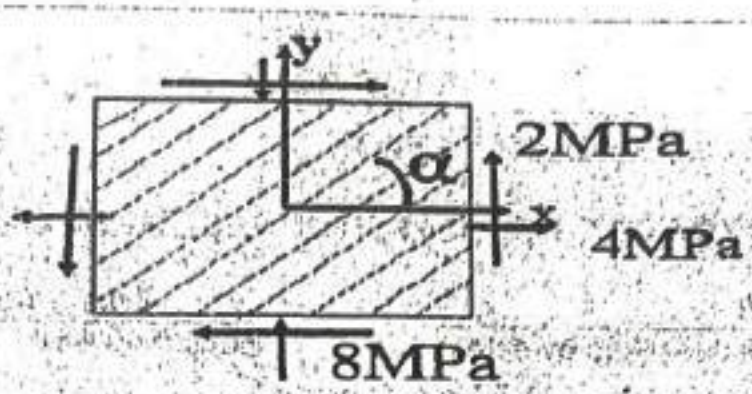

Figure(1)

[c] Derive the expressions for [A],[B] and [D] matrices for laminate
[5] [CO4] [BTL6]

Q.4 [a] With neat sketch explain the hand lay up process in composite manufacturing. Write its advantages and limitations. [3+2] [CO5] [BTL1]

[b] Find the maximum value of $S>0$, if a stress of $\sigma_x = 2S$, $\sigma_y = -3S$ and $\tau_{xy} = 4S$ is applied to 60^0 angle lamina of graphite-epoxy unidirectional lamina. Use maximum stress failure theory. Properties of unidirectional lamina as $(\sigma_1^T)_{ult} = 1500MPa, (\sigma_1^c)_{ult} = 1500MPa, (\sigma_2^T)_{ult} = 40MPa, (\sigma_1^c)_{ult} = 246MPa, \tau_{12} = 68MPa$

[5] [CO4][BTL5]

[c]With neat sketch explain the filament winding in composite manufacturing.
[5] [CO5] [BTL1,2]

Q.5 [a] Explain the function of matrix materials in composite. Classify the matrix materials and explains it's briefly. [5] [CO6] [BTL1,2]

[b]Explain the failure mechanism of fibres matrix and composite with help of stress strain diagram. Also derive expression V_{min} (minimum fibre volume fraction),

$$V_{min} = \frac{\sigma_{mu} - (\sigma_m)_{\varepsilon_f^*}}{\sigma_{fu} + \sigma_{mu} - (\sigma_m)_{\varepsilon_f^*}}$$

where σ_{mu} and σ_{fu} indicate the tensile strength of matix and fibres. $(\sigma_m)_{\varepsilon_f^*}$ indicates matrix stress at the fibers fracture strain ε_f^* [5] [CO4] [BTL5,6]

[c] Write short notes on
(i)Particulate composite (ii) Injection moulding [5] [CO5] [BTL1,2]

(b) Consider the following problem involving activities from A to J.

Activity	Internediate Predecessors(s)	Duration(months)
A	-	1
B	A	4
C	A	2
D	A	2
E	D	3
F	D	3
G	E	2
H	F,G	1
I	C,H	3
J	B	2

(i) Construct the CPM network.
(ii) Determine the critical path.
(iii) Compute total floats and free floats for non-critical activities.

[06][CO 6][BTL6]

Q7. Write Short Notes on: **[2x5=10][CO3,4,5] [BTL2]**
(a) Lean Manufacturing
(b) KANBAN Model
(c) JIT
(d) Toyota Production system
(e) Cellular Manufacturing

•••

Total No. of Pages 04 *Roll no.....*

VI SEMESTER
B. TECH (ME)

END TERM EXAMINATION *May-2025*

ME 330 PRODUCTION AND OPERATIONS MANAGEMENT

Time: 03:00 Hours ***Max. Marks: 50***

Note: Answers any FIVE questions
All questions carry equal marks.
Assume suitable missing data, if any.

Q 1. (a)What are the key elements of Operations Strategy?
(b) The payoffs (in Rs) of three Acts A_1 , A_2 and A_3 and the possible states of nature S_1 , S_2 and S_3 are given below :

Acts → / States of Nature ↓	A_1	A_2	A_3
S_1	-20	-50	200
S_2	200	-100	-50
S_3	400	600	300

The probabilities of the states of nature are 0.3, 0.4 and 0.3 respectively. Determine the optimal act using the Bayesian Criterion.
(c) The process of decision-making depends upon the different situation under which the decision is being made. Present your view with example? **(3+3+4) [CO 1][BTL1,2]**

Q2. (a) Which stage of the product life cycle focused on promotional activities? Illustrate with an example.
(b) Let a customer has asked your company to prepare a bid on supplying 800 units of a new product. Production will be in batches of 100 units. You estimate that costs for the first batch of 100 units will average Rs. 100 a unit. You also expect that a 90% learning curve will apply to the cumulative labour cost on this contract. On the basis of given data:
(i) Prepare an estimate of the labour costs of fulfilling this contract.
(ii) Estimate the incremental labour cost of extending the production run to produce an additional 800 units.

C-61

(iii) Estimate the incremental labour cost of extending the production run from 800 units to 900 units. **(3+7) [CO2][BTL4]**

Q3. (a) A company is planning on expansion and building a new plant in one of the three state of India. Manager charged with making decision has determined that five key success factors can be used to evaluate the prospective states. Manager used Factor Rating Method of 1 (least desirable state) to 5 (most desirable) to evaluate each factor

Key Success Factors	Weight	Candidate state rating		
		HARYANA	GUJARAT	TAMILNADU
Technology	0.2	4	5	1
Level of education	.01	4	1	5
Political and Legal aspects	0.4	1	3	3
Social and cultural aspects	0.1	4	2	3
Economic factors	0.2	3	3	2

(i) Which state should be selected for new plant
(ii) Political unrest in Gujarat in a lower score 2, for political and legal aspect does your conclusion change?
(iii) What if Gujarat's score drops even further leads for political and legal aspects.

(b) Assume a line manager has to produce 216 units in a 6-hour shift. The tasks list with its required processing time and immediate predecessor is listed in the table below:

Tasks	A	B	C	D	E	F	G	H
Task Time (Sec)	100	20	80	20	10	70	60	40
Immediate Predecessor	--	--	A	A,B	D	C	C	E,F,G

Using the above details, (i) develop a precedence diagram (ii) Calculate cycle time (iii) find the least number of workstations needed for the production and also assign the tasks in these workstations.
(4+6) [CO 3][BTL3]

Q.4 (a)What do you understand by the term "forecasting" ? Explain the need of forecasting in Production/Operations Management.
[04][CO4] [BTL 2]

(b) A firm uses simple exponential smoothing with $a = 0.2$ to forecast demand. The forecast for the first week of January was 400 units, whereas actual demand turned out to be 450 units.
(i) Forecast the demand for the second week of January.
(ii) Assume that the actual demand during the second week of January turned out to be 460 units. Forecast the demand up to February third week, assuming the subsequent demand as 465, 434, 420, 498, and 462 units.
[06][CO4][BTL4]

Q.5(a)The demand for an item is 8000 units per annum and the unit cost is Re.1/. Inventory carrying charges of 20% of average inventory cost and ordering cost is Rs. 12.50 per order. Calculate optimal order quantity, optimal order time, optimal inventory cost and number of orders. **[04][CO 5][BTL 3]**

(b) The details of material stocked in a company are given below with the unit cost and the annual consumption in Rs. Classify the material in to *A* class, *B* class and *C* class by *ABC* analysis.
[06][CO 5][BTL 4]

S.No.	*Item Code No.*	*Annual consumption in pieces*	*Unit price in Paise.*
1	501	30,000	10
2	502	2,80,000	15
3	503	3,000	10
4	504	1,10,000	05
5	505	4,000	05
6	506	2,20,000	10
7	507	15,000	05
8	508	80,000	05
9	509	60,000	15
10	510	8,000	10

Q.6(a)What are the major comparative characteristics of PERT model and the CPM model? What are their limitations, if any? discuss.
[04][CO6][BTL4]

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Total No. of Pages :02 Roll No. .....

VIII Semester

B.Tech.(PE)

END SEMESTER EXAMINATION May-2025

ME 404 Industrial Engineering

Time: 3 Hours Max. Marks: 50

Note: Answer all questions.
Assume suitable missing data, if any.

1. Define the term 'reliability'. Discuss the objectives of reliability engineering. [3][CO4][L2]

2. What do you mean by MTBF and MTTF? [3] [CO4][L3]

3. Explain the basic failure rate models: (a) Constant failure rate model, (b) Weibull model, (c) Normal model. [3] [CO4][L3]

4. Discuss the methods used for reliability testing. [3][CO5][L2]

5. Explain the objectives of material handling systems. [3][CO5][L3]

6. Discuss the principles of material handling systems. [3][CO5][L5]

7. What do you mean by cost of quality? Define the cost of conformance and the cost of non-conformance. [3] [CO5][L5]

8. Discuss in brief about the contribution of W. E. Deming, K. Ishikawa, Philip B. Crosby, G. Taguchi, and J. M. Juran, in the field of quality management. [3][CO6][L4]

9. What are the sources of variations in the quality of a product? Discuss the different types of the variables. [3][CO6][L3]

10. What is the difference between the variables and attributes? Discuss the method to produce the control chart for variables. [3][CO6][L4]

11. What are the objectives of control charts for the variables? [4] [CO5][L3]

12. How do you decide that whether the process is under control or out of control? What are the reasons for the process out of control? [4][CO5][L4]

13. What is process capability? How do you determine the process capability index? [4] [CO6][L4]

14. What do you mean by sampling plan? What are the advantages of sampling plan over the control chart? [4][CO6][L4]

15. How do you differentiate between single sampling plan and double sampling plan? Explain with the flow charts. [4][CO6][L5]

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Total No of Pages: 2 Roll no .....

SEVENTH SEMESTER

B.Tech (A.E)

END SEMESTER EXAMINATION May -2025

ME408 COMBUSTION GENERATED POLLUTION

Time: 3.0 Hours *Max. Marks: 50*

Note: All questions carry equal marks.
Attempt any five:
Assume suitable missing data, if any.

1. (a)What are the factors which control the formation of oxide of nitrogen and how it is control? Explain the working principle of Stratified charged engines. [CO 1,L1] 5

(b) How can affect the air fuel ratio on performance of CI engine. List the different type of fuels used in SI and CI engine [CO1,L,3] 5

2 (a) What is the significance of Cetane number in the combustion process observed in CI engines'? [CO2,L,5] 5

(b) Give a detailed comparsion between homogeneous charge compression ignition engine, lean burn engine & stratified charge engines. [CO L,2] 5

3 (a) Explain the effect of spray formation, combustion and emission. What are blue, white and black smokes in diesel engines? Describe the mechanism of black smoke formation. [CO,L,4] 5

(b) Which is the major emission from 2-stroke S.I engines? What is the reason for it? How the two stroke engines are responsible for pollutant formation? [CO 3,L3] 5

4 (a) 1. What are the different ways to control gasoline engine exhaust emissions? 3. What are the main sources of hydrocarbon emissions in SI engines [CO L,2] 5
(b) 5. What is the role of injection timing on the pollutant formation and performance of diesel engines?. Explain the working principle of Chemiluminescence analyzers. [CO L,3] 5

5 (a)What is the operating principle of a non dispersive Infrared Analyzer (NDIR)? With a help of neat sketch explain how carbon monoxide emissions from IC engines can be measured using NDIR. 5[CO, L,3]
(b)Discuss various mechanisms of formation of HC emissions in CI engine, Explain the term 'Soot 'and particulate matter (PM) 5 [CO 1,L,1]

6 (a) Discuss schematic representation of energy balance between earth and atmosphere and greenhouse effect and what would be global warming projections by climatic models with neat sketch. 5 [CO1, L3]
(b) Propane (C_3H_8) is burned with 75% excess air during a combustion process. Assuming complete combustion, determine air fuel ratio. 5 [CO 2, L,5]

7 (a) What do you mean by the term alternative fuels? Explain the effect of alcohol fuels on regulated and un regulated emissions as compared to gasoline. 5 [CO 3, L,3]
(b) What is the significance of ASTM distillation curve of gasoline? Explain how vapour lock and engine warm up are related to ASTM distillation curve. 5 [CO2,3 L4]

-END-

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Total No. of Pages 02

Roll No.....

EIGHTH SEMESTER

B. TECH.

END-TERM EXAMINATION

ME420 MATERIALS MANAGEMENT **MAY-2025**

Time: 3:00 Hours **Max. Marks: 50**

Note: Answer any FIVE questions.
All questions carry equal marks.
Assume suitable missing data, if any.

1 (a) What are the reasons of material management? [4][CO1] [BLT1]

(b) Explain optimal policy curve for rationalization. [6][CO3] [BLT4]

2 (a) A hardware store procures and sells hardware items. The following information is available:

Expected annual sales – 1500 units
Ordering cost – Rs. 200 per order
Holding cost – 20% of average inventory value

The item can be purchased in the following schedule:

Lot size	Unit price (Rs.)
1 – 499	30.00
500 and above	28.00

Determine order size. [7][CO5] [BLT5]

(b) What are the reasons of low materials productivity? [3][CO1] [BLT2]

3 (a) Explain Wilson Model and calculate optimum system cost and economic lot size. [7][CO4] [BLT4]

(b) Show that under estimation is costlier than over estimation by deviation from optimal order quantity. [3][CO3] [BLT3]

4 (a) What are the advantages and disadvantages of centralized material management system? [4][CO3] [BLT3]

(b) What are the various vendor rating plans? Explain. [6][CO4] [BLT4]

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5 (a) A trading company starts its operations on March 1, 2017. Its stock register reveals the following data regarding goods in March, 2017.
(i) March 1 : Receipts 200 units at the rate of Rs.12 per unit
(ii) March 5 : issues 150 units
(iii) March 10 : Receipts 100 units at the rate of Rs.11 per unit
(iv) March 11: issues 120 units
(v) March 14 : Receipts 200 units at the rate of Rs.10 per unit
(vi) March 18: issues 50 units
(vii) March 20 : issues 120 units
(viii) March 25 : Receipts 150 units at the rate of Rs.13 per unit
(ix) March 30 : issues 150 units

Value the closing stock and cost of the goods sold under
(a) FIFO method [6][CO5]
(b) LIFO method [BLT5]

(b) What are the factors considered in favour of making? [4][CO3] [BLT3]

6 Write short notes on any FOUR of the following: [10][CO2]
(a) Purpose of Color coding of ABC items [BLT2]
(b) Just in Time
(c) Inventory Turnover Ratio
(d) Selection of vendor
(e) All unit discounts

Total No. of Pages: 03

Roll no. _____

II SEMESTER

B.Tech. (MCE)

END TERM EXAMINATION

May-2025

MC102n DISCRETE MATHEMATICS

Time: 3:00 Hours

Max. Marks: 50

Note: Assume suitable missing data, if any.

Q.1 Let R be a relation on R^2 where $(x_1, y_1)R(x_2, y_2)$ iff $x_1^2 + y_1^2 = x_2^2 + y_2^2$. **[2+3][CO1][L1]**

a) Show that R is an equivalence relation.

b) Describe the partition induced by R. What do the equivalence classes represent geometrically?

Q.2 Let P(x): x is even, Q(x): x is prime. Infer and translate the following into English: **[2][CO2][L4]**

a) $\forall x \in Z, P(x) \rightarrow \neg Q(x)$

b) $\exists x \in N, Q(x) \wedge P(x)$

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Q.3 Solve the following puzzle using propositional logic: "If the suspect is guilty, then the knife is in the drawer. Either the knife is not in the drawer or Jason saw the knife. If Jason saw the knife, he is not lying. Jason is lying. Is the suspect guilty?" **[3][CO2][L3]**

Q.4 Let G be a group and let H and K be subgroups of G. **[2+3+3][CO3][L3]**

a) Prove that the intersection $H \cap K$ is also a subgroup of G.

b) Show by example that the union $H \cup K$ is not necessarily a subgroup of G

c) Determine the necessary and sufficient condition under which $H \cup K$ is a subgroup of G. Prove your claim.

Q.5 Check whether Q_* is a group. Is it an abelian group? **[2][CO3][L3]**

Q.6 Let the recurrence relation be: **[5][CO1][L3]**

$a_0 = 1, a_1 = 1, a_2 = 2, a_n = 5a_{n-1} - 8a_{n-2} + 4a_{n-3} = 0$ for $n \geq 3$.

Use generating functions to determine a closed-form expression for a_n.

OR

Q.7 Let $G = M_2(Z_4)$, the group of 2x2 matrices over Z_4 under addition modulo 6, and $H = Z_3$ under addition. Define $\varphi: G \rightarrow H$ by $\varphi(A) = (a+d) \bmod 3$, where $A = [[a, b], [c, d]]$. **[2+3][CO2][L3]**

a) Determine the image of φ.

b) Justify whether φ is injective or surjective.

Q.8 Consider $L = \{0, 5, 10, 15, 20, 25\}$ with the following operations:

Meet: $a \wedge b = \gcd(a, b)$

Join: $a \vee b = \text{lcm}(a, b)$

Analyse if this structure is a lattice. Identify the least and greatest elements. **[5][CO4][L4]**

Q.9 Let A be a Boolean algebra. Show that the identity:

$(a + b)(a + c)(b' + c) = ab + ac$

Also, show that:

$a = b \Leftrightarrow a' + b = 1$ and $a \cdot b = a$ **[2+3][CO4][L1]**

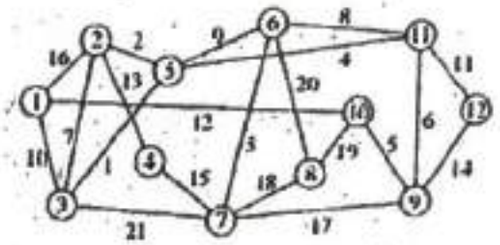
OR

Q.10 Use a 3-variable Karnaugh Map to minimize the following Boolean function in both SOP and POS forms: **[5][CO4][L5]**

$F(A, B, C) = A'B'C + A'BC' + AB'C' + ABC + A'BC + AB'C + A'B'C'$

Construct the K-map for the given function. Find the minimized SOP (Sum of Products) form. Find the minimized POS (Product of Sums) form.

Q.11 Define the minimum spanning tree. Consider the following graph. If we start with node 10 as the starting node and use Prim's algorithm to design a minimum spanning tree, state the order in which nodes will be accessed. Also, compute the minimum total weight. **[5][CO5][L1]**



Q.12 Draw and illustrate the resultant tree with the following traversals:

Preorder: G, B, Q, A, C, K, F, P, D, E, R, H

Inorder: Q, B, K, C, F, A, G, P, E, D, H, R

Also, determine the postorder traversal of the tree. **[5][CO5][L4]**

Q.13 Describe and explain the following with the help of an example:

a) Binary Search Tree

b) Strictly Binary Tree

[5][CO5][L2]

iii. What are pressure-sensitive adhesives, and how do they adhere to surfaces? (CO1) [BTL1]

iv. Give two advantages of conversion coatings. (CO1) [BTL1]

V Define gelation temperature. (CO2)[BTL1]

Q3. (i) Compare the UV and electron beam-based curing equipment used for coatings. Support your answer with a suitable diagram. (5)(CO3)[BTL4]

(ii) Give an outline of the preparation method of hide glue from its raw form. (4) (CO2) [BTL3]

(iii) Write a chemical reaction for nitration of cellulose. (1) (CO2) [BTL1]

Q4. (i) A Delhi particleboard plant mistakenly heated a batch of soybean meal, intended for adhesive, to 75°C, exceeding the <70°C target. Subsequent quality checks revealed weak bonding in the produced particleboard. As a result, the compromised effectiveness of the glue directly contributed to the structural weakness observed in the particleboard. This incident underscores the critical need for precise temperature control in material processing to maintain desired functional characteristics.

Considering the above case analysis of Delhi particleboard plant and suggest reasons for the following:

a. What specific protein property, vital for its adhesive function, was negatively impacted by the 75°C temperature? [BTL3]

b. Briefly explain why the temperature requirement differs for soybean meal used in food versus adhesive applications, based on the protein's behaviour. (5)(CO2) [BTL4]

(ii) Discuss the mechanism of diffusion adhesion. (3) (CO1) [BTL2]

(iii) How does the contact angle provide information about a surface's wettability? (2) (CO1) [BTL4]

Q5. (i) "Global AutoMCoats" is a leading supplier of coatings to the automotive industry. One of their flagship products is a high-gloss, solvent-based topcoat known for its exceptional durability and finish. However, this topcoat contains several solvents listed as Hazardous Air Pollutants (HAPs). Due to increasingly stringent environmental regulations and growing consumer demand for sustainable products, Global AutoMCoats faces significant pressure to reformulate this topcoat. They need to develop a new formulation that meets or exceeds the performance of the original while significantly reducing or eliminating HAP emissions.

The challenge is significant since the new topcoat must maintain its high gloss, scratch resistance, chemical resistance, and application properties (sprayability, drying time). Failure to do so could result in lost contracts with major automotive manufacturers and damage to the Company's reputation.

Considering the above case analysis suggest appropriate solutions to the following:

a. Beyond HAP solvent substitution, briefly outline two key long-term strategies Global AutoMCoats could adopt to ensure the sustainability of their automotive coating products. [BTL6]

b. Besides the regulatory pressure, what other key driver, mentioned in the case study, is compelling Global AutoMCoats to replace the HAP-containing solvents in their topcoat? Briefly explain this driver. (5) (CO5) [BTL5]

(ii) Explain the purpose of zinc phosphating in industrial applications by briefly outlining the process steps and the key chemical transformation that occurs on the metal surface. Include a simple diagram to visualise the coated layer. (3) (CO1) [BTL2]

(iii) How does applied voltage affect the curing depth in electron beam curing? (2) (CO3) [BTL2]

10.2

Total no of pages 2
SIXTH SEMESTER
END SEMESTER EXAMINATION

Roll No.....
B.TECH[CHE]
May-2025

CH318 Petrochemical Engineering

Time: 3 Hours

Max. Marks - 50

Instructions to the candidates:

1) Attempt all questions

Q.1 Explain the synthetic method of Methanol production with chemical reactions involved, a neat process diagram, the catalyst used, and the operating parameters. (10) [CO1] [BTL3]

Q.2 Explain the Butadiene production from Ethanol with chemical reactions involved, a neat process diagram, the catalyst used, and the operating parameters. (10)[CO2] [BTL3]

Q.3 Explain the Ethylene Oxide with chemical reactions involved, a neat process diagram, the catalyst used, and the operating parameters. (10)[CO3] [BTL3]

Q.4 Write the reactions involved in the following processes

(i) Phenol production from Cumene process
(ii) Phenol Production from Toluene Oxidation
(iii) Chlorobenzene Caustic Process for Phenol Production
(iv) Styrene production from dehydrogenation of Ethylbenzene
(v) Phthalic Anhydride Production from Naphalene oxidation

(10)[CO4][BTL4]

Q.5 (i) Write down the advantages and disadvantages of biodiesel with the five most common crops used in biodiesel production.

(5)[CO5][BTL1]

(ii) Explain the differences between first-generation and second-generation biofuels. (5)[CO5][BTL4]

END

Roll no.....

Total no. of Pages: 2

SIXTH SEMESTER

B.Tech.

May-2025

END TERM EXAMINATION

CH 324 HEAT EXCHANGERS

Time: 03:00 Hours

Max. Marks: 50

Note : Answer All questions.
Assume suitable missing data, if any.

Q.1 i) Derive the velocity distribution within the hydrodynamic boundary layer in the context of boundary layer theory. [10 Marks] [CO1,3][BTL2,3,6]

OR

i) Derive a relationship for the boundary layer thickness at a distance 'x' from the leading edge. [10 Marks][CO#1,3][BTL#2,3,6]

Q.2 i) Derive the fin efficiency and fin effectiveness for a rectangular fin of uniform thickness having insulated tip. [7 Marks] [CO#1,3][BTL#4]

ii) A plate-fin heat exchanger has rectangular fins made of aluminium having thermal conductivity of 237 W/m.°C that are 30 mm high and 0.20 mm thick. The heat transfer coefficient for the air circulation over the fins is 200 W/m^2. Determine the fin efficiency. [3 Marks] [CO#2,3,5][BTL#3,6]

Q.3 i) Describe the various types of bodies in the context of radiation heat transfer. [3 Marks] [CO#4][BTL#1]

ii) Describe the Stefan Boltzmann's law. Derive an expression for the emissive power of the black body. [4 Marks] [CO#1,4][BTL#1,4]

iii) Two black bodies (S_1 and S_2) are exchanging heat only through radiation. The surface area of S_1 and S_2 are 1 m^2 and 5 m^2, respectively. If 50 % of energy emitted by S_1 is received by S_2. Determine the fraction of energy emitted by S_2 and received by S_1. [3 Marks] [CO#4][BTL#3]

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Q.4 i) Describe compact heat exchangers with suitable examples, configurations and applications. [5 Marks] [CO#5][BTL#1]

ii) Air enters the compact heat exchanger at 1 atm and 300 K with a velocity of 15 m/s. Describe the analysis procedure to determine the heat transfer coefficient. [5 Marks] [CO#5][BTL#3,4,6]

Q.5 i) Derive the effectiveness for a co-current (parallel) flow heat exchanger. [7Marks] [CO#1,3,5][BTL#4]

OR

i) Derive the log mean temperature difference (LMTD) for a co-current (parallel) flow heat exchanger. [7 Marks] [CO#1,3,5][BTL#4]

ii) In a co-current shell and tube heat exchanger, water (0.02 m^3/min) enters the tube side at 100 °C and leaves at 60 °C. Cold oil (0.10 m^3/min) of density 900 kg/m^3 and specific heat of 2 kJ/Kg.K enters the exchanger at 15 °C. Determine the log mean temperature difference (LMTD). [3 Marks][CO#5][BTL#1,3,5,6]

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Total no. Pages: 02 Roll Number:

B.Tech (VII Sem)/ M.Sc. (IVth Sem) May 2025

END TERM EXAMINATION

COURSE CODE: CH416

COURSE TITLE: Industrial Waste Management

Time: 3 hrs Max. Marks: 50

Note : Question no. 1 and 6 are compulsory.
Attempt any Three questions from question no 2 to 5.

Q.1 Attempt any Five. (4x5=20) [CO1-4] [BTL1-6]

(a) Are paper bags more environmentally friendly than plastic ones? Justify your answer? [BTL4]

(b) Suggest and explain different steps for Waste reduction/ Waste volume Reduction. [BTL1,2,6]

(c) Define and classify different types of Industries. Give two examples of each type. [BTL1]

(d) What are Management and Treatment Options for Hazardous and Non hazardous waste. Give any wo examples of each. [BTL2]

(e) Discuss the major environmental and health concern related to e-waste. [BTL5]

(g) Elaborate various waste disposal methods used in a pharma industry [BTL3,5]

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Q.2 What are small scale industries SSIs? Discuss various issues related to SSIs. How can industrial waste from SSIs be managed.
[7][CO3] [BTL1,3]

Q.3 What are different types of waste generated in a Pharma Industry. Explain with examples.
[7][CO4] [BTL2]

Q.4 Define E-waste and discuss its sources? What are the responsibilities and role of Industries and citizens to reduce e-waste.
[7][CO4] [BTL2,5]

Q.5 What are different levels of waste generation in a typical industrial setup? Explain in detail the waste generated by any industry and impact of that waste.
[7][CO2] [BTL2,5]

Q.6. Write short notes on any **TWO** of the following:
[2x4.5=9][CO1,3,5] [BTL2,3,4]

(a) Reverse osmosis (process, application, advantages and disadvantages)
(b) Recycling of E-waste and its advantages.
(c) Various processes in a Textile industry and the waste generated.

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Total no. Pages: 02

VIII SEMESTER

B.Tech. Chemical Engineering

END TERM EXAMINATION *MAY-2025*

CH 424 SAFETY AND HAZARD IN CHEMICAL INDUSTRY

Time: 3 Hours *Max. Marks: 50*

Note: ATTEMPT ANY FIVE QUESTIONS
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1[A] Differentiate between Occupational Injury and Occupational Illness with examples. [2][CO1][L1]

[B] Comment on the common methodologies used for hazard identification in chemical processes? [3][CO5][L2]

[C] Identify the 3-Step Accident Process in the following Accident scenario:
Due to a wellhead seal failure, an uncontrolled release of high-pressure hydrocarbons (oil and gas) occurred from the drilling well, forming a substantial plume. The potential ignition of this plume posed a significant fire hazard to the rig platform, necessitating the activation of emergency shutdown procedures to isolate the well and facilitate firefighting efforts in containing the subsequent blaze. [3][CO1][L4]

[D] Justify why the inherent safety planning of the chemical plant is greatest at the earliest stages of Process development. [2][CO3][L5]

Q.2[A] A Plant employs 1500 full-time workers in a Process with a FAR of 5. How many industrial-related deaths are expected each year? [3][CO2][L3]

[B] Define Material Safety Data Sheet (MSDS). Furthermore, identify the primary categories of information provided within this document that are crucial for effective response during a chemical emergency. [5][CO4][L1,4]

[C] Categorize the following techniques to appropriate inherently safer process designs categories (i.e., Minimize, Substitute, Moderate and Simplify): [2][CO3][L3]

i. Use chemicals with higher flash points, boiling points.
ii. Use vacuum to reduce boiling point.

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iii. Reduce storage inventory of raw materials.
iv. Design plants for easy and safe maintenance

Q.3[A] During the Evaluation phase in Industrial hygiene, why is special attention given to small leaks of toxic gases? [3][CO3][L5]

[B] List down the any six types of Personal Protective Equipment usually worn by the worker. [3][CO8][L1]

[C] Which Four Major Legislations in India cover occupational safety and health at the workplace? [4][CO7][L1]

Q.4[A] How the Bhopal Accident could have been prevented? [3][CO3][L5]

[B] How is Safety training accomplished? [3][CO8][L2]

[C] Which Parameters significantly affect the behavior of explosions? [3][CO2][L2]

[D] Which legal Act in India ensures that employees receive compensation for injuries resulting from accidents at work? [1][CO7][L2]

Q.5[A] What is a Safety audit? What purposes does it serve? [4][CO6][L1]

[B] If you are an Audit Team member, what steps will you follow to conduct an Effective Safety Audit in a plant? [3][[CO6][L6]

[C] How is post-incident analysis conducted to identify root causes and implement corrective actions following an emergency in a chemical plant? [3][CO5][L6]

Q.6[A] How is the Nuclear Hazard Assessment in nuclear industries carried out? [3][CO2][L2]

[B] Suggest the Control measures implemented to prevent fires and explosions in the Chemical industry. [2][CO3][L5]

[C] What are the advantages of transporting chemicals by road? [2][CO4][L1]

[D] What are the Advantages and Disadvantages of Fault Tree Analysis? [3][CO3][L1]

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VIII & VI Semester
B.Tech

ENDTERM EXAMINATION **May 2025**

CH426 Biofuel Engineering

Time: 3:00 Hours ***Max. Marks: 50***

Note: Be brief. Attempt only **Five Questions** out of which Question No. 1 is compulsory. In addition to Question 1, answer any **Four** questions from the rest of the questions.

1. Write your Name & Roll Number clearly. What are biofuels? Mention the 1st to 4th generation of biofuels. What are biomass, bioenergy, and bio-power? What are the social, economic, and environmental impacts of bioenergy?
(1+9 Marks) (CO-1)(L1)

2. What is the difference between diesel and biodiesel? How can you produce biodiesel, the benefits & drawbacks of biodiesel? Your thoughts on Biodiesel & jobs, biodiesel emission and health effects and sustainability.
(10 Marks) (CO-2)(L2)

3. How much greenhouse gases (%) are emitted by China, the USA, the EU, and the rest of the world? What is the global oil use per day, and which country is the solar power leader in the world? Explain greenhouse gases and the greenhouse effect.
(10 Marks) (CO-1 & 2)(L1,2)

4. How to convert biomass to Syngas and ethanol using the hydrothermal liquefaction (HTL) method. What are the advantages of HTL? Which international company has the technology to convert carbon monoxide to ethanol?
(10 Marks) (CO-2)(L2)

5. How long (years) will the oil and gas resources are going to last in the world? How can you produce bioethanol from sugarcane or corn? What are the concerns about using food-based feedstocks for fuel/biofuel production?
(10 Marks) (CO-3)(L1)

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6. Our city of Delhi generates how much municipal solid waste (MSW) per day, and how much is used as landfill, and how much is used for energy generation. Mention the process that you think is used to generate bioenergy from these wastes for energy plants. **(10 Marks) (CO-4)(L1,3)**

7. What are advanced biofuels? What are the advantages and advanced biofuels, and what are the critical hurdles in the production of these advanced biofuels? How can you think needs to be done to overcome these hurdles? **(10 Marks) (CO-5)(L1,3)**

8. What is Life Cycle Assessment (LCA)? How do you see the scenario for transportation biofuels by the year 2060? **(10 Marks) (CO-3 &4)(L1,3)**

GOOD LUCK

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Roll No. .....

econd SEM

B.Tech.

ND SEMESTER EXAMINATION

May 2025

CO-102 Programming Fundamentals

me: 3:00 Hours

Max. Marks: 40

Note: Answer any five. All questions carry equal marks.
Give suitable example/code wherever needed
Assume suitable missing data, if any.

1 (a) What is union? How it is different from structure? Create a union and structure for storing student data. 4[CO3,L1,2]

(b) Write a program to apply 6 bitwise operators on the following values and analyse the operator and output.

int a= 21, b = 34; 4[CO2,L4,6]

2. (a) Classify different operators and discuss their types, precedence and associativity? Illustrate by example of one operator of each type. 4[CO2,L3,4]

(b) Write a program to implement strlength, strcompare in C without using library functions. 4[CO4,5,L6]

3. (a) Differentiate between call by value and call by reference with examples . 4[CO3,4,L2]

(b) Explain the two way selection (if, if-else, nested if-else, cascaded if-else) in C language with syntax . 4[CO2,L2]

4. (a) Evaluate the relationship between formal arguments and actual arguments with the help of suitable code. 4[CO3,L5]

(b) Write a C program to create two int arrays **a[5] and b[5]**, add each element of array b to the corresponding element of a to a using function call by reference to function "add" and print the resultant array a. 4[CO4,5,L3,6]

Q5. (a) Write algorithm for selection sort and apply algorithm on b[10] = {5,3,65,21,45,11,8,23,89,4} and show each step/iteration outcome. 4[CO1,4,L1,3]

(b) Summarize the difference between (i) pointer variable (ii) address of integer k (iii) address of array a[10] (iv) . Give an example. 4[CO4,L5]

Q6. (a) Define the terms keywords, identifier, strings, token. With example. 4[CO1,L1]

(b) Show the errors with justification (where int j, a[5], *ptr;) 4[CO2,4,L3,5]

(i) a = 15 (ii) ptr = a[4] (iii) &j = a (iv) j+2 = 23 (v) a= ptr
(vi) *ptr = a+2 (vii). a[3] = ptr+3 (viii) *ptr = &j

Q7. Write short notes (any two) with example 8[CO1,2,L1,2]

(a) Difference between C and C++
(b) File I/O operations, statements and steps
(c) I/O functions

Total no. of Pages:03 Roll no.....

B.Tech. 4th SEMESTER

END TERM EXAMINATION ***May-2025***

COURSE CODE: CO 204 [Old Scheme]

COURSE TITLE: OPERATING SYSTEM DESIGN

Time: 03:00 Hours *Max. Marks: 40*

Note : All questions carry equal marks.
Attempt all five questions.
Assume suitable missing data, if any.

Q.1 Attempt any two:

(a) In what ways do different operating system structures (monolithic, layered, microkernel, etc.) affect the performance, scalability, and maintainability of the system, and how do these choices influence system protection mechanisms? [4][CO1]

(b) Write a short note on

i. Paging and segmentation
ii. Disk structure
iii. Race condition
iv. Context Switch [4][CO4]

(c) What are the key design considerations in solving classical syn problems (e.g., Dining Philosophers, Bounded Buffer), and how do they apply to real-world concurrent applications like database systems?

[4][CO2]

Q.2)

(a) Consider the situation in which the disk read/write head is currently located at track 45 (of tracks 0-255) and moving in the positive direction. Assume that the following track requests have been made in this order: 40, 67, 11, 240, 87. What is the order in which optimized C-LOOK would service these requests and what is the total head movement? Also, calculate the total head movement in case of shortest seek time first. [4][CO5]

(b) In a system, there are 5 processes (P1 to P5) and 4 resources (R1 to R4), each with only 1 instance. The current resource allocation and requests are as follows:

- P1 is holding R1 and is requesting R2
- P2 is holding R2 and is requesting R3
- P3 is holding R3 and is requesting R4
- P4 is holding R4 and is requesting R1
- P5 is requesting R2 but currently holds no resource.

i) Draw the Resource Allocation Graph (RAG) based on the scenario above.

ii) Determine whether a deadlock exists or not. If a deadlock is present, list the processes involved in the deadlock cycle. [4][CO3]

Q.3 Attempt any two:

(a) Explain how demand paging improves memory efficiency, and discuss how it can lead to thrashing. What strategies can the operating system use to prevent or mitigate thrashing? [4][CO4]

(b) Consider the following page reference and reference time strings for a program: Page reference string: 5, 4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5. Show how pages will be allocated using the LRU and Optimal page replacement policy. Also, calculate the total number of page faults when allocated page blocks are 3 and 4 respectively. [4][CO4]

(c) Estimate Discuss how cache memory organization (direct-mapped, fully associative, and set-associative) affects hit rate and overall system performance. How do these strategies balance speed and hardware complexity? [4][CO4]

Q.4 Attempt any two:

(a) How do different file access mechanisms (such as sequential access, direct access, and indexed access) impact the performance of file systems? Discuss the trade-offs between these mechanisms in terms of data retrieval speed, storage efficiency, and flexibility. [4][CO5]

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(b) Consider a scenario, a file is stored using direct access method in a file system having following conditions:

- The file spans 6 blocks, with each block having a size of 512 bytes.
- The disk access time for reading a single block is 10 ms.
- The average disk seek time is 15 ms, and the rotational latency is ms.

Considering the above situation, calculate the following:

(i) Calculate the total access time required to read the entire file sequentially.

(ii) If the user needs to access block 4 specifically, calculate the average access time for retrieving this block. [4][CO5]

(c) What are the key design issues that an operating system faces when managing I/O devices? How do issues like device independence, buffering, and error handling influence the design and implementation of I/O subsystems in modern operating systems? [4][CO5]

Q.5

(a) **Consider a scenario:** An organization is planning to migrate its data center from a Windows-based server infrastructure to a Linux/Unix-based system. The migration is expected to improve performance, scalability, and reduce licensing costs. However, the company needs to carefully evaluate the strengths and weaknesses of each operating system in terms of system performance, reliability, and security.

Using the above scenario answer the following:

i) Compare Windows, Linux, and Unix in terms of their performance and reliability in enterprise environments. Which OS would be most suitable for different types of tasks (e.g., web servers, database management, file servers)?

ii) Discuss the security features of each operating system and how they impact the overall system architecture. What additional steps should be taken to ensure robust security in each environment? [4][CO6]

(b) What is a race condition? Explain how does a critical section avoid this condition. What are the properties which a data item should possess to implement a critical section? [4][CO1]

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FOURTH SEMESTER

B.Tech. (CO)

END TERM EXAMINATION

MAY-2025

CO206 COMPUTER ORGANIZATION AND ARCHITECTURE

Time: 3:00 Hours

Max. Marks: 50

Note: Answer anyfive questions. All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 (a)Construct and explain the working of BUS system design using three state buffers. [5][CO1][BTL1]

(b)A computer uses a memory unit with 128K words of 32 bits each. A binary instruction code is stored in one word of memory. The instruction has four parts: an indirect bit, an operation code, a register code part to specify one of 32 registers, and an address part.

I. How many bits are there in the operation code, the register code part, and the address part?

II. Draw the instruction word format and indicate the number of bits in each part.

III. How many bits are there in the data and address inputs of the memory? [5][CO4][BTL2]

Q.2 (a) What is the difference between a direct and an indirect address instruction? How many references to memory are needed for each type of instruction to bring an operand into a processor register? [5][CO1][BTL1]

(b) How many address lines; data lines and control lines are there in 16M * 32 memory? [5][CO4][BTL3]

Q.3 (a) Draw the block diagram of a basic hardwired control organization with two decoders, a sequence counter and a number of control logic gates? [5][CO2][BTL3]

(b) Design a parallel priority interrupt hardware for a system with 4 interrupt source and explain its working? [5][CO5][BTL4]

11.8

Q.4 (a)What is DMA? Explain the use of DMA and also explain why does DMA have priority over CPU when both request a memory transfer? [5][CO5][BTL4]

(b) Explain Asynchronous data transfer using following control signal in source initiated and destination-initiated mode:

(i) Strobe signal

(ii) Handshaking [5][CO5][BTL1]

Q.5 (a) The following program in a list of instruction in hexadecimal code. The computer executes the instruction starting from address 100. What is the content of AC and the memory word at address 103 when the computer halts? [5][CO3][BTL6]

Location	Instruction
100	5103 BSA
101	7200 CMA
102	7001 HLT
103	0000 AND
104	7800 CLA
105	7020 INC
106	C103 BUN

(b) A digital computer has a common bus system for 16 registers of 32 bits each. The bus is constructed with multiplexers.

(i) How many selection inputs are there in each multiplexer?

(ii) How many multiplexers are there in the bus? [5][CO2][BTL5]

Q.6 Write a short note on any two:

(a) RISC and CISC

(b) Explain the use of interface unit with the peripherals?

(c) Explain First pass and Second pass assembler with flow chart.

[5][CO1,5,1][BTL1]

Total no. of Pages:2 Roll no.....

SIX SEMESTER

B.Tech.

END TERM EXAMINATION ***MAY-2025***

CO208 Algorithm Design and Analysis

Time: 03:00 Hours *Max. Marks: 50*

Note : All questions carry equal marks.
Attempt any five questions.
Assume suitable missing data, if any.

Q.1 Consider the following message:
Aa bbbba bbb ccc ddd eeee ccc ece dd ee .
Find the number of bits required for Huffman encoding of the above message, and also find the average bits required to represent a character.

[L1, L3](CO3)[10]

Q.2 If you have Seven tasks T1, T2, T3, T4, T5, T6, T7 having deadline D1=3, D2=4, D3=4, D4=2, D5=3, D6=1, D7=2 and profit P1=35, P2=30, P3=25, P4=20, P5=15, P6=12, P7=5. Find the maximum profit possible? And write the algorithm of the Job Sequencing deadline problem, with its analysis.

[L1, L2](CO4)[10]

Q.3 Differentiate between;

(a) "Backtracking" and "Branch and Bound" strategies.

(b) 0-1 Knapsack Problem by using greedy and dynamic approach with the help of an example. **[L1,L5](CO2)[10]**

Q.4 A salesman has to visit 4 cities with the following distances between them. Solve the TSP using dynamic programming.

	A	B	C	D
A	0	1	1	3
B	2	0	5	1
C	1	4	0	3
D	4	3	2	0

(a) Find the minimum cost.

(b) Find the tour path starting and ending at A. **[L3, L4](CO4)[10]**

Q.5 Write a short note on

(a) P class

(b) NP class

(c) NP complete class

(d) Reducibility **[L1](CO5)[10]**

Q. 6 The Rod Cutting Problem is a classic optimization problem where you are given a rod of length n and a list of prices that contains the value of a rod piece of length i for i = 1 to n. The objective is to determine the maximum total revenue obtainable by cutting the rod into smaller lengths and selling the pieces.

(a) Formulate the rod cutting problem and express its solution using recurrence relations.

(b) Explain the limitations of the recursive approach in solving this problem.

(c) Describe how dynamic programming can be used to improve the efficiency of the solution. Provide the algorithm and explain its time and space complexity. **[L6](CO4)[10]**

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Total No. of Pages:2 *Roll No.....*

B. Tech.

SIXTH SEMESTER

END-TERM EXAMINATION **May-2025**

CO302(Compiler Design)

Time: 3 Hours *Max. Marks: 40*

Note: Attempt Any Four of the following questions.
Assume suitable missing data, if any.

Q.1 Compute first, follow sets for the following grammer :

E→ TA

A→+TA / ϵ

T→FB

B→ *FB / ϵ , F→(E) / id

Also make the recursive descent parser for the same grammar.

[10][CO-2][BTL 1,2]

Q.2 a What are two different approaches of parsing. Explain ?

[5][CO-1][BTL 1,2]

b. Draw the DAG for expression a+a*(b-c) +(b-c)*d ? Show the steps for constructing the same. **[5][CO-1][BTL 1,2]**

Q.3 write and Explain SDT for infix to postfix conversion?

Or

construct SLR parsing table for the following grammer.

S-→AA

A-→Aa/b

[10][CO-1][BTL 1,2]

Q .4a What is intermediate code. Explain different types of intermediate code representations? [5][CO-1][BTL 1,2]

b. Explain the conflicts occurring in LR parsing? [2][CO-1][BTL 1,2]

c. what are the data structures used for symbol table? [3][CO-5][BTL 1,2]

Q.5 Give SDD for a simple desk calculator and draw the dependency graph for 1*2*3*(4+5)n ?

Or

Give SDD that generates array types. [10][CO-4][BTL 3, 4]

END

Total no. of Pages:03

Roll no.....

VI SEMESTER

B.Tech.

END TERM EXAMINATION

May-2025

COURSE CODE: CO304

COURSE TITLE: ARTIFICIAL INTELLIGENCE

Time: 03:00 Hours *Max. Marks: 50*

Note: Attempt any five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1. a) Differentiate between plateau, ridge and a local maxima.
b) Given the 8-puzzle shown in figure 1, use the hill-climbing algorithm with the Manhattan distance heuristic (or hops) of the misplaced tiles to find a path to the goal state. Would the answer differ in case of Steepest Hill Climbing?

[4+6 M][CO 1,2][BTL 2,3]

1	2	3
4	8	
7	6	5

Initial state

1	2	3
4	5	6
7	8	

Goal state

Figure 1

Q.2.
a) With help of following example, illustrate how knowledge is represented using semantic net. Also write the corresponding property inference procedure.
Tom is a cat. Tom caught a bird. Tom is owned by John. Tom is ginger in colour. Cats like cream. The cat sat on the mat. A cat is a mammal. A bird is an animal. Birds can fly All mammals are animals. Mammals have fur.
b) What are semantic frames. What are the various links used in semantic frames? With the help of above example prove that they are better than semantic nets.
c) Differentiate between PROLOG and LISP with example.

[3+3+4 M][CO 3][BTL 3,4]

Q.3. Consider the following axioms:
1. All hounds howl at night.

2. *Anyone who has any mice does not have any mice.*
3. *Light sleepers do not have anything which howls at night.*
4. *John has either a cat or a hound.*

a) Write the above axioms in first-order predicate logic.
b) Considering the above axioms as facts, prove the following conclusion using the resolution method.
If John is a light sleeper, then John does not have any mice.

[4+6 M][CO 3][BTL 1,3]

Q.4.
a) Differentiate between Supervised learning, Unsupervised learning and Semi-supervised learning with example. [3 M][CO 4][BTL 4]
b) The figure 2 shows a neural network with one hidden layer where h_i's indicate linear combination of the input layer units and z indicates the linear combination of ReLU applied hidden layer units. Assume ReLU activation only for the hidden layer and y' as the output. The loss function used is Mean Squared Error (MSE) loss i.e., $J(y, y') = (y' - y)^2$. Considering single example $x = [3, 5]$, $y = 10$, $w_{ij} = 1$, and $v_j = 0.5$, $\forall i \in \{1, 2\}, j \in \{1, 2, 3\}$.
a) Compute the total number of parameters in the given neural network.
b) Find the updated values of the w_{ij}'s and v_j's using backpropagation. Consider learning rate $\alpha = 1$.

[2+5 M][CO 4][BTL 3,5]

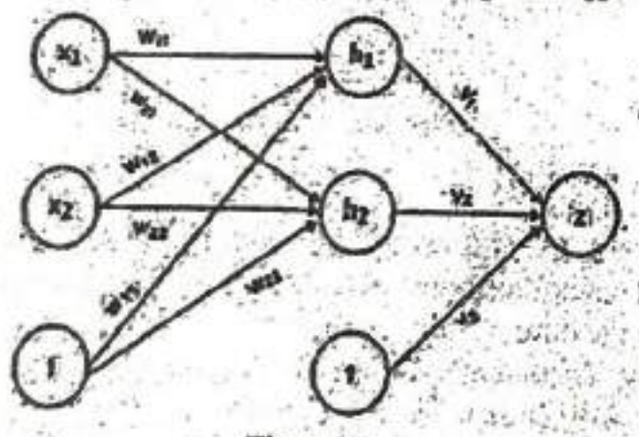

Figure 2

Q.5.
a) What is non-monotonic reasoning? How does it differ from monotonic reasoning? Provide an example where non-monotonic reasoning is necessary.
b) Suppose a genetic algorithm uses chromosomes of the form x = abcdefgh with a fixed length of eight genes. Each gene can be any digit between 0 and 9. Let the fitness of individual x be calculated as: f(x) = (a + b) − (c + d) + (e + f) − (g + h), and let the initial population consist of four individuals with the following chromosomes:

$x_1 = 65413532$
$x_2 = 87126601$
$x_3 = 23921285$
$x_4 = 41852094$

i. Evaluate the fitness of each individual, showing all your workings, and arrange them in order with the fittest first and the least fit last.
ii. Perform the crossover operation: Cross the fittest two individuals using one-point crossover at the middle point.
iii. By looking at the fitness function and considering that genes can only be digits between 0 and 9 find the chromosome representing the optimal solution (i.e. with the maximum fitness). Find the value of the maximum fitness.

[5+5 M][CO 4,5][BTL 5]

Q.6 Write short notes on the following:
a) Different Components of Expert System
b) Syntactic Analysis in NLP
d) Applications of AI in Robotics

[3+3+4 M][CO 5][BTL 4,5]

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B.Tech.(CO)
End-Term Examination

Roll no.....
Sixth Semester
May-2025

CO-306 Computer Networks

Time: 3 Hours *Max. Marks: 40*

Note: Answer all Questions.
Assume suitable missing data, if any.

Q.1 a) How can the suitability of a transmission medium be assessed, and which evaluation criteria should be applied in selecting the appropriate medium for data communication? [2] [CO1] [BTL-3]

b) What is count-to-infinity problem? [2] [CO2] [BTL-1]

c) Given the IP address 180.25.21.172 and the subnet mask 255.255.192.0 what is the subnet address? [2] [CO3] [BTL-4]

d) Explain the concept of congestion and which techniques can be applied to prevent it in a network? [2] [CO4] [BTL-2]

e) Analyze the role of HTTP in web communication and evaluate how it contributes to the functioning of modern websites. [2] [CO5] [BTL-4,5]

Q.2 a) Analyze the OSI and TCP/IP models and evaluate how they differ in their approach to network communication and layer organization. [3] [CO1] [BTL-5]

b) With suitable illustrations, compare baseband and broadband transmission techniques. Which is more suitable for high-speed data transfer and why? [3] [CO1] [BTL-4]

Q.3 a) Evaluate the structure of an IPv4 address and assess the classification of IP addresses into Classes A, B, and C. [3] [CO2] [BTL-5]

b) An ISP has allocated the IP address block 200.10.0.0/20 to a client. The client wants to divide this block into 8 equal-sized subnets.

i) What will be the new subnet prefix for each subnet?

ii) How many hosts can each subnet support?

iii) What is the range of IP addresses (network and broadcast) for the first and last subnet? [3] [CO2] [BTL-4]

OR

c) Explain the operation of the Stop-and-Wait, Go-Back-N, and Selective Repeat ARQ protocols. Compare their efficiency and error recovery mechanisms. [3] [CO2] [BTL-4]

Q.4 a) Evaluate the significance of the Border Gateway Protocol (BGP) in inter-domain routing. Compare and contrast BGP with RIP and OSPF by assessing their purposes, routing decision mechanisms, and scalability in network environments. [3.5] [CO3] [BTL-5]

b) Demonstrate an understanding of congestion control and Quality of Service (QoS) in computer networks. Analyze the key parameters that define QoS and discuss their roles in maintaining effective and reliable network performance. [3.5] [CO3] [BTL-3,4]

Q.5 What is the total delay (latency) for a frame size of 10 million bits that is being set up on link with 15 routers, each having queueing time of 2μs and a processing time of 1μs? The length of link is 3000 km the speed of lights inside the link 2x108 m/sec. the link has bandwidth of 6 Mbps. [5] [CO4] [BTL-5]

Q.6 Demonstrate how SMTP facilitates the transmission of messages and its ability to support multimedia content such as video through extensions. Also discuss the advantages of IMAP4 over POP3 mail access protocols. [6] [CO5] [BTL-4]

OR

Q.7 Discuss the architecture and functioning of MQTT in IoT environments. How does it support lightweight communication and real-time responsiveness? [6] [CO5] [BTL-4]

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Roll No.....

VI Semester

B. Tech

END TERM EXAMINATION

May-2025

CO308 Parallel Algorithm

Time: 3 Hours

Max. Marks: 50

Note: Answer all questions. Assume suitable missing data, if any.

Section A (2 × 5= 10 Marks)

Q1-Attempt all the parts

a) In a small town, a network of roads is being planned to connect various locations. The town has 10 main areas that need to be connected with roads, and the objective is to build a network that connects all areas with the least amount of total road length. The planners aim to create a **Minimum Spanning Tree (MST)** to ensure that the roads are both efficient and cost-effective. As the chief planner, you are tasked with ensuring that the network connects all 10 areas, with no unnecessary extra roads. Your goal is to determine the **minimum number of roads (edges)** that will be required to connect all areas in the most cost-effective way.

How many roads (edges) will be required to construct the minimum spanning tree for a network with 10 areas (vertices)? Explain the reasoning behind your answer. **[2M][CO6][BL2]**

b) What are the challenges in implementing parallel merge sort? Briefly explain. **[2M] [CO4][BL3]**

c) In a small village, the local council is organizing a community event where different groups of people will be assigned to various tasks, such as setting up booths, preparing food, and managing logistics. To help coordinate the teams, they have decided to represent the relationships between the groups using graphs. In the first case, the council is planning a **null graph**, where no groups are connected to each other. Each group operates independently, with no overlapping tasks or dependencies. In another case, the council is considering a **complete graph**, where every group is connected to every

other group, as all tasks are tightly interdependent, and each group needs to collaborate with every other one.Your task as the event coordinator is to determine how many different colors (or task categories) are needed to assign to the groups in both situations, ensuring that no two connected groups are assigned the same task category.

What is the **chromatic number of a null graph and a complete graph?** Explain the reasoning behind your answer in both cases. **[2M][CO3][BL2]**

d) Briefly explain how database query processing can be parallelized.
[2M] [CO1][BL2]

e) Use the given dataset to demonstrate the process of sorting. Show all intermediate steps as the data is sorted using the algorithm, including the creation of **bitonic sequences** and how they are merged.

Data to Sort:
[3, 7, 2, 9, 4, 1, 6, 8] **[2M][CO4][BL3]**

Section B (8 × 5 = 40 Marks)

2. Given the following matrix A, perform its LU Decomposition. Additionally, explain how parallel computing can speed up the LU Decomposition process and provide an example to illustrate this.
[CO1][BL3][8M]

$$A = \begin{bmatrix} 4 & 3 & 2 \\ 3 & 6 & 4 \\ 2 & 4 & 5 \end{bmatrix}$$

3. The following network has 10 vertices:A,B,..,J. The number on each edge represent the distances, in miles, between pairs of vertices. Use Kruskal's algorithm to find the minimum spanning tree for the network.
[CO6][BL3] [8M]

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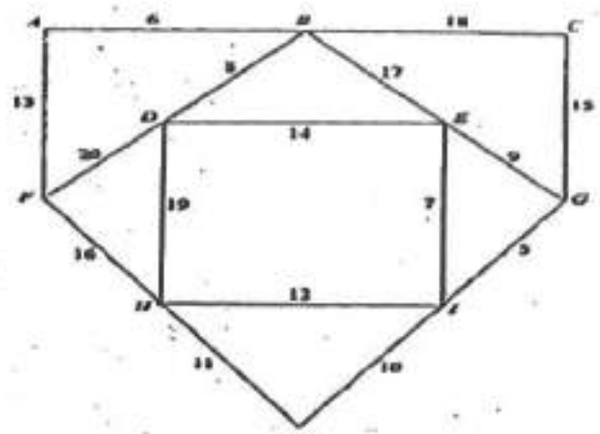
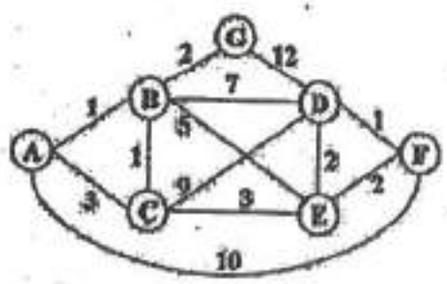


4. Explain the difference between the EREW, CREW, and CRCW models in the context of parallel searching. How does each model affect the performance of searching on a sorted sequence? **[CO1] [BL2][8M]**

5. Consider a random array of 10 integers: [20, 10, 85, 30, 70, 20, 60, 75, 40, 100]. Use the parallel search algorithm (CREW or CRCW model) to search for the number 70. Assume that 5 processors are available, and the array is divided equally among them. Show the steps and results.
[CO5][BL3] [8M]

6. Consider the following weighted graph:



Solve the single source shortest path problem using Dijkstra Algorithm. Assume node 'A' as the source vertex. Show all intermediate steps in tables mentioning the intermediate distance values of all the nodes at each iteration of the algorithm. Finally, produce the shortest-path tree. **[CO6][BL3][8M]**

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Total No. of Pages ___

VI SEMESTER

B.Tech.

END TERM EXAMINATION May-2025

COURSE CODE- CO318

COURSE TITLE- ADVANCED DATABASE MANAGEMENT SYSTEMS

Time: 3:00 Hours Max. Marks : 50

Note : Answer any 5 questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 a) Explain the hybrid merge-join algorithm and its advantage over using only secondary indexes on unsorted relations. Also, describe how the algorithm can be extended when both relations are unsorted but have secondary B+-tree indexes. [5] [CO2] [BLT3]

b) Explain the architecture and key considerations of a remote backup transaction processing system used to achieve high availability. Discuss any three important design issues involved in such systems. [5] [CO3] [BLT2]

Q.2 a) Explain how the following differ: fragmentation transparency, replication transparency, and location transparency. [5] [CO5] [BLT1]

b) Discuss the advantages and disadvantages of the two methods for generating globally unique timestamps. [5] [CO5] [BLT2]

Q.3 a) What are the factors that can work against linear scale up in a transaction processing system? Which of the factors are likely to be the most important in each of the following architectures: shared memory, shared disk, and shared nothing? [5] [CO4] [BLT4]

b) What factors could result in skew when a relation is partitioned on one of its attributes by:

a. Hash partitioning?
b. Range partitioning?

In each case, what can be done to reduce the skew? [5] [CO4] [BLT4]

Q.4 a) Consider the relational schema

Part (part id, name, cost)

Subpart (part id, subpart id, count)

A tuple (p1, p2, 3) in the subpart relation denotes that the part with part-id p2 is a direct subpart of the part with part-id p1, and p1 has 3 copies of p2. Note that p2 may itself have further subparts. Write a recursive SQL query that outputs the names of all subparts of the part with part-id "P-100". [5] [CO1] [BLT3]

b) Suppose that a B+-tree index on (*dept name, building*) is available on relation department. What would be the best way to handle the following selection?

σ (*building* < "Watson") $\wedge$ (*budget* < 55000) $\wedge$ (*dept name* = "Music")(*department*).

[5] [CO2] [BLT3]

Q.5 a) Explain how a TP monitor manages memory and processor resources more effectively than a typical operating system. [5] [CO6] [BLT2]

b) What is the purpose of compensating transactions? Present two examples of their use. [5] [CO6] [BLT1]

Q.6 a) Explain the use of control flow constructs in SQL procedures with examples. [5] [CO1] [BLT2]

b) Differentiate between system-generated, user-generated, and derived references in SQL with appropriate syntax examples. [5] [CO1] [BLT2]

***** END *****

Total No. of Pages: 02

SIXTH SEMESTER

Roll No. .....

B.Tech. (CSE)

END TERM EXAMINATION

May, 2025

CO324 Pattern Recognition

Time: 3:00 Hours

Max. Marks: 40

Note: Answer *ALL* questions.
Assume suitable missing data, if any.
CO# is course outcome(s) related to the question.
BLT# is related order of thinking skill (Bloom's Taxonomy)

1. Attempt any TWO of the following.

[a] How is pattern recognition applied to detect vehicle types and manage traffic lights intelligently? Discuss the implications of real-time processing on design methodologies. **[4] [CO2, 4, 5] [BTL3, 4]**

[b] How does Bayesian decision theory help classify medical images for disease detection? What role does minimum-error-rate classification play in reducing false positives? **[4] [CO2] [BTL2, 3, 4]**

[c] A data point has a missing feature: x [3, ?]. Assume the mean and variance of the missing features for each class are known: C1: $\mu = [3, 5]$, $\sigma^2 = [1, 2]$. Estimate the missing feature using the expected value and classify using MAP. **[4] [CO2] [BTL3, 4]**

2.[a] Given a 2-dimensional data point $x = [3, 4]$, and the direction of the first principal component as the unit vector $v = [0.6, 0.8]$, compute the projection of x onto the principal component axis. **[4] [CO3] [BTL3]**

[b] You are given a dataset x=[2,3]. Assume the data is drawn from a Gaussian distribution with known variance.

i. Compute the Maximum Likelihood Estimate (MLE) of the mean μ.

ii. Assuming a prior distribution $\mu \sim N(0,1)$, compute the Maximum A Posteriori (MAP) estimate of μ.

iii. Compare the MLE and MAP results and explain when the MAP estimate is more reliable than the MLE. **[4] [CO2] [BTL3, 4]**

3. Attempt any TWO of the following.

[a] Consider the data points x = [1, 4, 8], with initial cluster centres $c_1 = 2$ and $c_2 = 7$, and a fuzziness parameter m = 2. Perform a single iteration of the fuzzy K-means clustering algorithm by computing the membership degrees of each point to both clusters, followed by updating the cluster centres based on the calculated memberships. **[4] [CO5] [BTL3, 4]**

[b] Compare and contrast the Parzen-window and K-Nearest Neighbour methods for probability density estimation. Discuss their respective advantages and disadvantages, and identify scenarios where one method may be more suitable than the other. **[4] [CO2] [BTL4]**

[c] Estimate the probability density at x = 2 using Parzen Window Estimation, given the sample points x = [1, 2, 3] and a Gaussian kernel with bandwidth h = 1. **[4] [CO2] [BTL3, 4]**

4. Answer any TWO of the followings.

[a] Consider a perceptron receives an input vector $X = [0.7, -0.3]$, has corresponding weights $W = [0.8, 0.5]$, and a bias term $b = -0.1$. Compute the output of a perceptron using sigmoid activation function and calculate the weighted sum (net input) and the final output of the perceptron. **[4] [CO4] [BTL3, 4]**

[b] Consider a simple neural network that has the following characteristics: One input neuron; One hidden neuron with ReLU activation: ReLU(x) = max(0, x); One output neuron with linear activation: f(x) = x; Weight from input to hidden: $w_1 = 0.5$; Weight from hidden to output: $w_2 = 1.0$; Input value: x = 1; Target output: t=2; Learning rate: η=0.1. Considering Backpropagation in a Simple Neural Network, calculate the following:

i. Perform a forward pass and compute the final output of the network.

ii. Calculate the error using the squared error function:

$$E = \frac{1}{2}(t - y)^2$$ **[4] [CO4] [BTL3, 4]**

[c] Explain the characteristics of ReLU, sigmoid, and tanh activation functions. Compare their mathematical properties, behavior during training (such as vanishing gradients), and typical use cases. In what scenarios is each activation function most suitable? **[4] [CO4] [BTL2, 3]**

5.[a] A logistics company wants to optimize delivery routes across multiple cities, considering time windows and traffic conditions. Traditional algorithms fail due to the complexity of the solution space. Identify the optimization problem in this scenario. Explain how a genetic algorithm can be applied to solve it, briefly describing the roles of initialization, selection, crossover, mutation, and termination. Analyse how each stage helps guide the search toward an optimal or near-optimal route. **[4] [CO5] [BTL4]**

[b] Describe the concept of Boltzmann learning in neural networks, highlighting how it differs from Hebbian learning and backpropagation, and explain the computational challenges associated with Boltzmann machines, along with the impact of their stochastic update mechanism on convergence. **[4] [CO1, 4] [BTL4]**

—Best of Luck—

[b] For vanilla GAN, write down the loss $\mathcal{L}_G^{minmax}$ that you would minimise for the generator G if you followed the game definition literally (no tricks). Explain why $\mathcal{L}_G^{minmax}$ minimax can lead to vanishing gradients early in training **(Use maximun two sentences)**. Derive the alternative non-saturating generator loss $\mathcal{L}_G^{NS}$ used in many modern GANs, and show (mathematically) that minimising it is equivalent to maximising logD(G(z)). **[4] [CO1, CO4]**

[c] A small GAN uses generator G that produces its fake sample according to $x_{fake} = w_G z + b_G$ and a discriminator D, a logistic regression based classifier $D(x) = \sigma(w_D x + b_D)$, where $\sigma(v) = 1/(1 + e^{-v})$. In one training iteration the generator receives the noise value $z = 1.2$ while the single real data example is $x_{real} = 4$. The netwok weights are w_G=1.4, b_G= 0.8, w_D= 0.9, $b_D = -2.1$. Determine the fake sample produced by the generator. Also, find the generator loss $\mathcal{L}_G$ and discriminator loss $\mathcal{L}_D$ with following function: **[4] [CO3, CO4]**

$$\mathcal{L}_D = -\frac{1}{2}\left[\ln D(x_{real}) + \ln(1 - D(x_{fake}))\right]$$

$$\mathcal{L}_G = -\ln D(x_{fake})$$

Use the followings to simplify calculations: $\sigma(1.5) = 0.817, \sigma(0.132) \approx 0.533$, $\ln(0.817) = -0.202, \ln(0.533) \approx -0.629$, $\ln(0.467) \approx -0.762$.

---Best of Luck---

Total No. of Pages :04 *Roll No. .....*

SIXTH SEMESTER

B.Tech. (CSE)

END TERM EXAMINATION ***May, 2025***

CO328 DEEP LEARNING

Time: 3:00 Hours ***Max. Marks: 40***

Note: Answer *ALL* questions.
Assume suitable missing data, if any.
CO# is course outcome(s) related to the question.

1.[a] A manufacturing company is using high-resolution camera systems on its assembly lines to detect defects in metal components. You are part of the data science team responsible for deploying a deep learning–based visual inspection system using a convolutional neural network (CNN). The initial model performs with 98% accuracy on training data but only 82% on real-world production images. After investigating, you discover that the model was trained on clean, well-lit lab images, while production images often have inconsistent lighting, background noise, and slight variations in orientation. Answer the following in **3–4 sentences** each: What is the most likely cause of the performance gap between lab data and production data? What metrics or methods would you use to ensure that the updated model performs reliably under production conditions? **[4] [CO2, CO3]**

[b] Suppose you are training a feedforward neural network with the architecture: Input Layer (3 nodes), Hidden Layer 1 (2 neurons), Hidden Layer 2 (2 neurons), Output. All hidden layers use the sigmoid activation function. During backpropagation for a single training example, you are currently computing the gradients at Hidden Layer 1. At this stage, the upstream gradient from Hidden Layer 2 is $\delta^{[2]}$. The weight matrix from Hidden Layer 1 to Hidden Layer 2 is $W^{[2]}$. The activations from Hidden Layer 1 are $a^{[1]}$ and the sigmoid derivatives at that layer are $\sigma'(z^{[1]})$. The followings values are given: **[4] [CO1]**

[b] For vanilla GAN, write down the loss $\mathcal{L}_G^{minmax}$ that you would minimise for the generator G if you followed the game definition literally (no tricks). Explain why $\mathcal{L}_G^{minmax}$ minimax can lead to vanishing gradients early in training (**Use maximun two sentences**). Derive the alternative non-saturating generator loss $\mathcal{L}_G^{NS}$ used in many modern GANs, and show (mathematically) that minimising it is equivalent to maximising $\log D(G(z))$. **[4] [CO1, CO4]**

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$$\mathcal{L}_D = -\frac{1}{2}[\ln D(x_{real}) + \ln(1 - D(x_{fake}))]$$

$$\mathcal{L}_G = -\ln D(x_{fake})$$

Use the followings to simplify calculations: $\sigma(1.5) = 0.817, \sigma(0.132) \approx 0.533$, $\ln(0.817) = -0.202, \ln(0.533) \approx -0.629$, $\ln(0.467) \approx -0.762$.

—Best of Luck—

Total No. of Pages :04

Roll No. .....

SIXTH SEMESTER

B.Tech. (CSE)

END TERM EXAMINATION ***May, 2025***

CO328 DEEP LEARNING

Time: 3:00 Hours ***Max. Marks: 40***

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CO# is course outcome(s) related to the question.

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[b] Suppose you are training a feedforward neural network with the architecture; Input Layer (3 nodes), Hidden Layer 1 (2 neurons), Hidden Layer 2 (2 neurons), Output. All hidden layers use the sigmoid activation function. During backpropagation for a single training example, you are currently computing the gradients at Hidden Layer 1. At this stage, the upstream gradient from Hidden Layer 2 is $\delta^{[2]}$. The weight matrix from Hidden Layer 1 to Hidden Layer 2 is $W^{[2]}$. The activations from Hidden Layer 1 are $a^{[1]}$ and the sigmoid derivatives at that layer are $\sigma'(z^{[1]})$. The followings values are given: **[4] [CO1]**

$\delta^{[2]} = \begin{bmatrix} 0.4 \\ -0.2 \end{bmatrix}$, $W^{[2]} = \begin{bmatrix} 0.6 & -0.1 \\ -0.5 & 0.3 \end{bmatrix}$, $a^{[1]} = \begin{bmatrix} 0.8 \\ 0.5 \end{bmatrix}$, $\sigma'(z^{[1]}) = \begin{bmatrix} 0.16 \\ 0.25 \end{bmatrix}$

Using the information above, compute the gradient vector $\delta^{[1]}$ at Hidden Layer 1. Show all necessary steps and intermediate values clearly.

2.[a] A convolutional layer produces, for a mini-batch of size N = 2, C = 2 channels and a single spatial location (H = W = 2), the following raw activations:

Channel 1: Batch 1: $\begin{bmatrix} 4 & 6 \\ 4 & 6 \end{bmatrix}$, Batch 2: $\begin{bmatrix} 6 & 4 \\ 6 & 4 \end{bmatrix}$

Channel 2: Batch 1: $\begin{bmatrix} 2 & 4 \\ 2 & 4 \end{bmatrix}$, Batch 2: $\begin{bmatrix} 4 & 2 \\ 4 & 2 \end{bmatrix}$

These activations are passed through BatchNorm with scale $\gamma = [1, 2]$, shift $\beta = [0, 1]$ and $\epsilon = 10^{-5}$. Calculate the BatchNorm output for the batch 1, in each channel c at spatial location $h = 1, w = 2$? Also, how many trainable parameters does this BatchNorm layer contain, and what are their shapes? **[4] [CO1]**

[b] You are training a deep learning model for detecting pneumonia from chest X-ray images using a convolutional neural network (CNN). During training, you notice the training loss is decreasing steadily, but the validation loss stops improving early and begins to increase after a few epochs. To address this, you consider implementing the following techniques: Dropout; Data augmentation. Explain how each of these techniques can help mitigate the issue you are facing. Limit your answer to **maximum 5 sentences.** **[4] [CO3]**

3.[a] Consider a CNN that takes as input a single-channel 8×8 image and processes it through four stages: first, a convolutional layer (Conv1) with two 3×3 filters, stride 1 and no padding, followed by a ReLU; next, a 2×2 max-pooling layer with stride 2; then a second convolutional layer (Conv2) with four 3×3 filters, stride 1 and padding 1, followed by a ReLU; and finally a global average-pooling that collapses each feature map to a single scalar. Determine the height×width×channels of the output tensor after each of these four operations, Also calculate how many trainable parameters Conv1 contains and how many Conv2 contains. **[4] [CO2, CO3]**

[b] Illustrate how stacking multiple convolutional (and optionally pooling) layers increases the receptive field of deep activations, and explain why this enables the network to learn hierarchical feature representations. **[4] [CO1]**

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4. Answer any TWO of the followings.

[a] Explain how an RNN's hidden state allows it to "remember" information from earlier in the sequence. Describe two key training difficulties that arise when trying to learn long-term dependencies with a vanilla RNN. For each difficulty, give a **one-sentence intuition** for why it happens. **[4] [CO1]**

[b] Consider a single-layer LSTM processing a sequence of length T = 5 with batch size N = 2. Each input vector has dimensionality D = 3, and the LSTM's hidden state size is H = 4. The LSTM uses the usual formulation with four gates. Assume each gate also has its own bias of size H. How many total trainable parameters does this LSTM contain? If the input tensor has shape (T, N, D) what are the shapes of the output hidden states h and cell states c after processing the full sequence? **[4] [CO1, CO2]**

[c] A single-head decoder self-attention layer (width = 2) receives the three embeddings: $x_1 = [1, 0]^T$, $x_2 = [0, 1]^T$, $x_3 = [1, 1]^T$. Its projection matrices are $W^Q = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, $W^K = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and $W^V = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$. With the causal mask in force, the scaled scores have already been soft-maxed, yielding the attention-weight matrix (rows = queries, columns = keys/values):

$$\alpha = \begin{bmatrix} 1 & 0 & 0 \\ 0.33 & 0.67 & 0 \\ 0.14 & 0.28 & 0.58 \end{bmatrix}$$

Write the query, key and value vectors associated with token 1. Which token supplies the largest contribution to token 2's attention output, and what feature of the key/query interaction explains this preference? **[4] [CO1, CO2]**

5. Answer any TWO of the followings.

[a] Consider a vanilla Generative Adversarial Network (GAN) defined by a two-player minimax game between a generator G and a discriminator D. Give the mathematical expression of the minimax objective, with expectations over real and noise distributions, indicating each player's (G and D) optimization goal **(Use maximum 3 sentences)**. Derive the batch-averaged discriminator loss $\mathcal{L}_D$ that you would actually minimise in code when using mini-batch sizes $m_{real} = m_{fake} = m$ into a plain minimisation problem. **[4] [CO1, CO4]**

Total No. of Pages- 02 *Roll No .....*

VIII Semester
B.Tech.

END TERM EAMINATION May-2025

CO408 - INTELLECTUAL PROPERTY RIGHTS

Time-3:00 Hours Max. Marks-50

Note: 1. Answer all questions.
2. Assume suitable missing data, if any.

Q1. (a) Design a flowchart showing all prosecution steps for a patent application in India.

(b) If the burden of proof in a patent infringement case were reversed, what challenges would arise? [5+5 M][CO1][L1,5]

Q2. (a) Critique the principle that 'Trademark rights are territorial' in a globalized economy.

(b) Frame a hypothetical situation where a work qualifies both for copyright and design protection. [5+5 M] [CO2][L5,6]

Q.3 Answer any two from the followings. [5+5 M] [CO3, CO4][L1,3,4]

(a) Suppose Darjeeling Tea was patented instead of registered as GI — what would have been the implications?

(b) Create a comparative table showing key differences between patent, trademark, copyright, and GI.

(c) Prepare a patent claim for an innovative smartphone feature.

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Q.4 Answer any two from the followings: [5+5 M] [CO3, CO4] [L2,3]

(a) How would you protect a new beverage brand using multiple IPRs simultaneously?

(b) What happens if an unregistered copyright is infringed internationally?

(c) Why are slogans sometimes protectable under trademarks, but not always?

Q5. Write Short note on any two from the followings:
[5+5M] [CO1, CO5] [L1]

(a) Fair Use in Copyright law.
(b) Freedom to Operate (FTO) analysis.
(c) Patent infringement defences.

Total No. of Pages – 4

Roll No. .....

Second Semester

B.Tech. (CSE)

End Term Examination

May–2025

CS102: DISCRETE STRUCTURES

Time: 3:00 Hours **Max. Marks: 50**

Note: Answer any five questions. All questions carry equal marks. Assume suitable missing data, if any.

Q. No. 1 (2 × 5)

A Test the validity of the following argument relating to the students of VIIth and VIIIth Semester of DTU using ***Rules of Inference***: - [CO1] {L5}

(i) There is a student in the VIIth semester who is not eligible to file for nomination to the post of class placement representative but is doing internship at Google.

(ii) If a student has CGPA of at least 9.0, then the student is eligible to file for nomination to the post of class placement representative.

(iii) If a student has CGPA less than 9.0, then the student has to clear the screening test for placement.

(iv) If a student has cleared the screening test for placement, the student is eligible for placement in any company.

Therefore, it can be concluded that a few students are eligible for placement in any company.

B Convert the statement $(x \to (y \wedge w)) \wedge (z \to (y \wedge w))$ into PDNF forms [CO1] {L2}

Q. No. 2 (2 × 5)

A Assume that the computational complexity of the divide and conquer algorithm is determined using recurrence relation given below. What is the big theta (Θ) estimate for the complexity of the algorithms? [CO2] {L3}

$f(n) = 2f(\sqrt[2]{n}) + 1$, where n is a perfect square, $f(1) = 1$

B If $A = \{1,2,3,4,5,6,7,8\}$, $p_1 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 3 & 4 & 1 & 2 & 6 & 5 & 7 & 8 \end{pmatrix}$; [CO3] {L2}

$p_2 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 2 & 3 & 1 & 5 & 4 & 6 & 7 & 8 \end{pmatrix}$; $p_3 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 6 & 3 & 2 & 5 & 4 & 1 & 7 & 8 \end{pmatrix}$.

Outline the expression for $(p_2 \circ p_1) \circ p_3$. Is the resulting permutation odd or even?

Q. No. 3 (2 × 5)

A Let $A = \{a,b,c,d,e\}$, R and S be equivalence relations on A whose matrices are given below. Compute the matrix of the smallest relation [CO3] {L3}

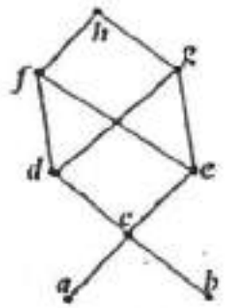
containing R and S (including their properties). Also list the elements of this relation.

$$M_R = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \end{bmatrix}; M_S = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

B If $\Lambda = \{1,2,3,5,6,10,15,30\}$ with the partial order $\leq$ of divisibility on Λ, *i.e* $a \leq b$ if and only if a *divides* b ; and $B = P(S)$, the power set of S, where $S = \{e,f,g\}$; and $(B, \subseteq)$ be a poset, where $\subseteq$ is the partial order of set containment. Analyse if $(\Lambda, \leq)$ and $(B, \subseteq)$ are isomorphic posets. Justify your answer. [CO3] {L4}

Q. No. 4 (2 × 5)

A $(A, \leq)$ is a poset, where $A = \{a,b,c,d,e,f,g,h\}$ and $\leq$ is the partial order on A with Hasse diagram as shown in Figure. If $B = \{a,b\}$ and $C = \{c,d,e\}$ are subsets of A. Interpret what are the following: - [CO3] {L2}



(i) Lower Bounds of subsets B and C.

(ii) Upper Bounds of subsets B and C

(iii) Greatest Lower Bound of subsets B and C

(iv) Least Upper Bound of subsets B and C

B If n is a positive integer, p a prime number and p^2 divides n. Is D_n, the set of positive integers that divides n, a lattice under the relation of divisibility? Prove or disprove that D_n is not a Boolean Algebra. [CO3] {L5}

Q. No. 5

A System specification for a 4-input security system is modelled using the function $f: B_4 \to B_1$, which is defined as given below [CO3] {L3}

$$f(x,y,z,w) = \begin{cases} 1 & \textit{as shown in table} \\ 0 & \textit{otherwise} \end{cases}$$

Use Karnaugh Map to develop a logical circuit diagram with minimum number of logic gates to implement the system specification.

x	y	z	w	f(x,y,z,w)
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	1	1	0	1

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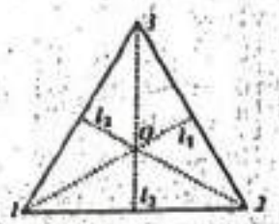
B Consider the equilateral triangle shown opposite. The symmetries of the triangle are: - [CO3] [L5]



Counter-clockwise rotations f_1, f_2, and f_3, about O through 360°, 120° and 240°, respectively; reflections g_1 , g_2 and g_3 about the respective angular bisectors l_1 , l_2 and l_3 respectively. Develop the multiplication table for the operation *, "*followed by*" defined on the set of symmetries of the triangle.

Q. No. 6 (2 × 5)

A Let $A = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7, v_8, v_9, v_{10}\}$ be a set and T be a relation on A, defined as $T = \{(v_2, v_3), (v_2, v_1), (v_4, v_5), (v_4, v_6), (v_5, v_8), (v_6, v_7), (v_4, v_2), (v_7, v_9), (v_7, v_{10})\}$. [CO4] [L2]

Determine if T is a tree. If yes, draw the digraph of the tree and identify the root, the leaves and the height of the tree. In case T is not a tree identify the properties that the relation satisfies.

B A college offers 5 elective subjects (with codes E01 to E05) for 2nd Sem students to choose 2 from these subjects. The data of the number of students registered for $Subject_i$ and $Subject_j$ is tabulated below. [CO4] [L6]

	$Subject_i$	$Subject_j$	#
a)	E01	E02	19
b)	E01	E05	26
c)	E02	E03	18
d)	E02	E04	24

	$Subject_i$	$Subject_j$	#
e)	E02	E05	17
f)	E03	E04	28
g)	E04	E05	35

A clash will occur in the timetable if the examination of two subjects is conducted during the same time-slot, resulting in a student not being able to take the examination of one of the subjects for which the student is registered. Assuming that the number of examinations per day for a given student is not more than one

(i) Apply the principle of graph colouring to find the minimum numbers of days required to conduct the End-Semester Examination for the elective subjects without any clash in the timetable?

(ii) How many different clash-free time-tables can be generated for the conduct of End-Semester Examinations of the elective subjects in the minimum number of days?

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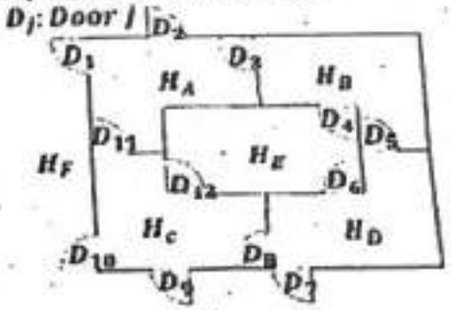
Q. No. 7 (2 × 5)

A An exhibition route map is required to be made for a newly renovated museum with five indoor Exhibit Halls and one outdoor Exhibit Stand. The floor plan of the museum is given in Figure. [CO4] [L3]



Is it possible to plan a route to visit every exhibit hall / stand in the museum by passing through each door exactly once? If it is possible, enumerate the path. Justify your answer, in case it is not possible to plan such a route.

B The representative weighted-graph of the cost of establishing high-speed data connectivity between new branch offices of a multi-national company (MNC) is shown in figure below. The weights mentioned against the edges represent the cost in multiples of ₹100,000/-. The Chief Operations Officer of the MNC intends to find the most economical solution to the problem. [CO5] [L3]

Assuming that the Head-office is located at city A, build a minimal spanning tree (root as city A) with vertices representing various branch offices of the company.

What will be the minimum cost for establishing this data network?

Total No. of Pages 2
IInd SEMESTER
END SEMESTER EXAMINATION

Roll No.....
B.Tech.(CSE)
(May-2025)

CS104: Data Structures

Time: 3:00 Hours **Max. Marks: 40**

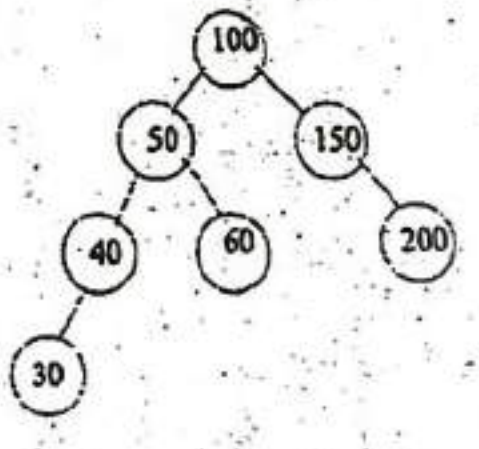
Note: Answer any five questions. Write pseudo codes/C code for explaining algorithms. Assume suitable missing data, if any.

1. A program is to read a long text input having only lowercase alphabets. We need to count frequency of each alphabet and store it in a data structure so that at any point of time we can tell the character with highest frequency.
   (a) Suggest a suitable data structure for this task and write following functions:
   (b) UpdateFrequency(..., chr) to update increase frequency of character chr. This function can take other parameters also if needed.
   (c) PrintHighestFrequency(...) to print character with highest frequency and its frequency count.

   [2+3+3=8 marks]

2. Implement a stack using doubly linked list and write algorithms for following operations: CreateEmptyStack(), Push(), Pop(). Assume suitable return type and passed parameters. **[2+3+3=8 marks]**

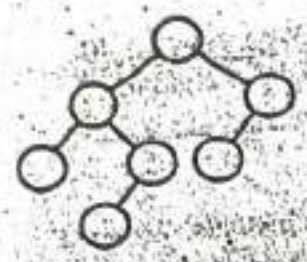
3. Consider following AVL tree:
   (a) Show the AVL tree after inserting 10
   (b) Show the AVL tree after inserting 180
   Consider given AVL tree as beginning point in both questions and show all intermediate trees (if any).



[4+4=8 marks]

4. Given an undirected connected graph G(V,E), write an algorithm to display one path between vertex x to vertex y taking help of DFS graph traversal technique and print the path as $x \rightarrow p \rightarrow q \rightarrow \ldots \rightarrow y$. **[8 marks]**

5. (a) Label each node in the following binary tree with numbers from the set {2, 26, 10, 27, 20, 15, 42} so that it is legal Binary Search Tree.



(b) Construct the binary tree that generated following In-order and Pre-order traversal results: In-order: AQVNBRMSP
Pre-order: BQAVNRSMP

[4+4=8 marks]

6. Consider a hash table consisting of M = 11 slots, and suppose nonnegative integer key values are hashed into the table using the hash function h1() written in C language:

```
int h1 (int key)
{
    int x = (key + 7) * (key + 7);
    x = x / 16;
    x = x + key;
    x = x % 11;
    return x;
}
```

Suppose that collisions are resolved by using linear probing. The integer key values [43, 23, 1, 0, 15, 31, 4, 7, 11, 3] are to be inserted, in the order given. Show the final hash table. [8 marks]

7. (a) Describe the structure of a node in B-tree.
(b) Describe how minimum and maximum number of keys/children in a B-tree node are decided in B-tree structure. [4+4=8 marks]

Total no. of Pages: 02 *Roll no.....*

End Term Examination **May-2025**

Fourth Semester **B.Tech. CSE**

Paper Code: CO 202/CS210n **Database Management Systems**

Duration: 03 Hours **Max Marks: 40**

Note: . All questions are compulsory.
Marks for questions are indicated alongside
Assume suitable missing data, if any.

Q1. Answer the following questions in brief. *(any four)* [8][CO1,2,3,5]

f) What is the purpose of checkpoints? How do they improve recovery performance? [BLT L1,2]

g) Define foreign key with an example. [BLT L1,2]

h) What is the scheme used by the database system to recover from the deadlock state? [BLT L2]

i) What are the different levels of data abstraction in DBMS? [BLT L2]

j) Name different types of relationships in ER modelling. [BLT L2]

Q2. (a) Suppose that the schema R = (A, B, C, D, E) is decomposed into (A, B, C) and (A, D, E). Considering the following set of FDs prove that the decomposition is lossless but not dependency preserving.

$$A \rightarrow BC$$
$$CD \rightarrow E$$
$$B \rightarrow D$$
$$E \rightarrow A$$

[BLT L3,5][4][CO3]

(b) A relation R(A, B, C) has FDs AB→C, C→A. Is R in 3NF or in BCNF? Justify your answer. [BLT L5][2][CO3]

(c) What are the advantages and limitations of Two-Phase Locking (2PL) protocol? [BLT L2,4][2][CO4]

Q3. (a) What do you mean by disjoint constraints of specialisation/ generalisation? Explain with an example. [BLT L2,3][2][CO2]

(b) Design an ER diagram for a University database with Students, Courses, Professors and Enrollments. Mention assumptions clearly. [BLT L6][4][CO2]

(c) What are the benefits of multilevel indexing? [BLT L2][2][CO7]

Q4. (a) If there are three transactions with 1,2,3 operations respectively. Then find: [BLT L3,5][4][CO4]

(iii) Total number of schedules

(iv) Total number of serial and non-serial schedules

(b) Explain timestamp ordering protocol with an example. How does it prevent conflicts? [BLT L1,2][4][CO5]

Q5. (a) Explain the four kinds of Integrity Constraints in a Database Management System with examples. [BLT L1,4][2][CO1]

(b) Check whether the given schedule S is conflict serializable or not. If it is conflict serializable then give all of its topological sorting.

T1	T2	T3	T4
			R(A)
	R(A)		
		R(A)	
W(B)			
	W(A)		
		R(B)	
	W(B)		

[BLT L5,6][3][CO5]

(c) A transaction performs the following operations: read(X), X=X-10, write(X), read(Y), Y=Y+10, write(Y). [BLT L3,5][3][CO6]

(iii) Show the undo and redo log records for this transaction.

(iv) Illustrate how recovery happens in both cases (undo and redo).

END

Total No. of Pages 2
IV-SEMESTER
END TERM EXAMINATION

Roll No.....
B.Tech.(CSE)
May- 2025

CS-204 THEORY OF COMPUTATION

Time: 3:00 Hours **Max. Marks: 50**

Note: Attempt any five questions. Assume suitable missing data, if any

Q.No. 1

A. Construct DFA that accepts string over {0, 1} if and only if the value of the strings interpreted as a binary representation of an integer is 0 mod 5. For example 0101, 1111 representing integer '5' and '15' respectively are to be accepted. *[5] CO1 BTL-3*

B. What is pumping lemma for regular expression? Show that the language **L= {0^n | n is a Perfect Square}** is not regular. *[5] CO1 BTL-1,3*

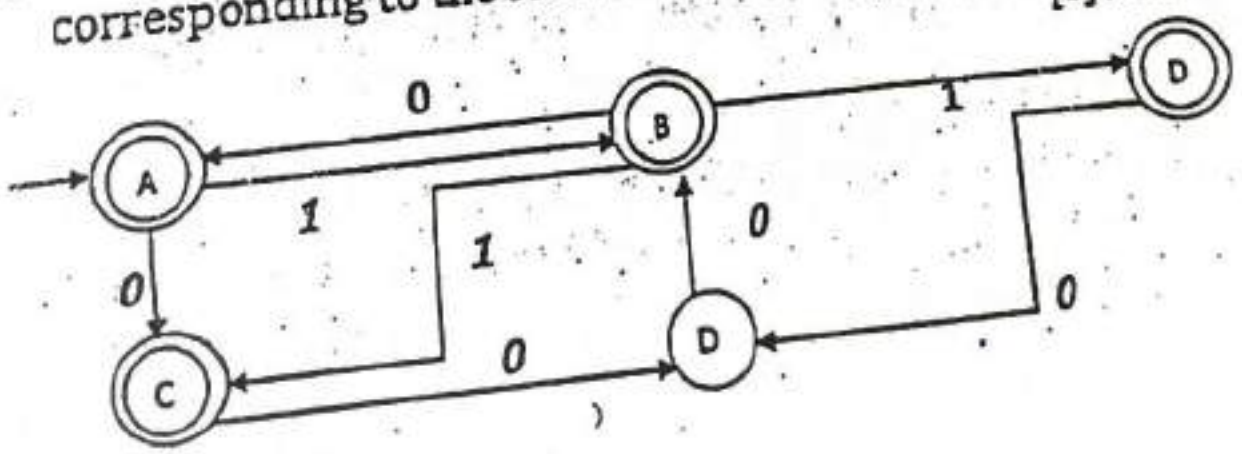
Q.No. 2

A. Design Moore and Mealy machine for binary input sequence if it ends in 1010, output is 'HELLO' if it ends in '1011' output is 'DELHI' , otherwise 'DTU'. *[5] CO3 BTL-3,4*

B. Construct a Context Free Grammar (CFG) for the alphabet {0,1} with number of 0's not equal to number of 1's and also explain chomsky's classification for the grammar. *[5] CO2 BTL-2,3*

Q.No. 3

A. What is Arden's theorem? Find a regular expression (RE) corresponding to the following FA using Arden's theorem. *[5] CO2 BTL-2,4*



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B. Is it possible for every context-free grammar to be converted to both CNF and GNF?

i. Convert the following grammar to CNF [5] CO2 BTL-1,2

$S \rightarrow bA \mid aB$, $A \rightarrow bAA \mid aS \mid a$, $B \rightarrow aBB \mid bS \mid b$

ii. Convert following CFG to GNF

$S \rightarrow AB$, $A \rightarrow BS \mid b$, $B \rightarrow SA \mid a$

Q.No. 4

A. Explain equivalence of two finite Automata (FA) and Construct a DFA to recognize the regular expression $(a+b(b+ab)^*aa)^*$. [5] CO1 BTL-2,3

B. Construct a push down automata for the following Language $L = \{ a^n b^{n+2} \mid n=1, 2, 3, \ldots\ldots\}$. [5] CO4 BTL-5

Q.No. 5

A. What is pumping lemma for context free language? Prove that the language $L = \{ a^n b^n c^n \mid n \geq 0\}$ is not CFL using pumping lemma for context free language (CFL). [5] CO3 BTL-3

B. Why the Universal Turing Machine (UTM) concept is important in the theory of computation? Design a Turing Machine (TM) that accepts all palindromes over the input alphabet {0,1}. [5] CO5 BTL-4,5

Q.No. 6

A. Construct the CFG generating the language accepted by the following PDA: $M=(\{ q_0,q_1\}, \{0,1\},\{Z_0,X\},\delta,q_0, Z_0,\phi)$ where δ is given below: [5] CO4 BTL-5

$\delta(q_0, 1, Z_0) = \{(q_0, XZ_0)\}$
$\delta(q_0, 1, X) = \{(q_0, XX)\}$
$\delta(q_0, 0, X) = \{(q_1, X)\}$
$\delta(q_0, \epsilon, Z_0) = \{(q_0, \epsilon)\}$
$\delta(q_1, 1, X) = \{(q_1, \epsilon)\}$
$\delta(q_1, 0, Z_0) = \{(q_0, Z_0)\}$

B. Explain following with suitable example

i. Halting problem and Church's thesis. [2.5] CO5 BTL-1,2

ii. Post Correspondence Problem (PCP) and Myhill-Nerode Theorem. [2.5] CO4 BTL-1,2

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Total no. of Pages:02 Roll no.....

FOURTH SEMESTER

B.Tech (CSE)

END TERM EXAMINATION May-2025

COURSE CODE: CS206n

COURSE TITLE: Computer System Architecture and Organisation

Time: 03:00 Hours Max. Marks: 50

Note: All questions carry equal marks.
Attempt any FIVE questions.
Assume suitable missing data, if any.

Q.1 (a) Design and explain the 4-bit binary to gray code converter. [5][CO1][BTL2]

(b) Register A holds the 8 bit binary 11011001. Determine the B operand and logic micro operation to be performed in order to change the value in A to (i) 01101101 (ii) 11111101. [5][CO1][BTL2]

Q.2 (a) What is RTL? Draw a block diagram showing the hardware implementation of the following register transfer;

IF(P=0) and Q=1 then R1← R2 else R1←R3 [5][CO2][BTL3]

(b) What do you mean by instruction cycle? Discuss the various phases of instruction cycle with suitable examples. [5][CO2][BTL1]

Q.3 (a) Design a parallel priority interrupt hardware (Priority Encoder) for a system with four interrupt sources. [5][CO3][BTL3]

(b) Why are the read and write control lines in a DMA controller bidirectional? Under what condition and for what purpose are they used as inputs and as outputs? [5][CO3][BTL3]

Q.4 (a) A virtual memory has a page size of 1Kwords. There are eight pages and four blocks. The associative memory page table contains the following entries:

Page	Block
0	3
1	1
4	1
6	0

Make a list of all virtual addresses (In decimal) that will cause a page fault if used by the CPU. [5][CO4][BTL5]

(b) Suppose the system is using a 8-way Set associative mapping in the cache. The cache size is 32 KB, block size is 16 words, word size is 32 bits. The size of main memory is 8GB. What is the number of bits required for cache tag? (Note: memory is word addressable). [5][CO4][BTL5]

Q.5 (a) Design and explain a BCD substractor in details. [5][CO5][BTL6]

(b) Design an array multiplier that multiply two 4-bit numbers. Use AND gates and 4-bit binary adder. [5][CO5][BTL6]

Q.6 Write short note on ANY TWO of the following.

a. Microprogram Sequencer [5][CO2][BTL2]

b. Programmed I/O [5][CO5][BTL2]

c. Match logic for associative memory [5][CO4][BTL2]

All the Best

Total no. of Pages:02

Roll no.....

FOURTH SEMESTER

B.Tech (CSE)

END TERM EXAMINATION ***May-2025***

COURSE CODE: CS206n

COURSE TITLE: Computer System Architecture and Organisation

Time: 03:00 Hours *Max. Marks: 50*

Note: All questions carry equal marks.
Attempt any **FIVE** questions.
Assume suitable missing data, if any.

Q.1 (a) Design and explain the 4-bit binary to gray code converter.

[5][CO1][BTL2]

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[5][CO2][BTL3]

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Q.5 (a) Design and explain a BCD substractor in details. [5][CO5][BTL6]

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Q.6 Write short note on ANY TWO of the following.

a. Microprogram Sequencer [5][CO2][BTL2]
b. Programmed I/O [5][CO5][BTL2]
c. Match logic for associative memory [5][CO4][BTL2]

----------All the Best----------

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Total no. of Pages: 3

Roll no.....

B.Tech.(CO)

Fourth Semester

End-Term Examination

May-2025

CS-208 Computer Network

Time: 3 Hours

Max. Marks: 40

Note: Answer all Questions.
Assume suitable missing data, if any.

Q.1 a) Compare the twisted pair, co-axial and fiber optic cable. [3] [CO1] [BTL-4]

b) How does RARP differ from ARP in functionality. [3] [CO2] [BTL-3]

c) What is the net mask of the gateway interface in a subnetwork where maximum of 25 hosts exists and IP address of the hosts is192.168.1.1? [3] [CO3] [BTL-5]

d) List all services offered by the session layer in the OSI model. [3] [CO4] [BTL-3]

e) What is SFTP and how is it different from FTP? [3] [CO5] [BTL-1,2]

Q.2 a) A digital signal system is required to operate at 9600 bps, if the signal element encodes a 4-bit word, what is the minimum required bandwidth of the channel? [2.5] [CO1] [BTL-5]

b) Compare the various switching methods with suitable examples. [2.5] [CO1] [BTL-4]

OR

c) With suitable illustrations, compare baseband and broadband transmission techniques. Which is more suitable for high-speed data transfer and why? [2.5] [CO1] [BTL-4]

Q.3 a) Describe the sequence of operations performed by a station in a CSMA/CD network during the phases of transmission initiation, collision detection, and post-collision handling. [2.5] [CO2] [BTL-2]

b) Consider a CSMA/CD networks that transmits data at a rate of 100Mbps (10^8 bits per seconds) over 1km cable with no repeaters. If the minimum frame size required for this network is 1250 bytes. What is the signal speed (km/sec) in the cable? [2.5] [CO2] [BTL-5]

OR

c) Perform the subnetting of the following IP address 160.11.X.X. Original subnet mask 255.255.0.0 and number of subnets 6. [2.5] [CO2] [BTL-5]

Q.4 a) Compare two data link protocols: Go-back-N and selective repeat in terms of flow control, error recovery and packet loss. [2.5] [CO3] [BTL-4]

b) Consider the use of 10K-bit size frames on a 10 Mbps satellite channel with 270 ms delay. What is the link utilization for stop and wait ARQ technique assuming P=10. [2.5] [CO3] [BTL-5]

OR

Q.5 In a network using the RIP (Routing Information Protocol), a router receives three route advertisements for the same destination network from three different neighbors with hop counts of 3, 2, and 5 respectively.
(a) Identify which route the router will prefer and explain why.
(b) If the preferred route becomes unreachable, explain how RIP handles this scenario and how long it may take for the router to converge to a new route. [5] [CO3] [BTL-5]

Q.6 Describe the structure of the TCP header and explain the working principles of the Transmission Control Protocol (TCP). Compare TCP and UDP in terms of functionality and provide a detailed comparison of their respective header formats. [5] [CO4] [BTL-2,4]

Q.7 a) Explain how DNS resolves domain names to IP addresses. What are the different types of name servers involved in this process? Also, describe the format of DNS query and response messages. [3] [CO5] [BTL-3]

b) Describe the following application-layer protocols: ***(Any Two)***

i) SSH
ii)HTTP
iii)MQTT. [2] [CO5] [BTL-2]

Total pages: 03 Roll No. _____

II Semester

B. Tech [Civil Engineering]

END TERM EXAMINATION **May- 2025**

CE102-Statistical Method of Engineering

Time: - 3:00 Hrs. **Max Marks: 50**

Note: All Questions are compulsory.

Assume suitable missing data, if any. End Term

Q.1 Difference between probability sampling and non-probability sampling. 5[CO1][L2]

Q.2 If we toss a coin 30 times and get a head, is the success? What is the mean, standard deviation, and variance of success? 5[CO2][L5]

Q.3 X is a discrete random variable having the following probability mass function 5[CO1][L6]

X:	0	1	2	3	4	5	6	7
P(X=x):	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

Determine the constant k (ii) Find P(X<6)

Q.4 The average number of acres burned by forest and range fires in a large New Mexico county is 4,300 acres per year, with a standard deviation of 750 acres. The distribution of the number of acres burned is normal. i) What is the probability that between 2,500 and 4,200 acres will be burned in any given year? 5[CO2][L3]

Or

Define the measures of central tendency, and what are the measures of central tendency? Also calculate median from the following data: 200, 217, 316, 264, 296, 282, 317 and 299.

Q.5 Define and differentiate between Type I and Type II errors. Describe briefly the level of significance. Also, define and distinguish between one-tailed and two-tailed tests. 5[CO3][L4]

Q.6 A big company uses thousands of CFL lights every year. The brand the company has used in the past has an average life of 1200 hours. A new brand is offered to the company at a price lower than they are paying for the old brand. Consequently, a sample of 100 CFL lights of the new brand is tested, which yields an average life of 1220 hours with a standard deviation of 90 hours. Should the company accept the new brand at a 5% level of significance? 5[CO3][L2]

Q.7 Prove that if X and Y are two independent variables, then the correlation coefficient between X and Y is zero, i.e., 0, 5[CO4][L6]

Or

What is Correlation? And what are the negative correlation, positive correlation and No correlation explain through graph.

Q.8 What is Standard Error? Find the standard error for the sample data: 2, 3, 4, 5, 6. 5 [CO4][L1]

Or

Find the correlation coefficient between price and demand for the following data.

Price	17	18	19	20	22	24	26	28
Demand	40	38	35	30	28	25	22	21

Q.9 The monthly sales for the last one year of a product in thousands of units are given below: 5[CO5][L6]

Month	1	2	3	4	5	6	7	8	9	10	11
Sales	0.5	1.5	2.2	3.0	3.2	3.5	3.5	3.5	3.8	4.0	4.7

Compute the autocorrelation coefficients up to lag 4. What conclusion can be derived from these values regarding a trend in the data?

Or

What is Autoregressive (AR) Model for Time Series Forecasting and how it's work

Determine the seasonal indices by the ratio to the moving average method for August and September,.1985.

Production Data (in thousand units):

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov
1985	7.92	7.81	7.91	7.03	7.25	7.17	5.01	3.90	4.64	7.03	6.88
1986	4.86	4.48	5.26	5.48	6.42	6.82	4.98	2.45	4.51	6.38	6.38

Total No. of Pages: 2
B. Tech (Civil Engineering)
END SEMESTER EXAMINATION
CE 104
TIME: 3 Hours

Roll No.....
2nd SEMESTER
May 2025
MECHANICS OF SOLIDS
Max. Marks: 40

Note: Answer any FIVE Questions. Assume any missing data, if any.

1 (a) Explain Stress Tensor with a neat sketch. M4/ CO1
(b) Discuss generalized Hooke's law with equations. M4/ CO1

2 (a) At a certain point in a material, which is strained, it is found that normal stresses on two orthogonal planes are 60 N/mm^2 and 40 N/mm^2. Both of these normal stresses are tensile in nature. Shear stress, positive on both of these planes, is 20 N//mm^2. Find the values of maximum principal stress and maximum shear stress in the material. M4/CO2

(b) A simply supported beam AB has a span of 6m. At the left hand support 'A' a pin support and at right hand support 'B' a roller support has been provided. At a distance of 2 m from both the end points, inside the beam span, two equal point loads of 10 KN are applied in a downward direction on the beam on the points C (towards A) and on point D (towards B). Mid point of the beam is E. Draw FBD of the portion AE of the beam. M4/ CO2

3 (a) What do you understand by Modulus of Rigidity? Discuss with a neat sketch and expression. M4/ CO3
(b) Draw neat sketches of any three types of supports with reactions which can develop in them. M4/ CO3

4 (a) A simply supported beam AB has a span of 6m. At the left hand support 'A' a pin support and at right hand support 'B' a roller support has been provided. At a distance of 1 m, 3 m and 4 m from Support A, point loads of 4 KN, 10 KN and 8 KN are applied in a downward direction on the beam on the points C, D and E respectively. Draw SFD and BMD for the beam. M4/ CO3
(b) Describe the procedure to draw Mohr's circle. M4/ CO3

5 (a) What are 'condition equations of static equilibrium'? Write the equations and discuss their use with an example. M4/ CO4
(b) Explain differences between a point load and a uniformly distributed load. M4/ CO4

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5 (a) What do you understand by pure bending of beams? Give an example.

(b) Compare stress strain diagrams of mild steel and medium tensile steel with sketches. M4/ CO4

7 (a) A cantilever beam AB has a UDL of 2 KN/m acting on the full 6 m length of the beam in a downward direction. Draw SFD and BMD for the beam. M4/ CO4

(b) Explain how Young's modulus of elasticity of mild steel can be determined from a tension test. M4/ CO5

8 Write detailed notes on any two of the following. M4/ CO5

(a) Properties of ductile materials

(b) Hardness and toughness

(c) Complementary shear stress M8/ CO5

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Total no. of Pages:01 Roll no.....

FOURTH SEMESTER

B.Tech (REGULAR)

END TERM EXAMINATION MAY-2025

CE202 SMART CITY PLANNING AND INTELLIGENT TRANSPORT

Time: 3:00 Hours Max. Marks: 50

Note :. Attempt any five Questions.
Assume suitable missing data, if any.

Q.1 How do Smart cities address the challenges of affordable & efficient Public transportation? [10][CO1][L4]

Q.2 How do smart cities promote inclusivity & accessibility for people with disabilities? [10][CO2][L2]

Q.3 How do smart cities ensure sustainable and efficient water supply & sanitation? [10][CO3][L3]

Q.4 What is the Role of Urban Planning & Design in smart city development? [10][CO5][L6]

Q.5 How do Smart cities address the challenges of air pollution? [10][CO2][L2]

Q.6 How do Smart cities promotes green construction practices and sustainable building material? [10][CO4][L6]

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Total No. of Pages:01

Roll No._____

III Semester (May-2025) END SEMESTER B. Tech [Civil Engineering]

CE-204: Engineering Surveying

Time: - 1:30 hrs Max Marks: 40

Note: Answer all Questions
Assume suitable missing data

Q01:- The area of the plan of an old survey plotted to a scale of 10 metres to 1 cm measures now as 100.2 sq. cm as found by a planimeter. The plan is found to have shrunk so that a line originally 10 cm long now measures 9.7 cm only. Find (i) the shrunk scale (ii) true area of the survey. [5] CO(5)

Q02:- Discuss in brief the principles of surveying. Also differentiate clearly between plane and geodetic surveying. [5] CO(5)

Q03:- (A) Convert the following whole circle bearing to quadrantal bearing: [5] CO(5)

(i)32°30' (ii) 170°22' (iii) 217°54' (iv) 327°24'

(B) Convert the following whole circle bearing to quadrantal bearing:

(i)35°20' (ii) 162°28' (iii) 222°58' (iv) 331°45'

Q04:- What is tacheometry? What are different systems of tacheometric measurement? [5] CO(5)

Q05:- Derive expression for the spacing of the stadia lines to give a multiplying factor K for a given sight distance D if i = stadia interval and S = stadia intercept. [5] CO(5)

Q06:- (a) Describe the procedure of setting out of a two storied building with 200 mm thick load bearing outer wall all round. The foundation width is 750 mm. The building is absolutely rectangular and outside dimensions above plinth level are 12000 mm x 18000 mm. Draw the 'foundation plan' of the outer walls showing all the dimensions (not to scale). In the above plan show the position of different pegs required for setting out of the above building. [5] CO(5)

Or

(b) A railway siding is to be curved through a right angle and in order to avoid buildings. The curve is to be compound, and radii of the two branches are 240 m and 360 m. The distance from the intersection points of the end straight to the tangent point at which the 240 m radius curve leaves the straight is 300 m (Figure 2) Obtain the second tangent length of whole curve.

Q07:- Brief face right and face left observation in theodolite surveying and its purpose. [5] CO(5)

Q08:- The magnetic bearing of a line is 48° 24'. Calculate the true bearing if the magnetic declination is 5° 38' East. [5] CO(5)

Total No. of pages 04 Roll No._____

IV SEMESTER B.Tech. [Civil Engg.]

END SEM EXAMINATION (May 2025)

CE204 ANALYSIS OF STRUCTURES II

Time: **03 Hours** Max. Marks: **40**

Note: Attempt any five questions. Assume suitable missing data if any. If not mentioned take EI = Constant.

Q1. Analyze the fixed beam shown in Figure 1 using the three-moment theorem to determine the fixed-end moments. [8][CO 1][L3]

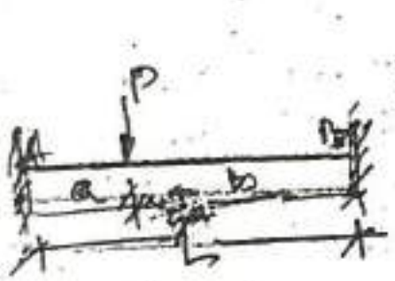
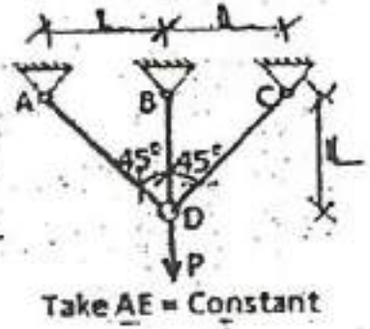


Figure 1



Take AE = Constant

Figure 2

Q2. (a) Explain the theorem of Least Work. [4][CO 1] [L2]

(b) Analyze the truss shown in figure 2 above taking F_{BD} as redundant using method of consistent deformation and find forces in all members of the truss. [4][CO 1] [L4]

Q3. Analyze the symmetric frame shown in figure 3 below using slope deflection method and draw the Bending moment diagram for the frame. [8][CO 2] [L4]

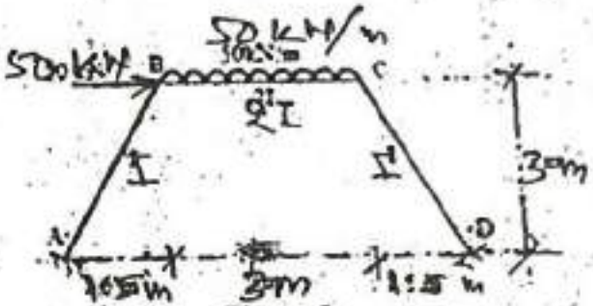


Figure 3

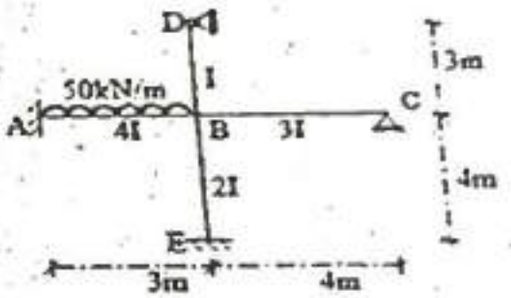


Figure 4

Q4. Analyze the frame shown in figure 4 above using the moment distribution method and draw the bending moment diagram and shear force diagram for the frame. [8][CO 2][L4]

Q5. Analyze the two-span continuous beam shown in Figure 5 below using the stiffness method and draw the bending moment diagram and shear force

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diagram. Take P = 20 kN and L = 4m

[8][CO3][L5]

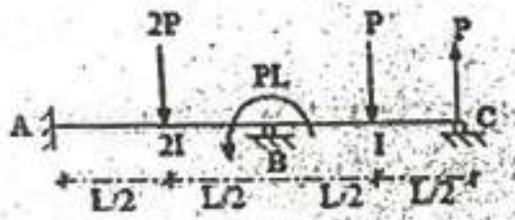

Figure 5

Q6. Analyze the two storey and two bay building frame shown in figure 6 using portal method of approximate analysis and draw the bending moment diagram (BMD).

[8][CO 4][L4]

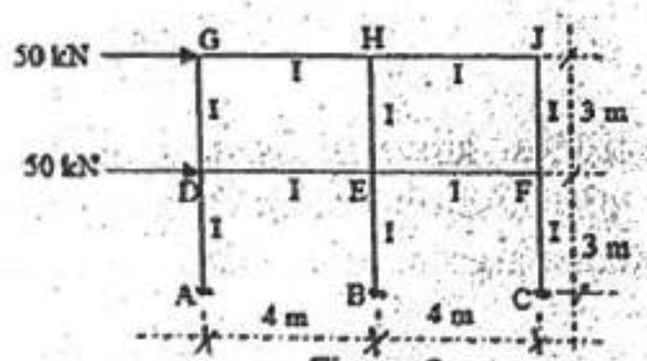

Figure 6

Q7. Explain the Müller-Breslau principle, and using it, draw the influence line diagram for the bending moment at the fixed end of a propped cantilever beam of span L. Obtain the influence coefficients at quarter span points.

[8][CO 4][L5]

Q8. (a) Draw the influence line diagram for the horizontal thrust in the cable of a suspension bridge stiffened by a two-hinged stiffening girder. Also, draw the influence line diagram for the bending moment at a given section of the stiffening girder.

[4][CO 5][L6]

Q8. (b) A symmetric suspension cable of 100 m span has a dip of 10 m. It is stiffened by a two-hinged girder. Total DL is 20 kN/m. Determine the maximum tension in the cable if a point load of 500 kN travels in the girder. Find also the maximum +ve and maximum –ve BM on the girder.

[4][CO 5][L6]

Total no. of Pages: 03

Roll no.....

4TH SEMESTER
B.TECH. CIVIL ENGINEERING
END SEMESTER EXAMINATION **MAY-2025**
CE-206 SOIL MECHANICS

TIME: 3.00 Hr **MAX MARKS: 40**

NOTE: Question No. 1 is compulsory and attempt other questions as per instructions given. Assume specific gravity of the soil as 2.65.

1.Check the validity of the following statements and explain briefly.
a. A soil with higher shrinkage limit will shrink more. CO-2 (2)(L4)
b. Exit gradient will increase when vertical cut-off walls are provided below the hydraulic structures. CO-3 (2)(L3)
c. Consolidated undrained test is performed for the stability of slope of unlined canal with water at FSL. CO-4 (2)(L3)
d. Sand drain is the example of 3-D consolidation. CO-5 (2)(L2)

2. Attempt any two parts-
a. What is the principle of sedimentation analysis? How gradation curve is drawn by hydrometer test? CO-1 (4)(L1)
b. The laboratory tests on a soil sample obtained from a site at Meerut, yielded the following results-
Liquid limit = 55%, Plastic limit = 26%, Natural moisture content = 30% and Percentage finer than 0.002 mm = 19%. Determine
(i)Liquidity index of the soil and comment on its consistency
(ii) Activity of the soil and comment on its nature
(iii) Draw plasticity chart and classify the soil CO-2 (4)(L6)
c. The results of a laboratory Proctor's test are shown below-

Test No.	1	2	3	4	5	6
Weight of mould & soil(kg)	3.53	3.71	3.80	3.91	3.93	3.88
Moisture content (%)	8.32	10.4	12.2	16.2	17.9	20.4

The height and internal diameter of the mould are 12.5 cm and 10.0 cm respectively. The weight of empty mould is 1.90 kg. Draw

(i) Compaction curve and determine optimum moisture content and maximum dry density.
(ii)Zero air void line and 10% air void line. CO-3 (4)(L5)

3. Attempt any two parts-
a. What is the difference between quick sand and quick clay?
A sand sample is 50% saturated and has a bulk density 17.5 kN/cum. Find the critical hydraulic gradient. How the critical hydraulic gradient of the soil will change if the soil is compacted to increase its bulk density by 10%, without any change in its water content? CO-3 (4)(L4)

b. What is flownet?
An earth dam is built on an impervious foundation with a horizontal filter at the base near the toe. The coefficient of permeability in the horizontal and vertical directions are 3.5×10^{-5} and 2.5×10^{-5} m/s respectively. The full reservoir level is 27 m above the base. A flow net constructed for the transformed section of the dam consists of 5 flow channels and 16 equipotential drops. Estimate the seepage loss per meter length of the dam. CO-3 (4)(L4)

c. Prove that the maximum vertical stress on a vertical line at a constant radial distance r from the axis of a vertical load is induced at the point of intersection of the vertical line with a radial line at an angle $39^{0}15'$ from the point of application of concentrated load. What will be the value of shear stress at that point? CO-4 (4)(L1)

4. Attempt any two parts-
a. Explain how Westergaard's analysis is different from Boussinesq' s analysis.
A rectangular area 3m x 6m carries a uniform load of 100 kN/sqm at the ground surface. Determine vertical stresses at 5m below the centre and one of the corners of the loaded area. CO-4 (4)(L3)
b. (i) Explain Mohr- Coulomb's failure theory.
(ii) What are the demerits of direct shear test.
CO-4 (2+2)(L1)
c. The results of a triaxial test conducted for a soil in consolidated-undrained conditions are as follows- CO-4 (4)(L5)

Sample No.	1	2	3
Cell Pressure (kN/ sqm)	100	150	200
Deviator stress at failure (kN/ sqm)	202	218	238
Pore pressure at failure (kN/ sqm)	41	62	70

5. Attempt any two parts-
a Define sensitivity of the soil.
A vane shear test was conducted in the field to determine the shearing strength of soft clay. The equivalent torque recorded at the torque head at failure was 418 kg-cm. In order to completely remould the soil, the vane was then rotated very rapidly. It was observed that the remoulded soil can be sheared by applying a torque of 285 kg-cm. Determine the shear strength of the soil in the undisturbed and remoulded states and its sensitivity. The height and diameter of the vane were 10 cm and 8 cm respectively. Also comment on the nature of the clay. CO-4 (4)(L5)

b. What is time factor. Explain square root of time fitting methods for the determination of coefficient of consolidation. CO-5 (4)(L1)

c. The results of a consolidation test on a fully saturated and normally consolidated clay sample were as follows-

Effective stress (kN/sqm)	Void ratio	
50	1.02	
100	0.85	

The test was conducted with two-way drainage condition. The time for 50% consolidation for the effective stress increment from 50 to 100 kN/sqm was 15 min and the average thickness of the sample was 24 mm, Determine the compression index and permeability of the soil.
CO-5 (4)(L4)

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Roll no: _____

End Semester Exam

CE 208 Environmental Engineering-I

Maximum Marks 40 Time Allowed 3 hours

Note: 1) Attempt any 5 questions.
2) Marks are indicative of time distribution. The use of calculator is allowed.
3) Mobile/tablets/programming calculators are not permitted.
4) Assume suitable missing date, if any and clearly state the same.

Q1. A) Explain the term treatment train and draw it for raw water having turbidity of 15 NTU and MPN count of 200. **(Marks 3, CO5)**

B) Design a rapid mix unit for 1200m^3/hr water treatment plant. Assume necessary data and clearly state the same. **(Marks 5, CO5)**

Q2. A) Write the design requirements on 'Water supply for small communities'. **(Marks 3, CO1)**

B) Explain the JAR test. How this test can be used for optimizing various parameters of flocculation and settling. **(Marks 3, CO4)**

C) Explain the following terms and their significance

(i) Surface Loading

(ii) Wier Loading **(Marks 2, CO4)**

Q3. A town with a population of 4 lakhs is to be supplied with water daily at 200 litres per head. The periodic demand of water is as follows:

6 AM to 10 AM	35% of total
10 AM to 02 PM	15% of total
02 PM to 06 PM	15% of total
06 PM to 10 PM	20% of total
10 PM to 06 AM	15% of total

Determine the capacity of the service reservoir assuming pumping to be at a uniform rate and the period of pumping to be from 6 AM to 8 PM. **(Marks 8, CO3)**

Q4. A) Explain with neat sketch the functioning of rapid sand filter. **(Marks 3, CO4)**

B) Prepare a filter sand of effective size of 0.6 mm and uniformity coefficient 1.6 from the stock sand, the sieve analysis for stock sand being given as follows: **(Marks 5, CO4)**

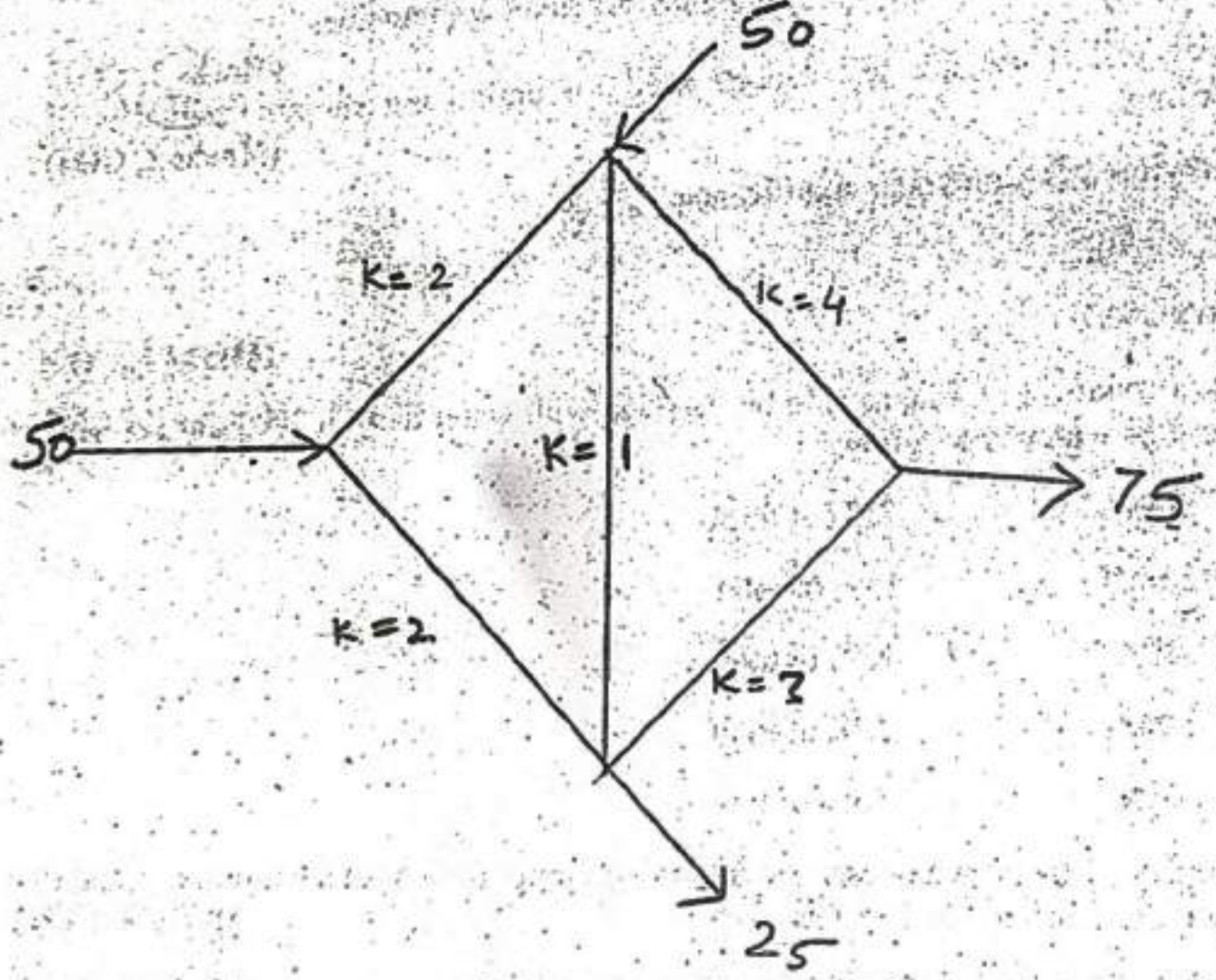
Sand Size, MM	0.21	0.30	0.42	0.84	1.12	1.68	2.38
Cumulative Weight, %	2	10	20	64	75	87	94

Q5. A) Explain and differentiate between Type I and Type II settling. (Marks 2, CO4)

B) A pipe line 4000 m long, 200 mm in diameter and roughness size 0.04 mm conveys water between two reservoirs, the difference in level between which is maintained constant at 40 m. In addition to the entry loss of $0.5 \frac{V2}{2g}$, a valve produces a head loss of $\frac{8V2}{2g}$. Determine the steady discharge between the reservoirs. (Marks 6, CO2)

Q6. A) Determine the distribution of flow in the pipe network shown in figure. The head loss, h may be assumed as KQ^2. The flow is turbulent and pipes are rough. The value of K for each pipe is indicated in the figure. (Marks 6, CO2)

B) Explain the terms 'Break Point Chlorination' and 'Residual Chlorine'. (Marks 2, CO1)



(Figure for Q. No. 6 A)

Pages of No. 03

Roll No.....

IV SEMESTER B. Tech. Civil Engineering

END TERM EXAMINATION

May-2025

COURSE CODE: **CE 210** COURSE TITLE: **Hydraulics and Hydraulic Machines**

Time: 3 Hours

Max. Marks: 40

Note: Attempt any **Five** questions. Marks carried by a question are indicated against it. Assume any missing data suitably.

Q.1 **(a)** An open channel of circular cross-section has a diameter of 4.0 m and is laid at a slope of 1 in 1000. For a most economical section determine the maximum discharge and the corresponding depth of flow. Take Chezy's constant C = 50. **[4] [CO1]**

(b) Water flows at a rate of 12 m^3/s in a rectangular channel 6 m wide at a depth of 40 cm. What is the total energy loss in a hydraulic jump which has occurred from this flow? **[4] [CO2]**

Q.2 Write down the equation for slope of free surface profile in gradually varied flow. Classify the free surface profiles in gradually varied flow; give clear and neat sketches for each surface profile. **[8] [CO3]**

Q.3 **(a)** A laboratory Cippoletti weir having a crest width of 45 cm is used to measure the flow of water in a rectangular channel 0.7 m wide and 0.5 m deep. If the water level in the channel is 25 cm above the weir crest, estimate the discharge in the channel in litres per minute by considering the velocity of approach. Take coefficient of discharge as 0.63. **[4] [CO4]**

(b) Determine the discharge over a broad-crested weir 30 m long with rounded entrance. The measured up-stream level over the crest is 65 cm. the width of the channel of approach is 40 m and its depth below the crest of the weir is 60 cm. Assume $C_d = 0.95$. Take into account the velocity of approach. **[4] [CO4]**

Q.4 (a) The mean bucket speed of a Pelton turbine is 14 m/s. the rate of flow of water supplied by the jet under an effective head of 50 m is 1000 litres/sec. If the jet is deflected by the buckets at an angle of 165°, find the power and efficiency of the turbine. Assume C_v=0.98 [4] [CO5]

(b) A jet of water 7.5 cm in diameter moving with a velocity of 12 m/s strikes a flat vane which is normal to the axis of the jet. (i) find the force exerted by the jet if the vane moves with a velocity of 5 m/s, (ii) determine the force exerted by the jet if instead of one flat vane, there is a series of vanes so arranged that each vane appears successively before the jet in the same position and always moving with a velocity of 5 m/s. [4] [CO5]

Q.5 (a) A standing wave flume is installed in a rectangular channel, conveying water with the object of raising the level of water upstream. The section on the upstream side of the flume is 3 m deep and 12 m wide. The bed of the flume at the throat is a streamlined hump 40 cm high and width at the throat section is 8 m. Determine: (i) the discharge through the flume; (ii) Critical depth of water at the throat; (iii) the height of the standing wave and maximum depth of water downstream. [4] [CO4]

(b) A jet of water having a velocity of 30 m/s strikes a curved vane, which is moving with a velocity of 15 m/s. The jet makes an angle of 25° with the direction of motion of the vane at inlet and leaves at an angle of 120° to the direction of motion of vane at the outlet. (i) Draw the velocity triangles at inlet and outlet and determine the vane angles at inlet and outlet so that the water enters and leaves the vane without shock; (ii) Calculate the work done per unit weight of water striking the vane per second. [4] [CO5]

Q.6 (a) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 rpm works against a total head of 45 m. The velocity of flow through the impeller is constant and equal to 3 m/s. the vanes are set back at an angle of 40° at outlet. If the outer diameter of the impeller is 600 mm and the width at the outlet is 50 mm, determine: (i) Vane angle at the inlet; (ii) work done by impeller on water per second; (iii) Manometric efficiency. [4] [CO6]

(b) A single acting reciprocating pump running at 55 r.p.m., delivers 0.02 m^3/s of water. The diameter of the piston is 200 mm and the stroke length is 400 mm. Determine: (i) the theoretical discharge of the pump (ii) the coefficient of discharge, (iii) Slip, and the percentage slip of the pump. [4] [CO6]

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Total no. of Pages:

Roll no. 161

IV SEMESTER

B.Tech ENE

END TERM EXAMINATION

May-2025

COURSE CODE: CE252 COURSE TITLE: Structural Analysis

Time: 03:00 Hours *Max. Marks: 50*

Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 A horizontal beam of uniform section and 7 meters long is simply supported at its ends. Two vertical concentrated loads of 100 kN and 140 kN act at 1m and 3m respectively from the left hand support. Determine the magnitude of the deflection under the loads and maximum deflection using Macaulay's method. If E = 200GN/m^2 and I=85X10^{-6}m^4 10

Q.2. A beam of length 5 m and of uniform rectangular section is simply supported at its ends. It carries a uniformly distributed load of 9 KN/m run over the entire length. Calculate the width and depth of the beam if permissible bending stress is 7 N/mm2 and central deflection is not to exceed 1 cm. 10

Q3. A symmetrical 3 hinged arch has a span of 16 m & rise to the central hinge of 4 m. It carries a vertical load of 20 kN at 4 m from the left end. Find a) the magnitude of thrust at the springing, b) the reactions at the support, c) bending moment at 6 m from the left hand hinge d) max. positive & negative moment. 10

Q4. Derive the equation of crippling load for the column having one end hinged and other end fixed with usual notation by Euler's theory. Also, explain why Rankine's theory is better than Euler's theory for short columns. 10

Q5 Explain the Betti's Law and Muller Breslau Law with the help of diagram. 10

7. A foot bridge of width 3m and span 50m is carried by two cables of uniform sections. The central dip is 5m and platform load is 5kN/m². The allowable stress is 120N/mm². Calculate the maximum pull in the cables and necessary sectional area. [6] [CO5] [BTL 3]

OR

Analyse the given beam in Fig 9 by Strain Energy Method by taking moment and vertical reaction at A as redundant. [6] [CO1] [BTL 4]

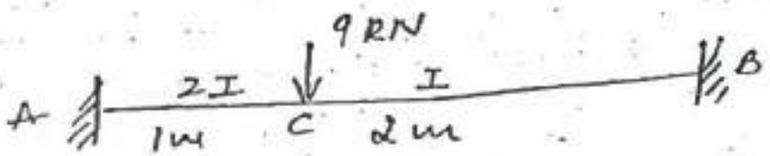

Fig 9

VIth SEMESTER **B.Tech.**

END TERM EXAMINATION ***May-2025***

COURSE CODE: CE 302

COURSE TITLE: ANALYSIS OF INDETERMINATE STRUCTURES

Time: 03:00 Hours ***Max. Marks: 50***

Note : Assume suitable missing data, if any.

Q1 Analyse the continuous beam given in Fig 1 by Stiffness Method if the downward settlement of support B and C in kN-m are 2000/EI and 1000/EI respectively. [8] [CO3] [BTL4]

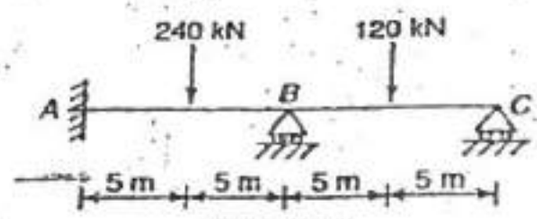

Fig 1

Q2 Analyse the given truss in Fig 2 by Flexibility Method with reference to coordinates 1 and 2. All values in parentheses are cross-sectional area in mm². [8] [CO3] [BTL4]

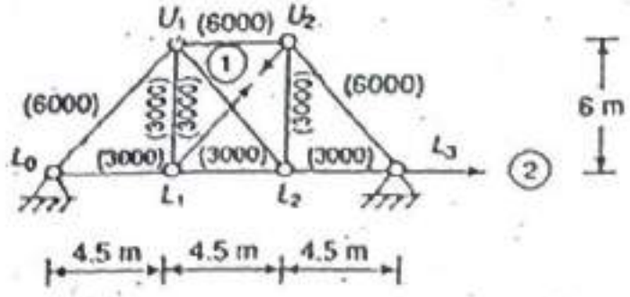

Fig 2

OR

Analyse the given continuous beam in Fig 3 by Flexibility Method



EI is constant

Fig 3

Q3 *Find the plastic moment carrying capacity in the continuous beam shown in Fig 4.* [8] [CO6] [BTL5]

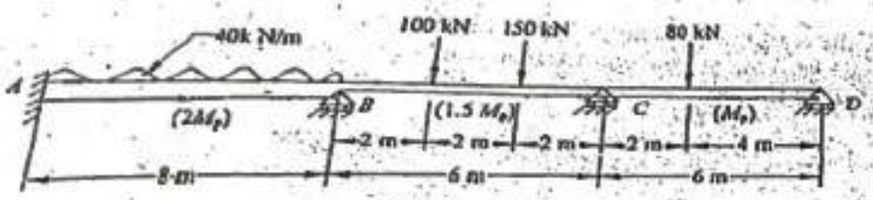

Fig 4

OR

Analyse the frame given in Fig 5 by Slope deflection method [8] [CO2] [BTL 4]

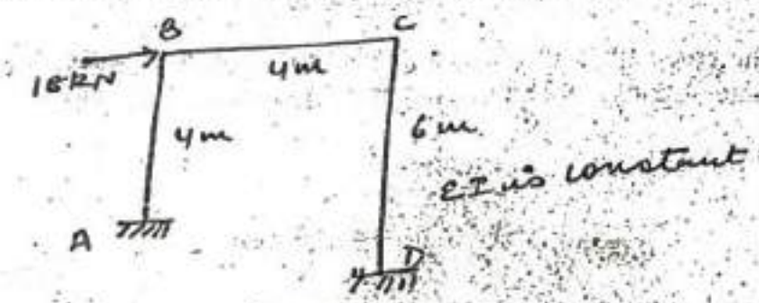

Fig 5

Q4 *Show that shape factor of a triangular cross section is 2.34.* [4] [CO6] [BTL4]

OR

Differentiate between Stiffness and Flexibility Matrix Method. [4]/[CO3] [BTL 3]

Q5 Analyse the given beam in Fig 6 by Moment Distribution Method [8] [CO2] [BTL4]

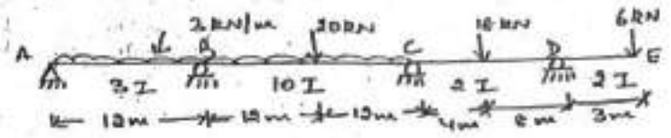

Fig 6

OR

A parabolic two hinged arch has a span of 32m and a rise of 8m. A uniformly distributed load of 1kN/m covers 8m horizontal length of the left side of the Arch. Find the horizontal thrust at hinge and bending moment at 8m from the left hinge. [8] [CO4] [BTL 3]

6 Develop the stiffness matrix w.r.t given coordinates in Fig 7 [6] [CO3] [BTL 3]

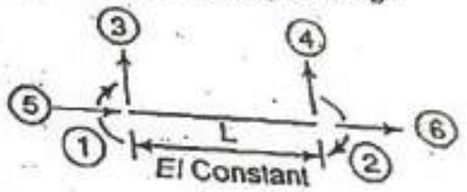

Fig 7

OR

Analyse the given frame in Fig 8 by Moment Distribution Method [6] [CO2] [BTL 4]

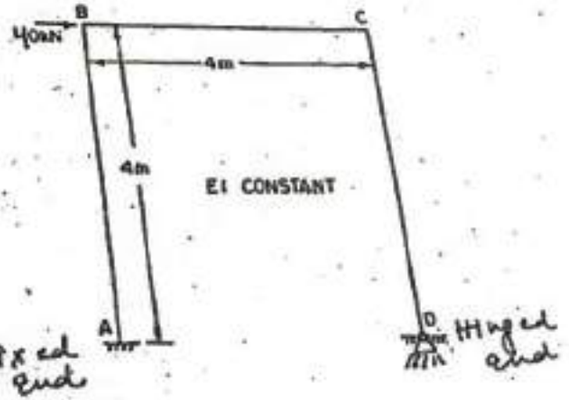

Fig 8

Total no. of pages: 03

Roll no.: .....

VI Semester
B.Tech.

END TERM EXAMINATION

May-2025

Course Code: CE304 **Course Title: Geotechnical Engineering**

Time: 03:00 Hours

Max. Marks: 40

Note: All questions carry marks as assigned
Assume suitable design data and state clearly

Q.1.(a) Bearing capacity factor N_c value is 5.7 in case of shallow foundation, on the hand we use different value of N_c in case of deep foundation. Justify your answer. [CO4], [L3],[2]

Q.1.(b) Among the shape factor of circular, square and strip footing which effect dominates bearing capacity equation, explain with suitable reason. [CO4], [L3],[2]

Q.1.(c) How the formula for maximum achievable group efficiency of a pile group is about 90%? Can we increase the efficiency of pile more than 100% in case of sandy soil? [CO4], [L4],[2]

Q.1.(d) Find out average elastic settlement of flexible foundations on saturated clay soil (Poission's ratio =0.5) using Figure 1a and 1b. Dimensions of rectangular foundation are 10m*5m and depth is 4.5m. Surcharge of 5kN/m^2 is acting on foundation. E= 30Mpa.

[CO4], [L5], [2]

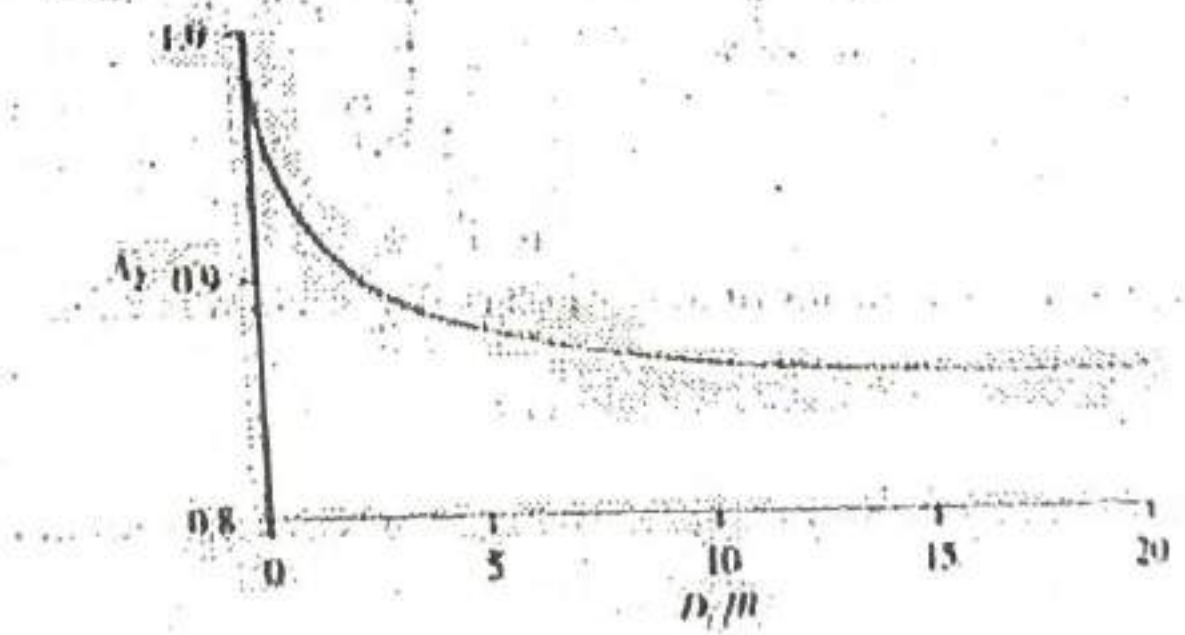

Figure 1a

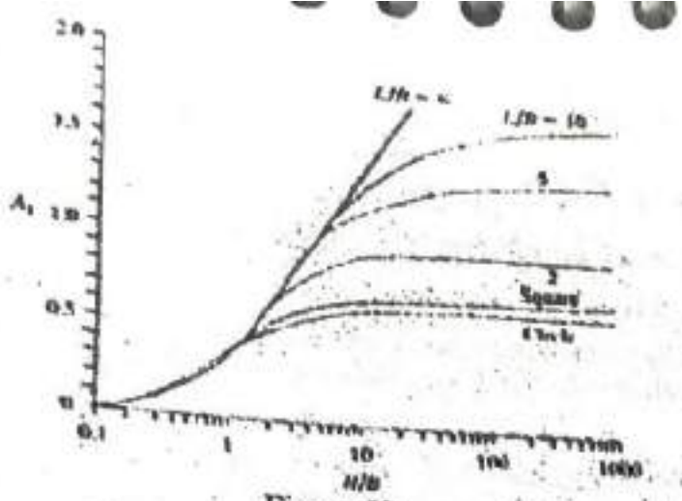

Figure 1b

Q.2.(a) How the conditions of downdrag develop according to the corrected SPT value (N) of soils and is considered significant in design. Explain with a neat dimensional sketch to show downdrag effects the deep foundation? [CO4], [L6],[4]

Q.2.(b) Tabulate guidelines for depth of investigation of:

i. Shallow foundation
ii. Deep foundation
iii. Well foundation
iv. Penetration into rocks [CO5], [L2],[4]

Q.3.(a) Analyse pictorially reasons for factors responsible for variation of influence factors in elastic settlement according to the size of foundation [CO4], [L4],[2]

Q.3.(b) What are factors to be considered for stability of slopes? How analysis of finite slopes is different from infinite slopes? [CO3], [L2],[4]

Q.4.(a) Construct and analyse the active earth pressure diagram and find the total pressure and its line of action from the base of 8m vertical wall. The depth of the water table is 2m from the top of the ground surface. The ground is level, and a surcharge of 15 kN/m is acting uniformly at the surface. The soil unit weight is 15.76 kN/m^3 and submerged unit weight is 9.81 kN/m^3. [CO2], [L4],[4]

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Q.4.(b) Evaluate and compare the lateral earth pressure on unyielding retaining structures under line loading (9kN/m) and strip loading (8kN/m) using Figure 2a and 2b at 1.5m below earth surface. Depth of retaining wall is 8m in both cases (a=0.5, α=21.7°β=23.4°) [CO4], [L5],[4]

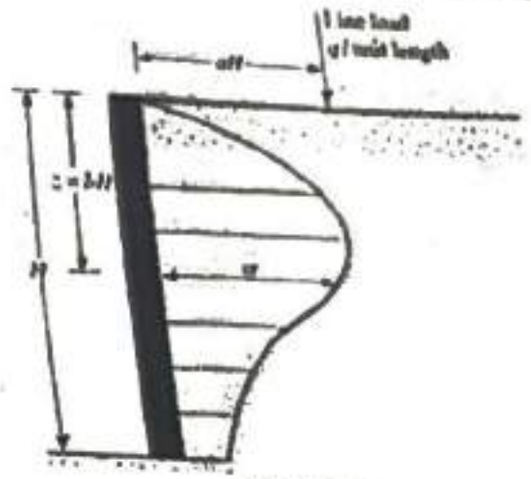

Figure 2a

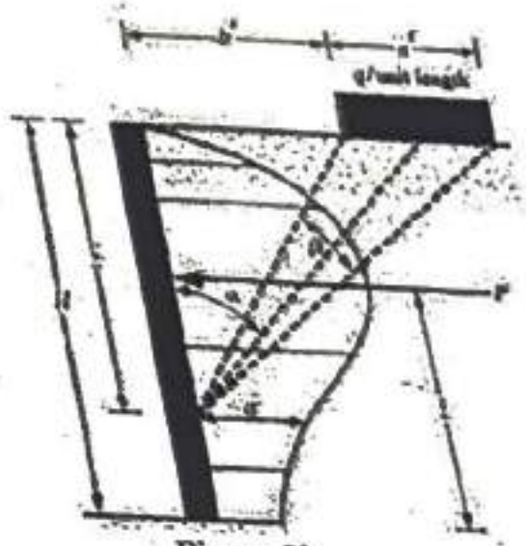

Figure 2b

Q.5.(a) Write short note on:

- Under reamed pile
- Machine foundation

Total No. of Pages: 2 *Roll Number*.....

B.TECH. (CIVIL) **VI SEMESTER**
END TERM EXAMINATION **MAY-2025**

CE306: TRANSPORTATION ENGINEERING

Duration: 3 Hours ***Max. Marks: 40***

Note: Answer any EIGHT questions. All questions carry equal marks. Assume suitable missing data, if any.

Q.1 Draw a typical cross section showing components of flexible pavement. Write the functions of each component. [CO2][5]

Q.2 Describe the lower and upper limits of super elevation. Design the super elevation at a horizontal curve of radius 250 m on National Highway passing through a plain terrain for design speed of 100 km/hr. [CO4][5]

Q.3 Describe the functions of ballast. Determine the thickness of ballast for a broad gauge railway track made of rail sections of 13 m length. Density of 25 cm wide sleepers is given by n + 7. [CO3][5]

Q.4 On a broad gauge railway, a branch line of 6° curve diverges in opposite direction from the main line track having a 3° curve. Design the permissible speed on the main track if the speed is restricted to 35 km/hr on the branch line. [CO4][5]

P.T.O.

Q.5 Design the turnout on a Broad Gauge railway track for the following given data:
Gauge length = 1676 mm
Length of straight arm = 864 mm
Heel divergence = 136 mm
Angle of switch = 1° 34' 27''
Angle of Crossing = 6° 42' 35'' [CO4][5]

Q.6 Mention the thumb rule for open cut. Discuss the advantages and disadvantages of tunnels. [CO3][5]

Q.7 The basic runway length is given as 1400 m. The airport site has an elevation of 400 m and airport reference temperature as 23°C. Maximum difference of elevation of highest point and lowest point on runway is 4 m. Design the runway length. [CO4][5]

Q.8 Classify different types of repair docks and also mention their relative advantages and disadvantages. [CO2][5]

Q.9 Write short notes on **ANY TWO** of the following
a) Minimum Circling Radius
b) Airport Zoning Laws
c) Wind Coverage [CO1][5]

Q.10 Write very short notes on **ANY TWO** of the following.
a) Traffic Signs
b) Passenger Car Unit
c) California Bearing Ratio [CO1][5]

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Total No. of Pages: 02 Roll No.....

VI SEMESTER B.Tech.

END SEMESTER EXAMINATION May-2025

CE308: DISASTER MANAGEMENT

Time: 3:00 Hours Max. Marks : 40

Note : Answer FIVE questions. Question number ONE is compulsory. Assume suitable missing data, if any.

Q.1 Answer the following questions (Any Four) [2x4=8]

[a] Classify the various seismic zones. In which zone does the city of Delhi lie? [CO2][BTL2]

[b] List major Earthquakes in India. [CO1][BTL2]

[c] What is the difference between disaster and vulnerability? [CO1][BTL4]

[d] Draw disaster management cycle. Explain [CO2][BTL3]

[e] How the landslide occurs? [CO4][BTL3]

Q.2 [a] Differentiate between Natural and Man-made disasters. [CO1][BTL2] [2]

[b] What are the causes of Earthquakes? [CO4][BTL3] [2]

[c] Write briefly on guidelines for improving the cyclonic resistance of low-rise houses as per IS15498 :2004 [CO5][BTL5] [4]

Q.3 [a] What are seismic waves? Differentiate between Body waves and Surface waves. [CO4][BTL2] [2]

[b] Explain the role of engineer to reduce the effect of disaster. [CO3][BTL5] [2.5]

[c] Discuss the institutional framework of disaster management in India. [CO2][BTL3] [3.5]

Q.4 [a]Define cyclones. What are the structural and non-structural mitigation for Cyclones? [CO4][BTL3] [4]

[b] What is the difference between Structural and Non-structural mitigation measures. What are the structural and non-structural mitigation for Floods? [CO4][BTL4][4]

Q.5[a] Do's and Don'ts during following disasters [CO5][BTL2] [4]

(i) Eartquake

(ii) Floods

[b] Vulnerability is a crucial aspect for defining the impact of disasters and its threat to people. How and in what ways can vulnerability to disasters be characterized? Explain various types of vulnerabilities with reference to disasters. [CO1][BTL6][4]

Q.6 Write sort notes on the following (Any two) [4x2=8]

(a) Mitigation measures/ strategies for Landslides [CO4][BTL4]

(b) Vulnerability Atlas of India [CO3][BTL3]

(c) Disaster Management Act 2005 [CO3][BTL3]

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Roll no.....

Total No of pages: 02

Sixth Semester

B.Tech. May-25

END TERM EXAMINATION

CE314 TUNNEL, PORT AND HARBOUR

Time:3Hours Max. Marks: 40

Note: Answer any eight questions
All question carry equal marks
Assume suitable missing data,if any

1. Enumerate different causes of accidents in tunnels and how many groups safety measures can be grouped? [5][CO1][L1]

2. What are the objective of tunnel linings: Explain with the help of neat sketches the sequence of tunnel lining. What are the effects of dust inhalation in tunneling? [5][CO2][L1]

3. Discuss briefly the methods deployed to check dust inhalation? [5][CO1][L2]

4. State the natural and meteorological phenomenon which affect the location and size of harbour. What factors are responsible for the formation of seasonal wind pattern. [5][CO2][L3]

5. On what factors the length and height of wave depends. Give relation between height and length of the wave. [5][CO3][L3]

6. Differentiate between the following:
   a) Gross tonnage and Net tonnage
   b) Displacement load and Displacement Height
   c) Cargo tonnage and ballast
   d) Natural road stead and artificial road stead
   e) Port and hinter land

[5][CO4][L5]

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7. How are dock entrances are controlled? Explain with neat sketches the construction of Sliding and Stop Caisson. [5][CO2][L5]

8. On a slip way the biggest vessel to be slipped is a 40 m long with a draught of 4m. if the height of cradle block from the slip way deck is 0.75m the inclination of slip way with horizontal is 4.0 degrees. Find the total length of slip way. [5][CO4][L6]

9. Give reasons for the following:
   a) A jetty face should be provided with a cushion
   b) In long Quary walls expansion joints are necessary
   c) Quay wall designed similar to retaining walls [5][CO5][L4]

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Roll no.....

Total no. of Pages: 02

2nd Semester

B.Tech (Civil)

May-2025

End Semester Examination

CE320 COMPUTATIONAL HYDRAULICS

Time 3 Hours

Max Marks 40

Note : Attempt any five questions. Draw neat and labeled diagrams wherever needed. Assume suitable missing data.

Q.1(a) What are the advantages and limitations of computational approach compared to experimental approach, as far as fluid dynamics is concerned ? [4, CO1, CO2][L1]

Q.1(b) Write down an expressions for continuity in conservative and non conservative form explaining terms. [4, CO1][L3]

Q.2(a) Explain, how partial differential equations are classified with regard to simulation of fluid dynamics problems ? Explain the physical behavior of PDEs [4, CO2, CO3][L2,3]

Q.2(b) Discuss the factors which contribute to errors in finite difference formulation. [4, CO2][L4]

Q.3(a) Discuss the difference between FVM and FDM with suitable example. [4, CO2, CO3][L2,3]

Q.3(b) Discuss various types of boundary conditions used in CFD. [4, CO1, CO2][L2]

Q.4(a) Discuss the rules of discretization. [4, CO1, CO2][L3]

Q.4(b) Discuss the difference between collocated grid and staggered grid and explain their relative merits and de-merits. [4, CO3, CO4][L4]

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Q.5(a) What is checker board arrangement and how staggered grid helps in overcoming this problem ? [4, CO3, CO4][L4]

Q.5(b) Is modeling of turbulence necessary ? if so, give explanation. [4, CO2, CO3][L5]

Q.6(a) Explain Reynold's averaging concept of turbulence. Derive RANS equation. [4, CO1, CO2][L3,4]

Q.6(b) Discuss various turbulence models. [4, CO1][L2]

Q.7(a) Discuss explicit and implicit approach for the computational solution of fluid flow problems. [4, CO2, CO3][L2,3]

Q.7(b) Explain, what is meant by a well posed problem ? [4, CO1, CO2][L3]

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Total No. of Pages:2 Roll Number..... VI SEMESTER

B.TECH. (CIVIL) MAY-2025

END TERM EXAMINATION

CE322: TRAFFIC AND TRANSPORTATION PLANNING

Duration: 3 Hours Max. Marks: 40

Note: Attempt all questions. All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Carry out trip distribution by Furness method for the present O-D trips along with predicted future trips as given in the following table: L3 [CO3][8]

		DESTINATION ZONE				Predicted future trips
		A	B	C	D	
ORIGIN ZONE	A	8	3	16	15	147
	B	6	9	8	5	42
	C	10	8	3	8	32
	D	2	4	7	12	30
Predicted future trips		39	24	68	120	

Q.2 The total trips produced and attracted to the three zones X, Y and Z of a study area in the design year are given in the following table:

Zone	Trips produced	Trips attracted
X	1600	3000
Y	2700	3500
Z	3600	2100

It is known that the trips between two ends are inversely proportional to the second power of travel time between zones, which is uniformly 15 minutes. If the trip interchange between zones Y and Z is known to be 950, develop the trip distribution matrix. L6 [CO4][8]

P.T.O.

Q.3 Discuss the factors that affect modal split? Show all the stages of the modal split in transportation planning process. L2, L4 [CO1][8]

Q.4 A trip distribution matrix is given in the following table:

FROM \ TO →	P	Q	R	S
P		900	400	700
Q	200		700	300
R	600	800		400
S	100	200	500	

Assign the trips on the network connecting the centroids of zones P, Q, R and S as shown below. Figures in italics on network links indicate cost of travel.



L4, L5 [CO4][8]

Q.5 Write short notes on **ANY FOUR** of the following:

a) Objectives of transportation planning
b) Category analysis for trip generation
c) Shortcomings of growth factor methods
d) Capacity restrained assignment technique
e) Impedance factor in trip distribution

L2, L1 [CO2][2×4 = 8]

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Total no. of Pages: 02

B.Tech.

6th SEMESTER

May-2025

END TERM EXAMINATION

CE324 Infrastructure Resilience and Socio-Economic Dynamics

Time: 3:00 Hours

Max. Marks: 50

Note : Answer any FIVE.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 a) Explain the three stages of a disaster — pre-disaster, during-disaster, and post-disaster — with suitable examples. [5][CO1][L1]

b) What is meant by resettlement in a post-disaster scenario? Discuss how multidisciplinary professionals collaborate to facilitate the resettlement process. [5][CO2][L2]

Q.2 a) Examine the ways in which socio-economic factors influence the levels of community preparedness. [5][CO3][L3]

b) Define retrofitting. How does retrofitting contribute to disaster risk reduction during the pre-disaster stage? [5][CO3][L1]

Q.3 a) Differentiate between temporary settlement and permanent settlement in the context of disaster recovery. [5][CO4][L4]

b) Define system-level post-disaster operability. Why is it critical for ensuring community resilience? [5][CO4][L2]

Q.4 a) Distinguish between direct losses and indirect losses in the context of disaster impacts. [5][CO5][L4]

b) Discuss the impact of infrastructure projects on employment and livelihood opportunities, particularly in vulnerable communities. [5][CO5][L4]

Q.5 a) Explore the psychological and behavioural factors that shape individual responses to risk. [5][CO6][L5]

b) Evaluate how urban transformation in India has influenced vulnerability patterns to natural disasters. [5][CO6][L6]

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Q.6 Write short note (any two): [5x2][CO2-CO6][L2-6]

a) Deterministic and probabilistic approaches to disaster risk
b) Resilience planning strategies for disasters
c) HAZUS-MH
d) Situational awareness during disaster

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Total no. of Pages:01

VIII SEMESTER

B.Tech (REGULAR)

END TERM EXAMINATION *MAY 2025*

CE422 VULNERABLITY AND RISK ANALYSIS

Time: 3:00 Hours *Max. Marks: 50*

Note : . Attempt any five Questions.

Assume suitable missing data, if any.

Q.1 Define Vulnerability as a human centric concept. [10][CO1][L3]

Q.2 What are the various factors that contributes to vulnerability? [10[CO2][L5]

Q.3 How Threat and Risks are associated with vulnerability? [10][CO3][L4]

Q.4 What are the various components and categories of vulnerability? [10][CO2][L2]

Q.5 Vulnerability is a crucial aspect for defining the impact of disasters and its threat to people. How and in what ways can vulnerability to disasters be characterized? Explain various types of vulnerabilities with reference to disasters. [10][CO4][L2]

Q.6 What are the various models of vulnerability applied by specialists? [10][CO4][L5]

OLD SCHEME

Total No of pages:3 Roll No:.....

SECOND SEMESTER B.TECH (GROUP B)

END SEMESTER EXAMINATION MAY-2025

EE-102 BASIC ELECTRICAL ENGINEERING

TIME:3HRS MAX. MARKS:40

NOTE: ATTEMPT ANY FIVE QUESTIONS. ASSUME MISSING DATA IF ANY.

1(a) Find Thevenin's equivalent circuit for the network shown in Fig.1 below at the left of terminals x-y. [4] CO2]

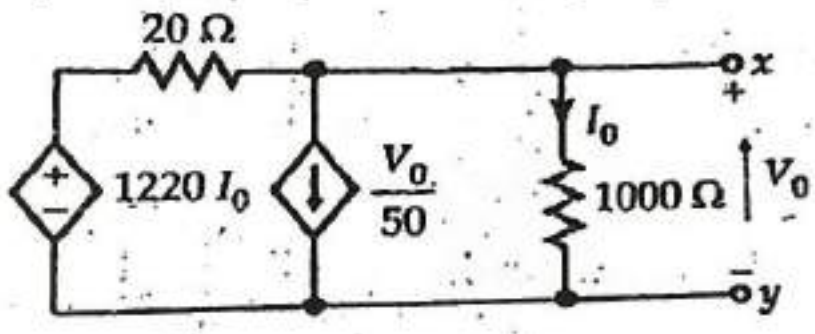


Fig. 1

(b) Using the superposition principle, find the voltage across 40 Ω resistance in Fig. 2 shown below. [4][CO1]

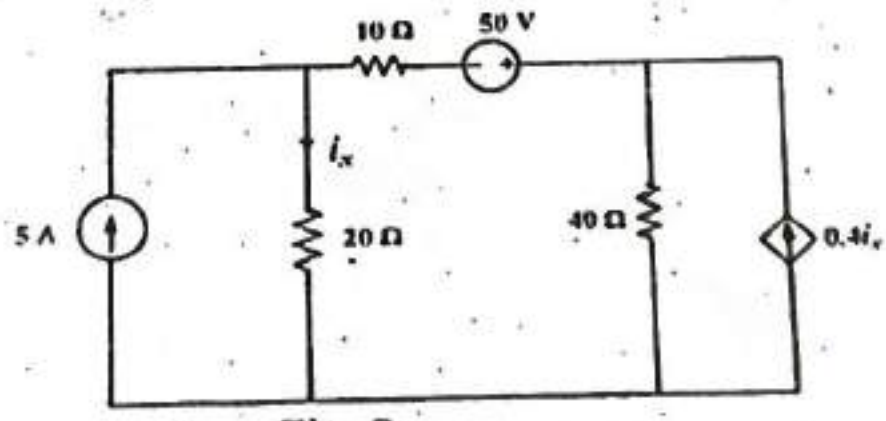


Fig. 2

2(a) State Maximum Power transfer theorem and derive the condition for maximum power transfer for the DC network. [4][CO2]

(b) Find the power across each resistance using the mesh analysis in fig. 3 shown below. [4][CO1]

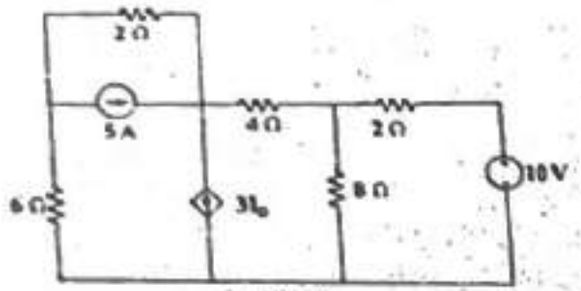


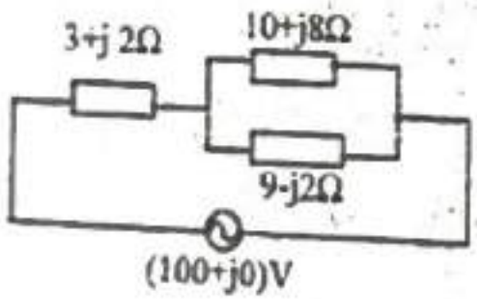
Fig. 3

3(a) A three phase delta connected RYB system with an effective voltage of 400V, has a balanced load with per phase impedances 3+j4 Ω, Calculate the (i) phase currents (ii) line currents and (iii) total power consumed by the load. [4][CO3]

(b) Prove that the power in a three phase balanced circuit can be deduced from the readings of the two wattmeters. Draw the relevant connections and phasor diagram [4][CO3]

4(a) A sine wave of v(t) = 200sin50t is applied to a 10Ω resistor in series with a coil. The reading of a voltmeter across the resistor is 120V and across coil 75 V. Calculate the active power, reactive power in the coil and power factor of the circuit. [4][CO3]

(b) For the circuit shown below, find current in each branch of the network. [4][CO3]



5(a) An iron ring has a mean diameter of 25cm and a cross sectional area of 4cm^2 . It is wound with a coil of 1200 turns. An airgap of 1.5mm width is cut in the ring. Determine the current required in the coil to produce a flux of 0.48 m Wb, in the air gap, if the relative permeability of iron under these condition is 800, Neglect leakage and fringing. [4][CO4]

(b) The total inductance of two coils A and B when connected in series is 0.5H or 0.2 H depending on the relative directions of current in the coils. Coil A, when isolated from coil B has a self inductance of 0.2H, Calculate (i) mutual inductance between the two coils (ii) self inductance of coil B (iii) the coupling factor between the coils and (iv) possible value of induced emf in coil A when current is decreased at 1000A/s in series circuit. [4][CO4]

6(a) Explain principal of operation of Transformer and explain the working of a transformer under no-load and on load conditions. [4][CO5]

(b) A 100 kVA, 3300/200V, 50 HZ single-phase transformer has 40 turns on the secondary, calculate (i) the values of primary and secondary currents, (ii) the number of primary turns, (iii) the maximum value of flux, (iv) If the transformer has to be used on 25 Hz system, calculate the primary voltage, assuming that the flux is increased by 10 per cent . [4][CO5]

7 Write short notes on the following:

(a) RLC series resonance [4][CO5]

(b) Permanent magnet moving iron instrument [4][CO5]

Total No. of Pages - 3

Roll No.....

II SEMESTER

B.Tech. [EE]

END-SEM EXAMINATION

MAY-2025

EE-102n DATA STRUCTURES AND ALGORITHMS

Time: 3:00 Hrs

Max. Marks:40

Note: Question no.1 is compulsory for all.
Attempt any four questions out of the rest.
Assume suitable missing data, if any.

Q1. Answer the following questions. [8 x 1 = 8]

(a) The depth of a complete binary tree with n nodes is [CO4] L2

A. log (n+1) – 1
B. log (n)
C. log(n-1) + 1
D. log (n) + 1

(b) The time complexity of $1^2 + 2^2 + ... + n^2$ is [CO2] L3

A. O(n) B. $O(n^2)$
C. $O(n^3)$ D. O(log n)

(c) The result evaluating the postfix expression 10 5 + 60 6 / * 8 - is [CO3] L5

A. 284 B. 213
C. 142 D. 71

(d) In recursion, the condition for which the function will stop calling itself is called ..... [CO5] L2

(e) Find the output of 3+6*(2*5-4)/10 in Python? [CO6] L4

A. 0 B. 6
C. 3 D. 6.6

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(f) Which data structure is used for DFS traversal _____ property. [CO4] L1

A. Linked list B. Queue

C. Both A & B D. None of the above

(g) What is the time complexity of deleting all the elements from the end in a singly linked list with n elements? [CO1, CO2] L4

A. O(n) B. $O(n^2)$

C. O(1) D. (log n)

(h) Which of the following is not a reserved keyword in Python? [CO6] L1

A. break B. True

C. yield D. start

Q2. (a) How do you create and import a module? [4] [CO6] L1

(b) What is the difference between Python's module, package and library? Explain with suitable examples. [4] [CO6] L2

Q3. (a) Explain data structures and its type briefly. [4] [CO1] L1 L2

(b) What is a file? And, explain why do we need to open and close a file operation. [3] [CO1] L1

Q4. (a) Define stack and write its steps of postfix expression evaluation using stack. Explain the steps with an example. [4] [CO3]L4

(b) Compare PUSH, POP and PEEK operations in the stack. Give examples to demonstrate which is required where. [4] [CO3] L2

Q5. (a) Write the different operations that can be performed in a linked list. [4] [CO1, CO3] L1

(b) Write the base condition of factorial recursive function and write various application of recursive functions. [4] [CO5] L2

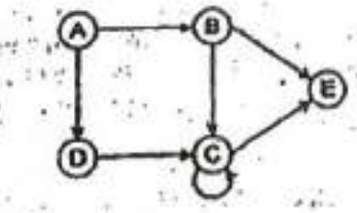
Q6. (a) Create a binary tree from the following inorder and postorder traversals sequence:

Postorder: 80,40,90,50,20,100,60,110,120,70,30,10.

Inorder: 80,40,20,90,50,10,60,100,30,110,70,120. [5] [CO4] L6

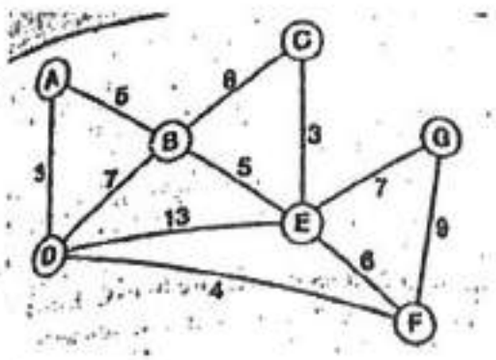
(b) Explain in brief the AVL tree rotation techniques with suitable graphical illustrations. [3] [CO4] L2

Q7. (a) For the directed graph below prepare the adjacency matrix (for both directed and undirected graph) and the incidence matrix. Edge naming / numbering to be shown in answer for incidence matrix by redrawing the graph.



[3] [CO4] L3

(b) For the given graph find the MST using Prim's algorithm.



[5] [CO5] L5

Q8. Write short notes on any two [4 x 2 = 8] [CO4, CO5] L1

(a) Searching algorithms

(b) Merge-in and Merge-short

(c) Depth-first search and Breadth-first search

(d) Hash table and Hash function

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Total no. of Pages: 02 *Roll no... ... ...*

II Semester
B.Tech.

End Term Examination **May-2025**

EE104 CIRCUIT AND FIELD THEORY

Marks :40 **TIME: 3:00 Hrs**

Note: ATTEMPT ANY FIVE. Question one is compulsory
Assume the suitable data, if required

Q . 1 Justify the answer in the following questions (a to d) by filling/choosing the correct answer in the blanks [CO1,4][L1,2] 4X2M

a. Power consumed by an ideal inductor is _____
b. Inductive reactance (increases/decreases) with increasing frequency.
c. In purely inductive circuit current lags the voltage by _____degrees.
d. In a balanced three phase system, the neutral current is_____

Q. 2 (a) Obtain the current in 2Ω resistor in the circuit of Fig. 1 by Thevenin's theorem [CO1][L4,5] 4M

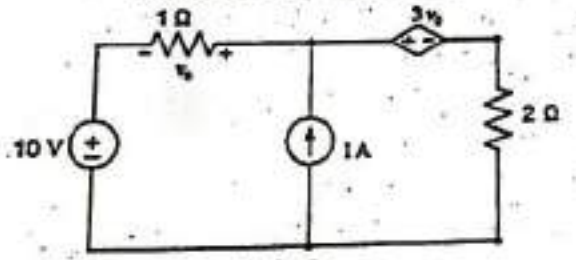

Fig1.

(b) Find v using the principle of Superposition theorem in Fig 2. [CO1[L4,5] 4M

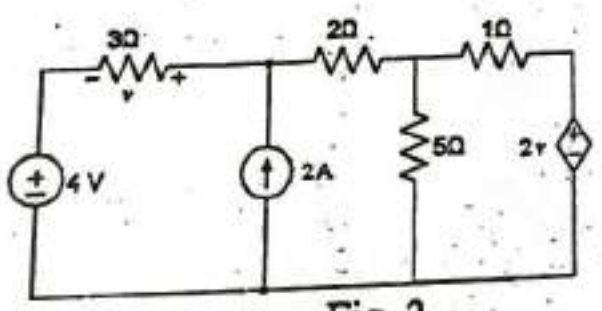

Fig. 2

Q. 3(a) Find the angle by which i_1 lags i_2 if $i_1 = 120\cos(100\pi t - 30°)$ and $i_2 = 5\sin(100\pi t + 50°)$ [CO2][L3] 4M

(b) A metal-filament lamp, rated at 750W, 100V is to be connected in series with a capacitance across a 230V, 50 Hz supply. Calculate the value of capacitance required. Draw the phasor diagram. [CO2][L4] 4M

Q.4 (a) A 3-Phase balanced load connected across a 3-phase, 400V ac supply draws a line current of 10A. Two wattmeters are used to measure input power. The ratio of two wattmeter readings is 2:1. Find the readings of the two wattmeters. [CO3][L5] 4M

(b) A balanced 3-phase load draws 8 kW at a lagging power factor of 0.8. if the line voltage applied is 440V, find the reactive power drawn and the line current. [CO3][L4,5] 4M

Q5 (a) What are the similarities and dissimilarities between electric and magnetic circuits? Enlist any five applications of magnetic circuits in engineering fields. [CO4][L2,6] 4M

(b) A toroidal core of radius 6 cm is having 1000 turns on it. The radius of core cross-section is 1 cm. Find the current required to establish a total magnetic flux of 0.4 mWb, if
(a) The core is nonmagnetic.
(b) The core is made of iron having the relative permeability of 4000. [CO4[L4,5] 4M

Q.6 (a) Write Maxwell's Equation in static and time-varying form. [CO5][L1] 4M

Q. 6 (b) If Electric flux density, $\vec{D} = (2y^2 + z)\vec{a_x} + 4xy\vec{a_y} + x\vec{a_z}$ C/m^2. Find [CO5][L4] 4M
i) Volume charge density at (-1,2,4)
ii) The flux through the cube defined by $0 \le x \le 1$, $0 \le y \le 1$, $0 \le z \le 1$

Q. 7 Write short notes on any two of the following: [CO2,5][L1,6] (4+4)M
a. Convection and Conduction Currents
b. B-H Curve and its applications
c. Resonance in parallel RLC circuit

Total no. of Pages: 03

Roll no.....

IV Semester

B. Tech, Electrical Engineering

END Term Examination **May- 2025**

EE202n/ME252 Power Plant Engineering

Time: 3:00 Hours ***Max. Marks: 40***

Note: i) Answer any Five of the following questions.
ii) Draw neat diagram (appropriately labelled), whenever required.
iii) Answer to each question must start on a fresh page.
iv) All parts of a question must be answered in one place only.
v) Assume missing data suitably, if any.

Q.1 (a) Draw the layout of hydroelectric power plant for net head available equal to 180 m. 2[CO2,3][L2,3]

(b) Enlist various components of a diesel engine power plant. 2[CO1][L1]

(c) What are the differences between water tube and fire tube boilers? 2 [CO2][L4]

(d) Explain the working principle of an electrostatic precipitator used in coal fired thermal power plants. 2 [CO-2,3][L5]

Q.2 (a) In a gas turbine plant operating on Joule Cycle, maximum and minimum temperatures are 825^0 C and 25^0 C. The pressure ratio is 4.5. 4 [CO4,5][L5]

Calculate i) specific work output,

ii) cycle efficiency and

iii) work ratio.

Assuming isentropic efficiencies of the compressor and the turbine at 85 and 90 percent respectively, calculate,

iv) heat rate in kJ/kW-hr, at turbine rating = 1300 kW.

Neglect mass flow of fuel and take c_p=1.005 kJ/kg K.

1855

(b) Draw schematic diagram of a <u>reheat cycle gas turbine plant</u>. Also sketch its T-s diagram and write the expression for its cycle efficiency in terms of temperatures at different points. 4[CO3,4][L3]

Q.3 (a) *Draw load curve and find out load factor* of a power station, if the plant supplies the following loads to the consumers for 24 hours. 4[CO4,5][L3,4]

Sr No	Time (Hours)	Load (MW)
1	0-6	40
2	6-8	50
3	8-12	60
4	12-14	50
5	14-18	70
6	18-22	80
7	22-24	40

Also find out the *load factor and the use factor* of the standby unit if the loads above 60 MW are taken by standby unit of 20 MW.

(b) i) What is the difference between *conventional and nonconventional sources of energy?* 4[CO1,2][L4]

ii) What are the advantages of *nonconventional sources energy* over conventional sources of energy?

Q.4 (a) i) Explain the term, *"Tidal Energy"*. With the help of neat sketches, explain how tidal energy can be used to generate electricity. 4[CO2,3][L1,2]

ii) What are the advantages and disadvantages of using *tidal energy* over using *wind energy* for power generation?

(b) i) Discuss various factors to be considered while selecting the site for a *hydro-electric power plant*. 4[CO2,3][L2]

ii) What are the advantages and disadvantages of *hydro-electric power plants* over coal fired thermal power plants?

Q.5 (a) i) What is a *super-critical boiler*? How super-critical boilers are different from that of sub-critical boilers? 4[CO3,4][L1,3]

ii) Describe advantages gained by using *economizers* in a modern thermal power plant.

(b) Draw schematic diagram of *Rankine cycle* (the theoretical cycle on which the steam turbine works in a steam power plant). Also sketch its T-s diagram and write the expression for its cycle efficiency in terms of enthalpy at different points. 4[CO3,4][L1,4]

Q. 6 Write short notes on the followings *(Any two)* 4+4[CO3,4][L5,6]

i) *Lay out of a Nuclear and Diesel Engine power plants ,*
ii) *Combustion process of pulverized coal and emissions in thermal power plants,*
iii) *Fluidized bed combustion,*
iv) *Geo-thermal energy.*

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Total No. of Pages.....

Roll No.....

FOURTH SEMESTER

B.TECH. ELECTRICAL ENGINEERING

END SEMESTER EXAMINATION

(May 2025)

EE-204, Power Transmission & Distribution

Time: 03 Hours

Max. Marks: 40

Note: *Answer any five questions. All question carry equal marks. Assume suitable missing data, if any.*

1. Explain: 2x4[CO1-5][BTL1,2]
   i. Overhead line conductor are in variably stranded and ACSR
   j. In order to maintain a good voltage profile on the line, the control of reactive power flow is necessary.
   k. Series compensation increases the power transmission capacity of a line.
   l. Insulators are often fitted with arcing horns.

2. (a) Derive an expression for the inductance of single phase two wire line. 4[CO3][BTL2]
   (b) A three-phase transmission line has a horizontal configuration with spacing of 6 m between adjacent conductors and 12 m between outer conductors. The radius of each conductor is 1.81 cm. Find the inductance per phase per km of the line. 4[CO3][BTL3]

3. (a) Develop the expression for sending end voltage and sending current for a medium length Transmission line using nominal T- circuit also draw the corresponding phase diagram for Nominal T- circuit. 4[CO2][BTL5]
   (b) A 200 km long 3-phase overhead line has resistance of 48.5 ohms per phase, inductive reactance of 80.20 ohms per phase and capacitance (line to neutral) 8.42 nF per km. It supplies a load of 13.5 MW at a voltage of 88 kV and power factor 0.9 lagging. Using nominal T circuit, find the Sending end voltage and regulation. 4[CO3][BTL3]

4. (a) What is string efficiency? Why is it necessary to have high string efficiency? How can the string efficiency be improved? 4[CO2][BTL1]
   (b) A string of insulator for a 66 kV line has 4 discs. The capacitance from each joint to tower is 25% of the self capacitance of each unit. Find the voltage distribution across the units and string efficiency. 4[CO2][BTL4]

5. Assuming that the shape of an overhead line can be approximated by a parabola, deduce expression for calculating sag and conductor length. How can the effect of wind and ice loading be taken into account? 8[CO2][BTL1,6]

6. (a) Describe the phenomenon of corona. Define disruptive critical voltage and visual and visual voltage. On what factor do they depend? Write equation for calculating these voltages. 4[CO5][BTL2,3]
   (b) Find the disruptive critical voltage and visual corona voltage (local corona as well general corona) for a 3-phase 220 kV line consisting of 22.26 mm diameter conductors spaced in a 6 m delta configuration. The following data can be assumed: Temperature 25^0 C, pressure 73 cm of mercury, surface factor 0.84, irregularity factor for local corona 0.72, irregularity factor for general (decided) for general (decided) corona 0.82. 4[CO5][BTL4]

7. Write short notes on any two of the following : 2x4[CO1-5][BTL1,2,6]
   a. Ring and Radial Distribution systems
   b. Choice of economical voltage of transmission
   c. Ferranti Effect

Total No. of Pages 03

Roll No. .....

FOURTH SEMESTER

B.Tech.(EE)

END SEMESTER EXAMINATION

May 2025

EE 206 Control Systems

Time: 3:00 Hours

Max. Marks :40

Note: Attempt any five questions. All questions carry equal marks. Use semilog graph paper for Bode plot and graph paper for Root locus plot. Assume suitable missing data, if any.

Q1. An Armature Controlled DC motor is used to rotate a load at a desired speed (ω rad/s). Based on the various parameters of DC motor, determine the closed loop transfer function of the Armature Controlled DC Motor. Define all the symbols/parameters with their units. Assume field time constant zero.

[CO1] [8] BLT 5, 6

Q2. Find the closed loop transfer function of the system, whose block diagram is given in figure 1. Use two methods (a) By Block Diagram Reduction Technique and (b) Draw the Signal flow graph and use Mason's gain formula.

[CO2] [4+4] BLT 4, 6

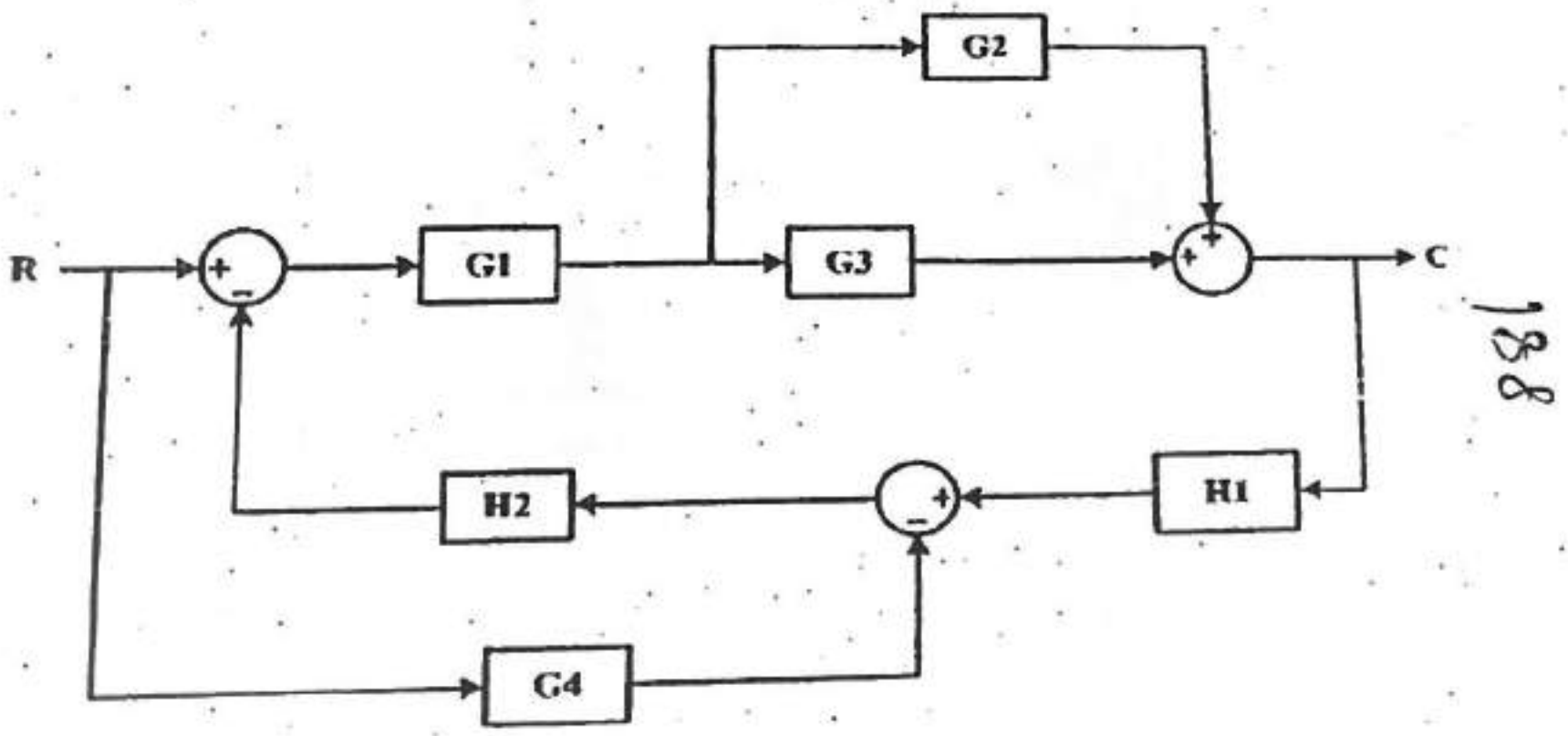

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Figure 1

Q3. The open-loop transfer function of the unity feedback system is given by

[CO4] [8] BLT 4, 5

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$$G(S)H(S)=\frac{K}{S(S+2)(s+4)}$$

Draw the root-locus sketch determining the following:

(i) number of open-loop poles and zeros on the s-plane
(ii) the root-locus on the real axis
(iii) the breakaway and break-in point and corresponding gain value of K
(iv) the point of intersection of asymptotes and angle of the asymptotes
(v) the points on the root-locus crossing imaginary axis and finding that frequency and gain value of K

Q. 4 (a)Measurements conducted on a servomechanism show the system response to be [CO4] [4+4] BLT 1, 3

$C(t)= 1+ 0.2\,e^{-60t} - 1.2e^{-10t}$

When subjected to a unit step input.

(b) Figure 2 shows a system employing proportional plus error-rate control. Determine the value of the error-rate factor "Ke" so that the damping ratio is 0.5. Determine the values of settling time, maximum overshoot and steady state error (for unit ramp input) with and without error-rate control. Comment upon the effect of error rate control on system dynamics.

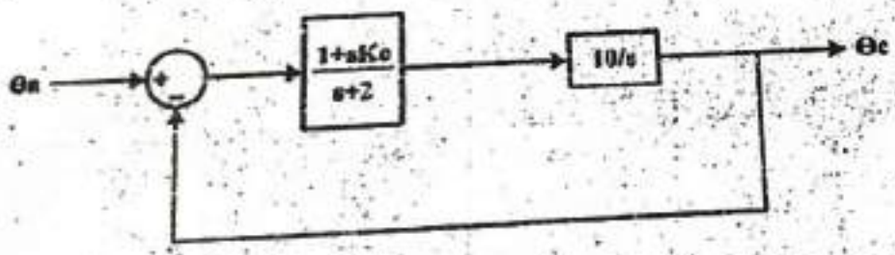

Figure 2

Q.5 (a) Examine stability of the following system given by characteristic equation,

using Routh-Hurwitz criterion. What would be the number of Poles in the right and left half of the s-plane? [CO5] [6+2] BLT 1, 4

$s^5+2s^4+2s^3+4s^2+4s+8$

(b) How to justify the system given by the characteristic equation is unstable.

$9s^6+2s^5++2s^3+5s^2+4s+18$

Q6. Construct the Bode Plot on the semi-log graph paper for unity feedback system whose open loop transfer function is given by [CO5] [8] BLT 4, 6

$$G(S)=\frac{500}{S(S+1)(s+50)}$$

From the Bode Plot determine (i) Gain and phase cross over frequency (ii) Gain and Phase Margin and (iii) Stability of the closed loop system.

Q.7 Write short notes on any two of the following [CO3] [4+4] BLT 1, 2

(a) AC servomotor
(b) Synchro
© Nyquist Criterion

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IVSEMESTER B.Tech. (EE)

END TERM EXAMINATION MAY2025

EE 208 AYSNCHRONOUS AND SYNCHRONOUS MACHINES

Time: 03:00 Hours Max. Marks: 40

Note: Answer any TEN questions. All questions carry equal marks. Assume suitable missing data, if any.

Q.1 Explain how and when an induction motor can be operated as generator? Also draw the torque characteristic of induction generator. [4][CO1][BTL3]

Q.2 Explain the concept of derivation of double revolving field theory in single phase induction machine. [4][CO2][BTL2]

Q.3 What are the conditions necessary for parallel operation of synchronous generator? Explain in detail a method to achieve it. [4][CO3][BTL1]

Q.4 Derive the power developed equation in cylindrical synchronous machines and draw its power angle characteristic. [4][CO3][BTL3]

Q.5 Explain the effect of excitation current on armature current of synchronous motor using phasor diagram and measured (rms) values. [4][CO3][BTL6]

Q.6 Discuss the effect of armature reaction in synchronous generator with phasor diagram for lag, lead and unity power factor conditions. [4][CO3][BTL2]

Q.7 A 11kV, 3 phase star-connected synchronous motor draws a current of 45A. The effective resistance and synchronous reactance per phase are 0.9 ohm and 28 ohm respectively. Calculate the power supplied to the motor and induced emf for a power factor of (i) 0.8 lag (ii) 0.8 leading. [4][CO3][BTL4]

Q.8 A 3.3 kV, 3 phase star-connected alternator has a full load current of 100A. Under short circuit condition it takes 5A field current to produce full-load short circuit current. The emf on open circuit for the same excitation is 900V (line-t0-line). The armature resistance is

0.9 ohm/phase. Determine synchronous reactance per phase and regulation for (i) 0.8 p.f lagging (ii) 0.8 p.f leading. [4][CO3][BTL5]

Q.9 A 220V, single phase induction motor gave the following test results: Blocked rotor test: 120V, 9.6A, 460W, No load test: 220V, 4.6A, 125W. The stator winding resistance is 1.5 ohm and during the blocked rotor test, the starting winding is open. Determine the equivalent circuit parameters. Also, find the core, friction and windage losses. [4][CO2][BTL5]

Q.10 A 3 phase induction motor has a starting torque of 100% and a maximum torque of 200% of the full load torque. Determine: (a) slip at which maximum torque occurs (b) full load slip (c) ratio of rotor starting current to full load current. [4][CO2][BTL5]

Q.11 A400V, 50 Hz, delta connected alternator has direct axis reactance of 0.1 ohm and a quadrature axis reactance of 0.07 ohm per phase. The armature resistance is negligible. The alternator is supplying 1000A at 0.8 pf. (a) Find the excitation emf neglecting saliency and assuming $X_q=X_d$. (b) Find the excitation emf taking into account the saliency. [4][CO3][BTL4]

Q.12 Write short notes on any two of the following:

(a) Construction and working principle of PMSM

(b) Hunting in synchronous machines

(c) Performance of Deep bar induction motors [4][CO4,2][BTL1]

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Total no. of pages: 02 *Roll No.....*

FOURTH SEMESTER
B.Tech(EE)
END SEMESTER EXAMINATION **May-2025**
EE-210n/202a Linear Integrated Circuits
Time: 3 Hours **Max. Marks: 40**

NOTE: Attempt any 8 questions. All questions carry equal marks. Assume suitable missing data if any.

Q1. For an inverting Schmitt trigger using an op-amp with ±15 V supply and saturation ±13 V, R_f = 150 kΩ, and R_{in} = 50 kΩ, calculate the upper and lower threshold voltages. Also determine the hysteresis width. **[05][CO3][BLT3]**

Q2. Find the transfer function (V_{out}/V_{in}) for the circuit given in fig. 1. **[05][CO2][BLT6]**

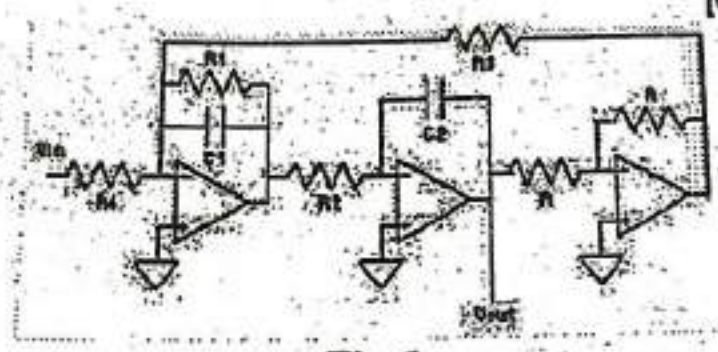

Fig. 1

Q3. Find V_{out} in terms of V_{in1} and V_{in2} for the circuit given in fig. 2. **[05][CO4][BLT5]**

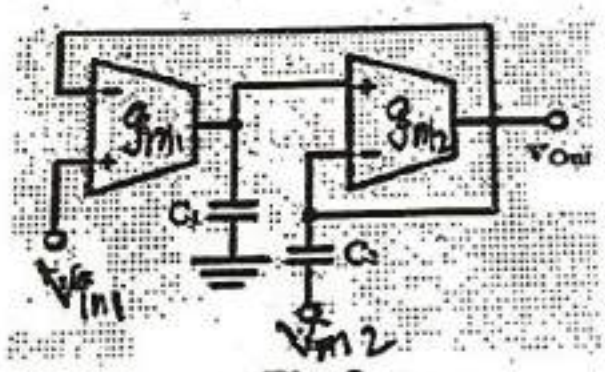

Fig. 2

Q4. Explain the internal circuit of 555 timer and show how 555 timer can be used for frequency modulation. **[05][CO4][BLT2,3]**

Q5. For the circuit in fig. 3, find the expression for closed loop voltage gain. Also find the gain value if all resistors are equal in magnitude i.e. R ohms. **[05][CO1][BLT2,3]**

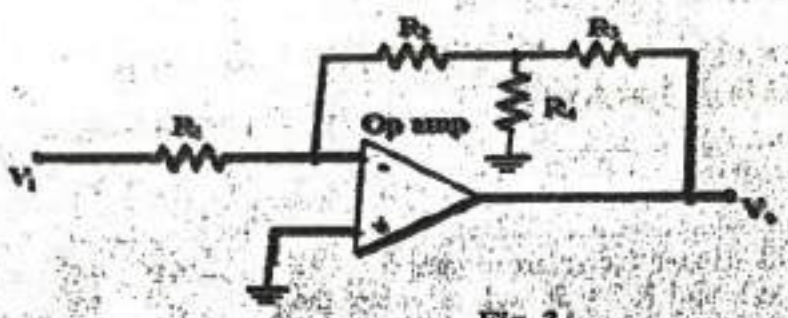

Fig. 3

Q6. Explain the circuit of an instrumentation amplifier with proper derivation. State its advantages over the normal differential amplifier. [05][CO1,2][BLT3]

Q7. Explain with the help of block diagram how will you find the square of an input voltage using op-amp. Draw the internal diagram of each block used. [05][CO3][BLT1,2]

Q8. For the circuit given in fig. 4, sketch the output voltage waveform if V_{in} = 500mV_{pp} sine wave at 100Hz and V_{ref} = 50mV. Given C_i = 0.1μF, R = 4.7KΩ, R_L =10KΩ and V_{sat} = 15V. [05][CO1][BLT2,3]

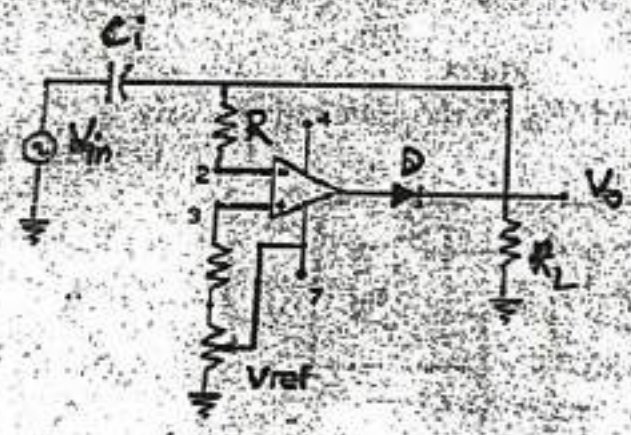

Fig. 4

Q9. Explain the functioning of a phase lock loop and describe in detail the structure of IC565. [05][CO5][BLT1,2,3]

Q10. Draw the basic circuit of general impedance converter(GIC). Using it, design a second order low pass filter with a cut-off frequency of 10KHz. [05][CO4][BLT3,4]

A 2 cm x 3 cm waveguide is filled with a dielectric material with $\varepsilon_r = 4$. If the waveguide operates at 20 GHz with TM_{11} mode, find:

a) Cutoff frequency
b) Phase constant
c) Phase velocity

[5M][CO5][BTL3]

Q.10 In a rectangular waveguide for which a = 1.5 cm, b= 0.8 cm, $\sigma = 0$, $\varepsilon = 4\varepsilon_0$, and $\mu = \mu_0$

$$H_x = 2 \sin\left(\frac{\pi x}{a}\right) \cos\left(\frac{3\pi y}{b}\right) \sin(\pi \times 10^{11} t - \beta z)\ A/m$$

Determine

(a) The mode of operation
(b) The cutoff frequency
(c) The phase constant β
d) The propagation constant Υ
(e) The intrinsic wave impedance η

[5M][CO5][BTL3]

------End------

Total no. of Pages: *Roll no.....*

IV SEMESTER

B.Tech

END TERM EXAMINATION ***May-2025***

EE262 ELECTROMAGNETICS

Time: 03:00 Hours ***Max. Marks: 50***

Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 It is found that $E = 60a_x + 20a_y - 30a_z$ mV/m at a particular point on the interface between air and a conducting surface. Find D and ρ_s at that point.

[5M][CO1,2][BTL3]

Q.2 Determine the capacitance of 10 m length of the cylindrical capacitors shown below in Fig.1. Take a = 1 mm, b = 3 mm, c = 2 mm, $\varepsilon_{r1} = 2.5$, and $\varepsilon_{r2} = 3.5$

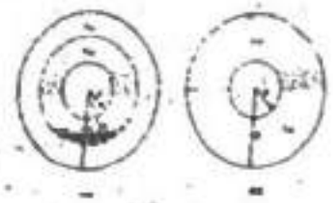

Fig.1

[5M][CO1][BTL3]

Q.3 Write down Maxwell equations for static and dynamic electric and magnetic fields. Find whether the following fields are magnetostatic fields or not:

a) $B1 = x\hat{a}_x - y\hat{a}_y$
b) $B2 = e^{-y}(\cos x\, \hat{a}_x - \sin x\, \hat{a}_y)$

[5M][CO2][BTL3]

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Q.4 Derive the formula for reflection coefficient and transmission coefficient when reflection of plane wave takes place at normal incidence with the suitable diagram.

[5M][CO4][BTL2]

Q.5 State Poynting's theorem and derive its formula with suitable diagram

[5M][CO3][BTL2]

Q.6 A transmission line of 75 ohm is connected to a 100 ohm load as shown in Fig.2. Find following:

a) Standing wave ratio due to this mismatch

b) Reflection coefficient

c) Ratio power reflected and incident powers at the load

d) Percentage of incident power reflected from the load

e) Percentage of incident power absorbed from the load

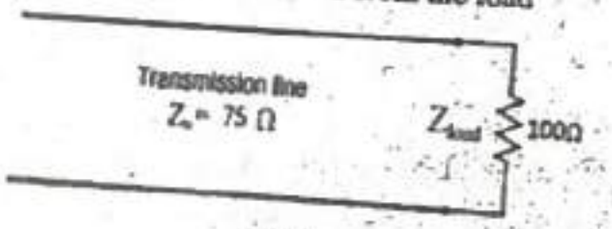

Fig.2

[5M][CO5][BTL3]

Q.7 A telephone line has R = 40 Ω/m, G = 400 μS/m, L = 0.2 μH/m and C = 0.5 nF/m.

a) If the line operates at 10 MHz, calculate the characteristic impedance Z_0 and velocity u.

b) After how many meters will the voltage drop by 30 dB in the line?

c) State the condition for distortion less and lossless transmission line

[5M][CO5][BTL3]

Q.8 Design a circuit model of a basic transmission line. A quarter wave lossless 100 Ω line is terminated by a load Z_L = 210 Ω. If the voltage at the receiving end is 80 V, what is the voltage at the sending end?

[5M][CO5][BTL6]

OR

Explain different mode of wave propagation in free space? Determine what mode is present in Fig.3 (a), (b), (c) in the rectangular wave guide.

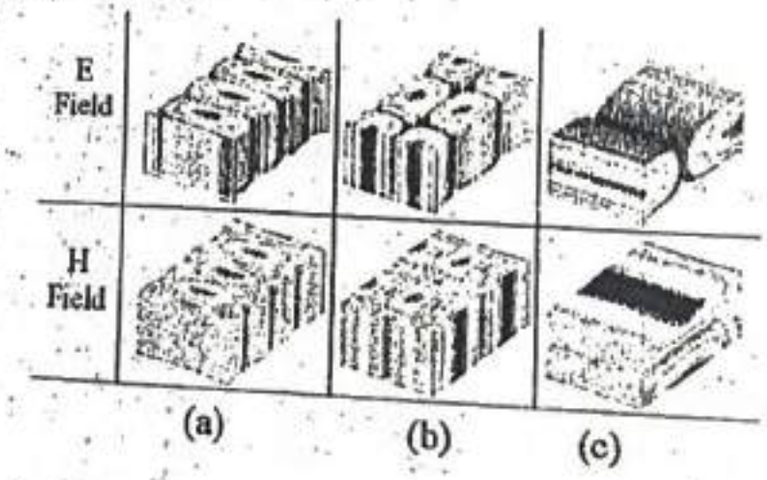

Fig.3

[5M][CO5][BTL5]

Q.9 In an air-filled rectangular waveguide with a = 2.286 cm and b = 1.016 cm, the y component of the TE mode is given by

$$E_y = \sin\left(\frac{2\pi x}{a}\right)\cos\left(\frac{3\pi y}{b}\right)\sin(10\pi \times 10^{10}t - \beta z)\ V/m$$

Find:

a) Operating mode

b) Propagation constant ϒ

c) Intrinsic impedance η

[5M][CO5][BTL3]

OR

Total no. of Pages: 02 *Roll no.....*

FOURTH SEMESTER 4 B.Tech.

END TERM EXAMINATION *May 2025*

EE 272 AUTOMOTIVE ELECTRICAL AND ELECTRONICS

Time: 03:00 Hours *Max. Marks: 40*

Note:
Question no. 1 is compulsory
Attempt any FOUR out of the remaining questions
Assume suitable missing data, if any.

Q.1 Indicate whether 'True or False' and justify briefly. [1x8][CO# 01]

(a) A relay is an electrically operated switch that uses a small electrical signal to control a higher-power circuit.

(b) A DC shunt motor is used as a cranking motor.

(c) The number of poles on the stator and rotor are always equal in all rotating machines.

(d) An increase in the plate area of a battery cell increases the internal resistance.

(e) The water is broken up into hydrogen and oxygen during the recharging of the Lead-acid battery.

(f) The cam angle is the number of degrees travelled by the distributor cam while the contact points are closed.

(g) If the result has an even numbers of 1s, the Parity flag is set in the 8085 microprocessor.

(h) As interfacing devices, a latch is used for an output port and a tri-buffer is used for an input port in the 8085 microprocessor.

Q.2 [4+4][CO# 01]

(a) Draw the schematic circuit diagram of the ignition coil of a four-cylinder petrol engine. Explain the function of each component.

(b) What is an earthed return system? Give the advantages and disadvantages of positive and negative earthing.

Q.3 [4+2+2][CO#01]

(a) Explain the construction and principle of operation of a Lead-acid battery.

(b) Enlist the emerging energy storage devices/technologies.

(c) Describe Sulphation and Internal short-circuiting for the lead acid battery.

P.T.O

Q.4 [4+4][CO#01,02]

(a) Give the constructional features of DC machines. Describe functions of field winding, armature winding and commutator.

(b) A 250 V DC shunt motor has an armature resistance of 0.5 Ω and a field resistance of 250 Ω. When driving a constant torque load at 600 RPM, the motor draws 21 A. What will be the new speed of the motor if an additional 250 Ω resistance is inserted in the field circuit?

Q.5 [4+2+2][CO#01, 02]

(a) Discuss the conventional and electronic engine management system (EMS) for automobiles.

(b) What are Electro Magnetic Interference and Electromagnetic Compatibility with reference to automobiles

(c) Explain Mass Air Flow and Crankshaft Position Sensors used in automobile.

Q.6 [4+4][CO#01]

(a) What is headlight dazzle? Discuss the various causes and remedies of dazzling effect. Also, discuss the fog lamp.

(b) Draw and explain in brief the pin diagram of the 8085 microprocessor.

Q.7 [4+4][CO# 02]

(a) Explain various address modes of the 8085 microprocessor with a suitable example.

(b) Write a program to add two hexadecimal numbers with carry; comment on each step clearly.

Q.8 [8][CO# 03 &4]

Two machine codes-0011 1110 (3EH) and 0011 0010 (32H)- are stored in memory locations 2000H and 2001H, respectively. The first machine code (3EH) represents the opcode to load a data byte in the accumulator, and the second code (32H) represents the data byte to be loaded in the accumulator. Illustrate the bus timings as these machine codes are executed. Calculate the time required to execute the Opcode Fetch and Memory Read cycles and the entire instruction cycle if the clock frequency is 2 MHz.

Total No. of Pages 3 *Name*_____ *Roll No*_____

B.Tech. SIXTH SEMESTER

END TERM EXAMINATION **MAY-2025**

COURSE CODE: EE-302 **COURSE TITLE: ELECTRIC DRIVES**

Time: 3:00 Hour **Max Marks: 40**

Note: Question 1 is compulsory;
Attempt **any four (4)** from the rest of the question.
All questions carry equal marks.
Assume suitable missing data, if any.

[1] Explain the following in brief: **[08] [BTL1-BTL4]**

(a) What do you mean by drive? Why electric drives are recently gaining popularity against their mechanical counterpart? Discuss the building blocks of electric drives while mentioning the role of its constituent components. [04][CO1]

(b) Steady state stability $dT_l/d\omega_m > dT/d\omega_m$; (where T_l and T are load and motor torque, respectively). [02][CO2]

(c) Energy loss during plugging is three times that of dynamic braking. [02][CO2]

[2] (a) Derive the fundamental load torque equation and discuss the different component of load torque. What kind of modification is required in load torque equation if there is presence of torsional elasticity in coupling shaft? Also, discuss the four-quadrant operation of hoist load. **[04][CO2] [BTL2]**

(b) A constant speed motor has the following duty cycle:
Load rising linearly from 200 to 600kW: 4min;
Uniform load of 400kW: 3 min;
Regenerative power returned to supply, reducing linearly from 400kW to 0: 3min;
Remains idle: 5min, determine rating of the motor assuming loss to be proportional to (power)^2? **[04][CO3] [BTL3]**

[3] (a) A 220 V, 24A, 1000rpm separately excited dc motor has an armature resistance of 2Ω. Motor is controlled by a chopper with frequency of 500Hz

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and source voltage of 230V. Calculate the duty ratio for 1.2 times rated torque and 500rpm. [04][CO3] [BTLA]

(b) A 230V, 960rpm, 200A separately excited dc motor has an armature resistance of 0.02Ω. The motor is fed from a chopper capable of performing motoring and braking operations. If the drive is operating under dynamic braking conditions with a braking resistance of 2 Ω, then calculate the following: [04][CO4] [BTL4]

(i) Duty ratio of chopper for a motor speed at 600 rpm with a braking torque of twice of the rated value.

(ii) Motor speed for a duty ratio of 0.6 at rated torque.

[4] (a) Discuss the closed loop speed control of PWM inverter fed induction motor. How the control loop could be modified to run the motor above the base speed? [04] [CO5] [BTL5]

(b) A 440V, 50Hz, 6-pole, Y-connected wound rotor motor has the following parameters: [04] [CO5] [BTL6]

$R_s = 0.5\Omega, R_r' = 0.4\Omega, X_s = X_r' = 1.2\Omega, X_m = 50\Omega.$

Stator to rotor turns ratio is 3.5.

The motor is controlled by static rotor resistance control. External resistance is chosen such that the breakdown torque is produced at standstill for a duty ratio of zero. Calculate the value of external resistance. How should the duty ratio be varied with speed so that the motor accelerates at maximum torque?

[5] A three-phase, delta connected 6-pole, 400 V, 50Hz, 925 rpm, Squirrel cage induction motor has the following parameters [2×4=08] [CO5] [BTL6]

$R_s = 0.2\Omega, R_r' = 0.3\Omega, X_s = 0.5\Omega, X_r' = 1\ \Omega.$

The motor is fed from a VSI with a constant V/F ratio from 0 to 50 Hz and constant voltage of 400V above 50 Hz frequency.

(i) Discuss the disadvantage of V/F control over vector control method.

(ii) Determine the break down torque for a frequency of 100Hz.

(iii) Also, obtain the torque at the rated motor current and 75 Hz.

(iv) Calculate the motor torque at 30Hz and a slip speed of 60 rpm.

[6] Write short notes on any TWO of the following: [4×2=08] [CO5] [BTL3-BTL6]

(a) Field orientation and development of equivalent circuit for Vector Control of Induction Motor.

(b) Hybrid braking scheme by combining schemes for operation during both low and high speeds respectively, in respect of induction motors. Support the answer with analysis and neat diagrams.

(c) Derivation of speed and current considering 2nd order model for starting of separately excited DC motor with armature control.

(d) Obtain the transfer function of the separately excited DC motor for speed control with current feedback loop; support the answer with analysis and neat block diagrams.

Total No. of Pages...02...

Roll No.....

SIXTH SEMESTER

B.TECH. ELECTRICAL ENGINEERING

END SEMESTER EXAMINATION

(May, 2025)

EE-304, POWER SYSTEM ANALYSIS

Time: 3.00 Hours Max.

Marks: 40

Note: Answer any five questions. All question carry equal marks. Assume suitable missing data, if any.

1. (a) What do you understand by a bus? Give the significance of voltage control bus, load bus and the slack bus in a power system. 2[CO1][BTL1]

(b) The Figure-1 shows a 4-bus power system. The shunt admittances at the buses are negligible. The line impedances are as below: Line impedances of a 4-bus system are as below: 6[C2][BTL2]

Bus code:	1-2	2-3	3-4	1-4	1-3
Impendence:	0.025+j0.10	0.02+j0.08	0.05+j0.20	0.04+j0.16	0.1+j0.4

Formulate the Bus Admittance Matrix (Y_{bus}).

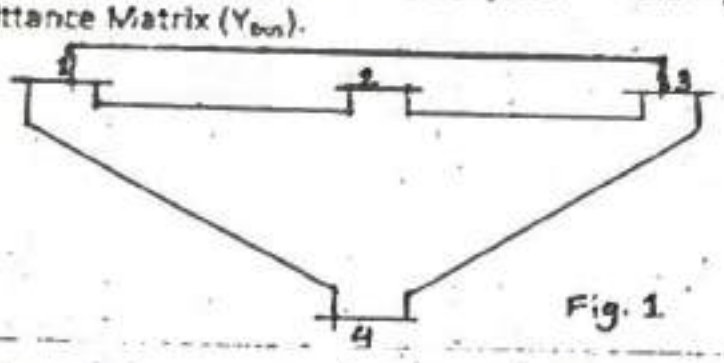

Fig. 1

2. (a) Explain the term 'Economic operating schedule'? Describe various types of system constraints to be considered for successful operation of power system. 4[CO3][BTL4]

(b) The incremental production cost of plant -1 and plant -2 are given as follows:

$dF_1/dP_1 = 0.4\ P_1 + 40.$

$dF_2/dP_2 = 0.5\ P_2 + 30$

Determine the economic operating schedule and the corresponding cost of generation if The maximum and the minimum loading on each unit are 100 MW and 25 MW. The demand is 180MW and transmission losses are neglected. If load is equally shared by both units determine the saving obtained by loading the units as per as per equal incremental production cost. 4[CO3][BTL3]

(a) Explain What are the various types of faults which usually occur in a power system? Discuss the various causes and consequences of a short circuit fault. How can we limit the magnitude of fault current? 4[CO2][BTL2]

(b) Three 10 MVA generators each having a reactance of 0.2 pu are operating in parallel. They feed a transmission line through a 30 MVA transformer having per unit reactance of 0.05. Find the fault MVA for a fault at the sending end of the line. 4[CO4][BTL5]

(a) Derive the necessary equations for calculating the fault current and the bus voltages for a single line to ground fault. 6[CO5][BTL1]

(b) The line currents in a 3 ph system are $I_a = 10/60^0$, $I_b = 10/-60^\circ$, $I_c = 0$. Find the symmetrical components. 2[CO4][BTL5]

(a) What is protective relay? Explain the functional requirement for a protective relay. 4[CO3][BTL1]

(b) Explain the constructional details of a circuit breaker. How is the arc produced between the circuit breaker contacts. How is the arc extinguished? 4[CO4][BTL1,2]

Q6)

6. Derive the Load Flow equations. Develop the G-S method for load flow study when P-V buses are absent for 'n' bus power system. How G-S method is modified when P-V buses are also present. B[CO5][BTL1,2]

7. Write short notes on any two of the following: 2X4[CO2,6][BTL1,2,6]
   a. Formation of Jacobien matrix
   b. Primary and backup protection
   c. Formation of Z_{bus} Matrix

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Total No. of Pages: 02

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SIXTH SEMESTER

B.Tech.[EE]

END-TERM EXAMINATION

(May-2025)

EE-306 Microprocessors and Microcontrollers & its Applications

Time: 3 Hours

Max. Marks: 40

Note: All questions carry equal marks. Attempt any five questions. Assume suitable missing data, if any.

Q1. a) With timing diagram, explain the memory read operation in 8085 microprocessor. [4] [CO1] [BTL2]

b) Write an assembly language program based on 8085 microprocessor instruction set to find the square root of data from 1 to n using Lookup table [4] [CO2] [BTL1]

Q2. a) Explain the operation of 8255 PPI Port A programmed as input and output in Mode 1 with necessary handshaking signals [4] [CO3] [BTL6]

b) Design a microprocessor system to interface an 8K × 8 EPROM and 8K ×8 RAM [4] [CO4] [BTL7]

Q3. a) Draw the logical block diagram of 8279 keyboard display controller and explain each block. [4] [CO4] [BTL4]

b) Draw and describe the interfacing of A/D and D/A converter interfacing with 8085 microprocessor. [4] [CO3] [BTL2]

Q4. a) What are the different ways to start and end the interrupt execution in 8259 programmable Interrupt controller [4] [CO5] [BTL2]

b) With functional block diagram, explain the operation and [4]

programming of 8251 USART in detail [CO4] [BTL3]

Q5. a) Explain the program memory interfacing in 8051 microcontroller. [4] [CO5] [BTL6]

b) Write an assembly language program based on 8051 microcontroller instruction set to perform four arithmetic operations on two 8 bit data [4] [CO2] [BTL3]

Q6. Write short notes on any two of the following : [4+4] [CO2] [BTL2]

a) Interrupts in 8085

b) Stack and Subroutines

c) Addressing Modes in 8085

d) Delay Loops

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Total no. of Pages: 02 *Roll no.....*

6th SEMESTER

B.Tech. (EE)

END TERM EXAMINATION *May-2025*

EE308 POWER SYSTEM OPERATION and CONTROL

Time: 3 hrs. **Max. Marks: 50**

Note: Attempt FIVE questions in all. Q. No.1 is compulsory. Attempt any four questions from the remaining questions. All questions carry equal marks. Assume suitable missing data if any.

Q.1 State whether the following statements are True/False. Justify your answer.

i) Equal area criterion cannot be used to study stability problem due to switching action.

ii) A power system draws leading VARs during off-peak hours.

iii) The action of P-f loop is faster than Q-V loop.

iv) The inertia constant H of a 200 MVA machine is 2 pu. Its corresponding value to 400 MVA is 4 pu.

v) The P-δ characteristics of infinite machine is $P=\sqrt{3}Sin\delta$. It is operating at $\delta=30^0$. The synchronizing power coefficient is 1.5 at the operating point.

[2X5][CO2,5,3,1,4][BTL3,2,1,2,5]

Q.2 (a) Draw the complete LFC block diagram with transfer functions of an isolated Power System. Derive the transfer function of Generator-Load model. [4][CO3][BTL1,2]

(b) A control area has a total rated capacity of 10,000 MW. The Regulation R for all units in one area is 2 Hz/p.u MW. A 1% change in frequency causes 1% change load. If the system is operating at 5000 MW and the load increases by 2%. Find (i) Static Frequency drop. (ii) If the governor loop were open, what would be the frequency drop? Comment on the result. [6][CO3][BTL3,4]

Q.3 (a) Why is Governor provided in Power System? Explain its Droop characteristics. [4][CO3][BTL1,2]

(b) A 100 MVA, 50 Hz generator is operating at no load at 3000 rpm. A load of 25 MW is suddenly applied to the machine. Due to inertia the valve opens after 0.8 seconds. Inertia constant of generator is 4.5 MW-sec per MVA. Find the frequency deviation before the valve opens to meet the load demand. Assume no change in load due to change in frequency. [6][CO3][BTL3]

Q.4 (a) Explain the Point-by-Point method of solving swing equation. [4][CO2][BTL1,2]

(b) A 50 Hz generator is delivering 50% of the power that it is capable of delivering through a transmission line to an infinite bus. A fault occurs that increases the reactance between the generator and infinite bus to 400% of the value before the fault. When the fault is isolated, the maximum power that can be delivered is 75% of the original maximum value. Determine the critical clearing angle. [6][CO2][BTL2,3]

Q.5 (a) What are the objectives of LFC for two-area system. Derive the expressions for synchronizing coefficients for both the areas. [4][CO4][BTL2]

(b) A system has two areas of equal capacity of 2000 MW. The speed regulation constant of area A is 10 Hz/pu MW and that of area B is 2 Hz/pu MW. In each area 1% change in load occurs for 1% change in frequency. Find the steady state change in frequency and change in tie line power if 20 MW change in load occurs in (i) Area A (ii) Area B [6][CO4][BTL3]

Q.6 (a) What do you mean by good quality of power supply? What are the different methods of voltage control. Discuss any one method. [4][CO5][BTL1,2]

(b) A 100 MVAr shunt reactor operates at 98% and 96% of its rated voltage and frequency respectively. How much reactive power will the reactor absorb? [6][CO5][BTL1,2]

Q.7 Write short notes on *any two* of the following:

i) FACTS devices
ii) LFC of Two Area System
iii) Stability of Power System [2X5][CO5,4,1][BTL1,2]

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Roll no.....

SIXTH SEMESTER

B.Tech.

END TERM EXAMINATION *May-2025*

EE-316 : ELECTRICAL ENERGY STORAGE SYSTEM

Time: 03:00 Hours *Max. Marks: 50*

Note : Answer any five questions, All questions carry equal marks. Assume suitable missing data, if any.

Q.1 Li-ion battery is mainly characterised by power capacity, battery internal impedance and open circuit voltage. Explain each and draw the equivalent circuit of LIB. [10][CO3][BTL1&3]

Q.2 Discuss the operational principles of rechargeable lithium ion batteries and draw block diagram showing major components of LIB. [10][CO3][BTL1&2]

Q.3 Differentiate between electric double layer capacitor (EDLC), pseudocapacitor and hybrid capacitor. [10][CO4][BTL4]

Q.4 What is the working principle of fuel cell, draw its schematic? List the different types of fuel cell. [10][CO4][BTL1&2]

Q.5 What is a BMS, list the various components of BMS. Discuss why it is important to have a BMS in a EV system. [10][CO5][BTL5]

Q.6 Differentiate between active and passive cell balancing. List the various techniques used for cell equalization. [10][CO5][BTL1&4]

Q.7 Design electric vehicle charging system architecture including off-board and on-board charger. Mention the importance of each component. [10][CO5][BTL6]

Total No. of Pages:2 *Roll No.....*

EVEN SEMESTE B.Tech. (EE/EC/CO/SE/MC/EP/PE)

END TERM EXAMINATION MAY-2025

EE-328 Deep Learning with Artificial Neural Networks

Time: 3:00 Hours *Max. Marks: 40*

Note: Answer FIVE questions. Q1 AND Q2 ARE COMPULSORY Write the ANSWERS IN A SEQUENCE. Assume any data if missing and clearly mention the assumption.

Q(1) (a). State the type of the optimization problems:

(i) max $\exp(-x^2)$ subject to $-2 \leq x \leq 5$

(ii) min $x^2 + y^2, (x-2)^2; (y-3)^3$

(iii) max $2x + 3y$ subject to $x > 0, 0 < y \leq 10, y \geq x$

(iv) min $x^2 y^6$ subject to $\frac{x^2+y^2}{4} = 1$

[4x1=4M][CO1][BTL1]

(b) Explain the Minimization of the constrained nonlinear optimization problem by using Karush-Kuhn-Tucker (KKT) conditions. Minimize $f(x,y) = (x-2)^2 + 4(y-3)^3$ for the constraints of $-x + y \leq 2$, $x + 2y \leq 3$. [4M][CO1][BTL2]

Q(2) (a) Write the mathematical expression and pseudo code for the following activation functions:

(i) Hard limiter (ii) Symmetrical Hard limiter (iii) Saturating Linear (iv) Symmetric Saturating Linear (v) Log Sigmoid (vi) Hyperbolic Tangent Sigmoid (vii) ReLU function (viii) Soft max function

[4M][CO2][BTL2]

(b) A fully connected feedforward network has 10 source nodes,2 hidden layers, one with 4neurons and the other with 3 neurons, and a single output neuron. Construct an architectural graph of this network

[4M][CO2][BTL5]

Q(3) (a) Find the optima of $f(x) = 1/(1 + |tanx|)$ in $\pi \leq x \leq \pi$. What is the potential difficulty? [4M][CO1][BTL3]

(b) Find if the following functions are convex or concave or neither?

(i) $x^2 + \exp(y)$ (ii) $1 - x^2 - y^2$ (iii) xy (iv) $\frac{x^2}{y}$ for $y > 0$

[4x1=4M][CO1][BTL3].

Q(4) A 2-2-1 radial basis function network is used to solve XOR problem. The first layer of weights is given as $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$. Calculate the activation functions for the hidden node units, for each XOR pattern using an activation function of the form $\varphi(net) = [-net^2]$, where net is the Euclidean norm

[8M][CO3][BTL4]

Q(5) The neural network with deeper layers yielded poorer performance is due to lack of proper training. Explain with suitable example the backpropagation algorithm training process of the deep neural network which experiences the primary difficulties (i)Vanishing gradient (ii)Overfitting (iii)Computational loading.

[8M][CO4][BTL4]

Q(6) Explain Convolution operation in convolutional neural network (CNN) and write short notes on the following layers: (i)Convolutional layer, Activation function layer (ReLU), Pooling layer, Fully connected layer and Dropout layer.

[8M][CO5][BTL5]

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Total No. of Pages: 02 Roll No. .....

B. Tech. (EE) SIXTH SEMESTER

END SEMESTER EXAMINATION (MAY-2025)

EE-324 Design, Estimation and Costing of Industrial Electrical System

Time: 3.00 Hours *Max. Marks: 50*

Note: Answer five questions in total. Question 1 is compulsory. Each question carry equal marks. Assume the missing data suitably (if any).

1. ***Answer the following questions in brief.*** [5×2=10]

   a. Briefly differentiate between lighting circuits and power circuits. [CO2][L1]

   b. What is MCB? How it is different from ELCB? [CO3][L2]

   c. What do you understand by overhead charges? Explain with suitable example. [CO1][L2]

   d. What is the purpose of cross arms in overhead transmission and distribution systems? [CO5][L2]

   e. Briefly describe the significance of of conduits? Briefly describe the selection of sizing of conduits. [CO4][L5]

2. a. How is the appropriate mode of procurement selected based on the requisition and estimation as per the latest general financial rules? What is the difference between GeM and e-tendering process? [CO1][L3][5]

   b. What is the purpose of estimation and costing? State the important facts, which an estimator should know for preparing an internal wiring estimate. [CO1][L4][5]

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3. a. Explain the concept and importance of a single line diagram. What key components and details should be included in a single line diagram to ensure it accurately represents the electrical distribution system? [CO2][L4][5]

b. How to determine the sizing of cables? Give your answer with suitable example. [CO2][L3][5]

4. a. Differentiate between the electrification of residential and commercial installations in terms of load requirements. [CO3][L3][5]

b. What is busbar? Describe its function, types and keep design consideration for busbar in electrical installation. [CO3][L2][5]

5. a. What are the different types of service connections, and what are their key features and applications. [CO4][L2][5]

b, What are joint box and looping-in wiring systems? Which system is more useful and why? [CO4][L2][5]

6. ***Write short notes on any two of the following.*** [2×5=10]

a. Procedure for determination of conductor size in domestic and commercial installation [CO5][L3]

b. Factors considered for selection of the site for a substation [CO5][L2]

c. Differentiate between Indoor and outdoor substations [CO6][L2]

d. Different type of earthing [CO6][L2]

Total no. of Pages: Roll no. 211

6/8th SEMESTER

B.Tech.

END TERM EXAMINATION May-2025

COURSE CODE EE416 COURSE TITLE GRID INTEGRATION OF RENEWABLE ENERGY SOURCES

Time: 3 Hours *Max. Marks: 60*

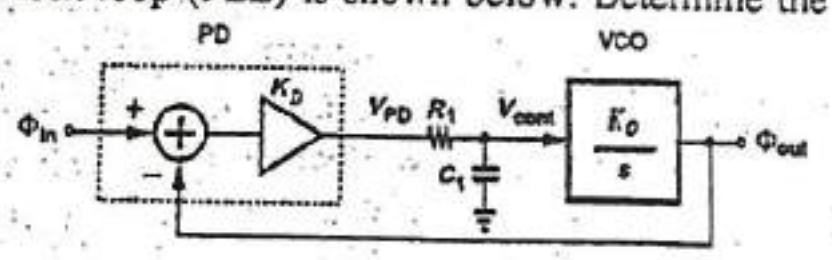
Note : Attempt any five questions.
Assume suitable missing data, if any.

Q.1 (a) Discuss the role of power electronics in harvesting the energy from intermittent renewables. How the ill effect of large penetration of renewables can be effectively managed by these power electronics devices? [6]

(b) Write a brief note on micro, string and centralized inverter while mentioning their advantages and disadvantages [6]

Q2. (a) Discuss the working principle of analog phase detector. How the the low pass filter design plays critical role in the development of phase detector? [6]

(b) The block diagram of typical phase lock loop (PLL) is shown below. Determine the close loop transfer function of the given PLL while assuming a unity feedback. Also derive the expression of natural frequency and damping factor for the same.

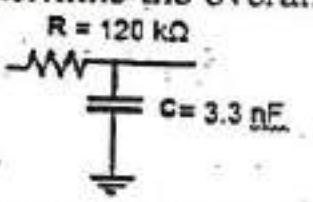


[6]

Q.3 A phase-locked loop has a center frequency of $\omega_0 = 10^5$ rad/s, $K_O = 10^3$ rad/s per V, and $K_D = 1$ V/rad. There is no other gain in the loop. Determine the overall transfer function H(s) for:

a) The loop filter F(s) = 1 (all pass filter).

b) The loop filter F(s) is shown below.



c) Loop filter F(s) as in part b) , XOR for the phase detector and $V_{DD} = 5V$.

d) Natural frequency ωn and damping factor ζ for part c) [12]

Q.4 What is the Park's transformation. Derive the park transformation and inverse park transformation matrices. How these transformations are used for the control of grid interfacing inverter. Explain with the help of suitable inverter control diagram. [12]

Q.5 (a) Discuss the different building blocks of Wind Energy Conversion Systems (WECS). List the various factor on which wind out power depends and also derive the expression for the same. [6]

2 12 (b) Calculate the energy of a wind turbine during 3h of continuous operation, with a blade length of 10m and efficiency of 40%, when the wind speed is 15kph and the air pressure and temperature are 10143.25 hPa and 15°C. [6]

Q.6 Write Short Note on any of the two

(a) Betz's Limit

(b) Types of WECS configuration

(c) Partial Shading [2x6]

Total No. of Pages: 03

Roll No. .....

SIXTH/EIGHTH SEMESTER

B.Tech

END SEM EXAMINATION

(MAY 2025)

EE434: Computer Control of Processes

Time: 3:00 Hours

Max. Marks: 50

Note: Question 1 is compulsory. Answer any four questions from remaining. All questions carry equal marks compulsory. Assume suitable missing data, if any.

Q1. Write true or false and justify your answer:

[CO1-CO5] [L1-6] (10*1=10)

(a) PID controller is the best choice for level control.(T/F)

(b) A temperature controller controls the temperature from $100^{\circ}C$ to $200^{\circ}C$. A sensor provides an output of 2 to 8 V for this temperature range. A circuit gain of 5 will be needed if proportional gain is 5%/%.(T/F)

(c) Three displays are commonly used in DCS.(T/F)

(d) Feedforward Control acts beforehand in an anticipatory manner. Justify the statement.(T/F)

(e) Ratio control is a type of feedforward control. Justify the statement.(T/F)

(f) Which type of controller mode builds up an corrective action proportional to the length of time the disturbance persists?

(g) Alternative path provided by vertical paths from the main rung of a ladder diagram that is paths in parallel represent "Logical OR" operation.(T/F)

(h) Override control protect the drum boiler from overheating by transfering the control action from the flow control to pressure control.(T/F)

(i) In model-refernce adaptive controller (MRAC), the specifications are given in terms of a performance index.(T/F)

(j) Three components of SCADA System are ..... , ... , and .....

Q2 (a) What are the main parts of a general purpose computer? Draw its block diagram and schematic diagram also. Describe input/output devices. [CO1] [L1,2] [5]

(b) Explain the SCADA hardware and software structure? [CO3][L1,2][5]

Q3 (a) What do you mean by PLC? Explain the PLC operation and scan time. [CO4][L2,3][5]

(b)Design PLC ladder diagram for water bottle filling mechanism:-

Whenever bottles are placed on the conveyor, the motor starts and the conveyor moves and photo-sensor senses the bottle motor stops and output valve opens for 30s. After 30s the valve is closed, motor starts and conveyor moves. When another bottle is detected, the process is repeated. Implement this in PLC using Ladder Diagram programming language.

[CO4][L4,5,6][5]

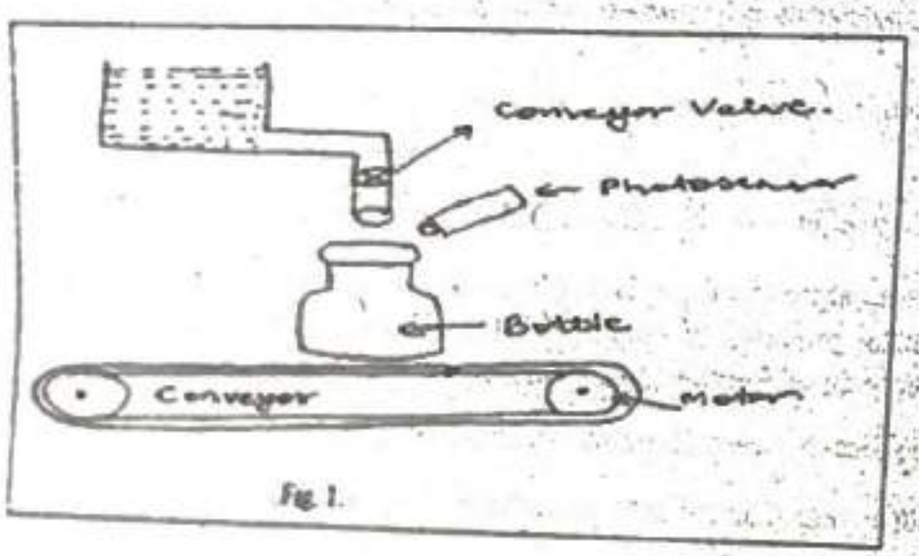


Fig 1.

Q4 (a) What are the various types of feedback controllers? Explain the selection criterion for selection of a controller for a particular application. [CO2][L2,3][5]

(b) A PID Controller has

$K_p = 5, K_I = 0.7\,s^{-1}$, $K_D = 0.5s$ and $p_I(0) = 20\%$. Draw the plot of the controller output. [CO2][L4,5,6][5]

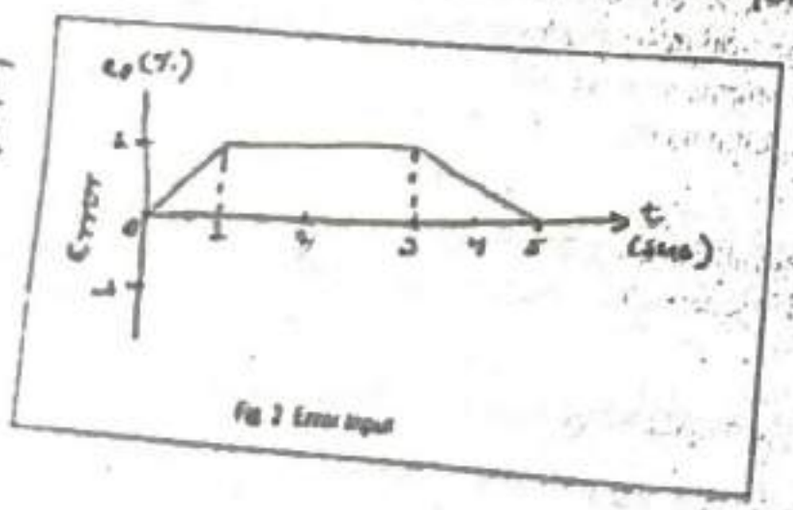


Fig 2 Error input

Q5 (a) Explain with the neat sketch the structure of a distributed control system (DCS). Discuss the functioning of its various parts. [CO3][L1,2][5]

(b) Write a short note on any two of the following

(i) OSI Model and DOD Model

(ii) Medium Access Protocol

(iii) IEEE 802

(iv) Hart Protocol [CO3][L1,2][5]

Q6 (a) What is an expert system? What is the structure of an expert system? With illustrative example, explain the use of expert control system for process control applications. [CO5][L2,3][5]

(b) Discuss about the different adaptive control techniques that are applied in industrial processes. [CO5][L1,2][5]

Q7 (a) Design a PID controller using op-amps showing the output at each op-amp and total output of the controller. [CO2][L2,3][5]

(b) A temperature control system inputs the controlled variable as arrange from 0 to 4 V. The output is a heater requiring 0 to 8 V. A PID is to be used with $K_p = 2.4\frac{\%}{\%}$, $K_I = 9\%/(\% - min)$, $K_D = 0.7\%/(\%/\text{min})$. The period of the fastest expected change is estimated to be 8s. Develop a PID circuit. [CO2] [L4,5,6] [5]

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EIGHTH SEMESTER

B.Tech.[EE]

END-SEMESTER EXAMINATION

(May-2025)

EE-446 DATA COMMUNICATION & COMPUTER NETWORKS

Time: 03 Hours

Max. Marks:50

[redacted]

Q1. a) A digitized voice channel, is made by digitizing a 10kHz bandwidth analog voice signal. We need to sample the signal at twice the highest frequency. We assume that each sample requires 8 bits. What is the required bit rate? [2] CO1 [BTL1]

b) We need to send 64 kbps over a noiseless channel with a bandwidth of 20 kHz. How many signal levels do we need? [2] CO2 [BTL1]

c) Compare and contrast a circuit-switched network and a packet-switched network. [2] CO2 [BTL2]

d) How does a single-bit error differ from a burst error? [2] CO3 [BTL2]

e) The address 43:7B:6C:DE:10:00 has been shown as the source address in an Ethernet frame. The receiver has discarded the frame. Why? [2] CO3 [BTL2]

Q2. Draw the graph of the NRZ-L scheme using each of the following data streams, assuming that the last signal level has been positive: a) 1110101 b)0100010 [10] CO2 [BTL2]

Q3. Five equal-size datagrams belonging to the same message leave for the destination one after another. However, they travel through different paths as shown in Table 1. [10] CO4 [BTL4]

Datagram	Path Length	Visited Switches
1	3200Km	1,3,5
2	11,700 Km	1,2,5
3	12,200 Km	1,2,3,5
4	10,200 Km	1,4,5
5	10,700 Km	1,4,3,5

Table 1

Assume that the delay for each switch (including waiting and processing) is 3, 10, 20, 7, and 20 ms respectively. Assuming that the propagation speed is 2 x 108 m, find the order the datagrams arrive at the destination and the delay for each. Ignore any other delays in transmission.

Q4. Let the message be the four element vector: n= [D7, D6, D5, D3]. The Hamming codeword $C(7,4)$ is generated using the four input bits n and modulus 2 arithmetic is assumed. The generated 7 bit codeword is represented as C = [D7, D6, D5, P4, D3, P2, P1], where the parity bits P1, P2, P3 and P4 are generated using the modulo 2 arithmetic and the syndrome S0, S1, S2 at the receiver is calculated as follows: [10] CO4 [BTL3]

P1= D7+D5+D3	S0 = D7 + D6 + D5 + P4
P2= D7+D6+D3	S1= D7 + D6 + D3 + P2
P3 =D7+D6+D5	S2 = D7 + D5 + + P1

a) Generate the Hamming code for the data words
b) Generate the table for the syndrome and the logical decision based on the syndrome value.

Q5 Compare and contrast Stop-and-Wait Automatic Repeat Request with Go-Back-N Automatic Repeat Request. [10] CO3 CO4 [BTL2]

Q6. Write short-notes on any two:

a) Network Layer Addressing
b) Switched Networks
c) Network Topology
d) Cyclic Codes

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Total no. of Pages:2 Roll no.....

VI/ VIII SEMESTER B.Tech.

END TERM EXAMINATION ***May-2025***

EE450 : Cloud Computing Fundamentals

Time: 03:00 Hours *Max. Marks: 50*

Note : All questions carry equal marks.
Answer any five questions.
Assume suitable missing data, if any.

Q.1 (a) Define the coefficient of variation and explain its significance in evaluating workload smoothness. Using CPU utilization as the context, analyze how positive and negative correlations between job workloads affect system smoothness. Rank the correlation types in order of efficiency and justify your answer with appropriate reasoning. [5M] [CO1] [BTL5]

(b) The storage demand as a function of time is expressed as:

$$S(t) = (60 \times (3 - e^{-0.01t})) + 70$$

Where t is measured in time units and S(t) is the storage required in terabytes (TB) at time t. The on-premise storage cost per TB is ₹120, and the cloud storage cost per TB is ₹280. In this situation, determine whether cloud storage is more cost-effective than on-premise storage for a period of 200 time units. The peak storage demand for the organization occurs at t=200. [5M] [CO3] [BTL3]

Q.2 (a) Mention the essential characteristics of cloud, deployment models in cloud, and service models in cloud as per the National Institute of Standards and Technology. [5M] [CO1] [BTL1]

(b) What is a packet in computer networks? Describe the various components of a network packet. [5M] [CO2] [BTL2]

Q.3 (a) Describe the read and write operations in block storage by mentioning their key parameters and their meanings. Also, mention any two common use cases of block storage. [5M] [CO3] [BTL2]

(b) Draw the architecture of a virtual machine manager (VMM) and explain the roles of its internal components. [5M] [CO4] [BTL4]

Q.4 (a) Give the other names of type-I and type-II hypervisors. Explain how virtualization supports both the combining and splitting of computing resources. Provide one real-world use case for each. [5M] [CO4] [BTL3]

(b) Provide the full forms of DHCP, SOA, REST, and SOAP. Differentiate REST and SOAP based on any two categories. [2+3M] [CO5] [BTL3]

Q.5 (a) What does a monitoring dashboard track? [1M] [CO5] [BTL1]

(b) Explain the two main methods by which IAM users can access AWS services: Console Login and Programmatic Access. [4M] [CO5] [BTL2]

(b) Consider yourself as a cloud security engineer responsible for writing an IAM policy that grants an application access to objects stored in a specific Amazon S3 bucket named project. The application should be able to perform all object-level operations (such as upload, download, and delete) on objects inside the bucket, but must not be allowed to list the bucket or perform any bucket-level actions. Create a valid IAM policy in JSON format using the version "2012-10-17" that fulfils these requirements. [5M] [CO5] [BTL2]

Q.6 Describe any five of the following:

a. RFC 1918
b. Bonding in Network Interface Card and its purpose
c. Object storage Tiers
d. Para Virtualization
e. Network Attached Storage
f. Content Delivery Networks

[5X2M] [CO2, CO3, CO4] [BTL2]

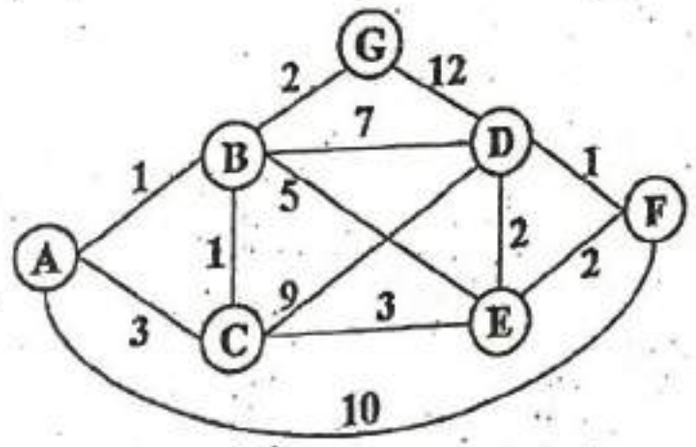

Figure 6

[4 M] [CO6] [BTL 3]

*** END ***

Total no. of Pages: 04 Roll no.

II SEMESTER

END TERM EXAMINATION ***May-2025***

EC 102: DATA STRUCTURES AND ALGORITHMS

Time: 3:00 Hours *Max. Marks: 40*

Note: All questions are compulsory.
Assume suitable missing data, if any.

Q.1 (a) Given the cost matrix between 4 cities (1,2,3,4). Calculate the minimum travelling cost from and back to city 1 for a travelling salesman.

	1	2	3	4
1	0	10	15	20
2	10	0	15	25
3	15	15	0	30
4	20	25	30	0

[4 M] [CO5] [BTL 3]

(b) Show how the depth first search works on the graph given in Figure 1 with vertex q as the source (starting vertex). Which vertex should be the source if the entire graph is to be spanned?

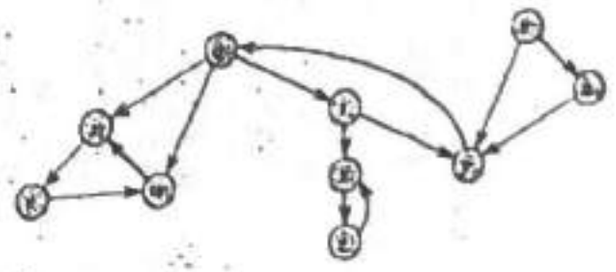

Figure 1

[4 M] [CO6] [BTL 3]

Q.2 (a) Write pseudocode to delete a node from a Binary Search Tree. Delete node 30 from the BST given in Figure 2.

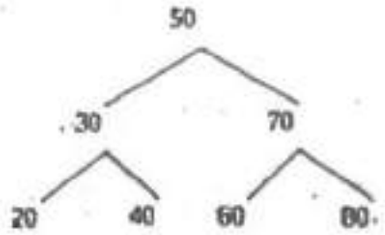

Figure 2

[4 M] [CO5] [BTL 3]

(b) Modify merge sort to sort an array in descending order. e.g. for the input array `[3, 1, 8, 2]`, your algorithm should output `[8, 3, 2, 1]`. Give clear pseudo-code for all functions.

[4 M] [CO4] [BTL 6]

Q.3 (a) Consider the following recurrence relation:

$$T(n) = 2T(n/2) + n$$

i. Use a recursion tree to determine a good asymptotic upper bound on the given recurrence relation.

ii. Use the Master theorem to verify the answer obtained in part (i).

[4M] [CO3] [BTL 2]

(b) Suppose array A contains the following elements:

10, 12, 14, 21, 23, 28, 31, 37, 42, 44, 49, 53

Show step by step analysis to search 44 and 36 from the given array using binary search.

[4M] [CO1] [BTL 2]

Q.4 (a) Write the time complexity for the following functions for both array and singly linked lists.

i. `insert_at(index, val)`: inserts value `val` at `index`.

ii. `get_at(index)`: Returns value at `index`.

iii. `set_at(index, val)`: sets the value at `index` to `val`.

iv. `delete_first()`: deletes the entry at index 0 so that item at index i is now at index i-1 for all i.

In what kind of applications would you prefer Arrays over Singly Linked lists and vice versa?

[4 M] [CO3] [BTL 5]

(b) Consider the tree given in Figure 4.

i. Traverse the tree in-order.

ii. Traverse the tree in pre-order.

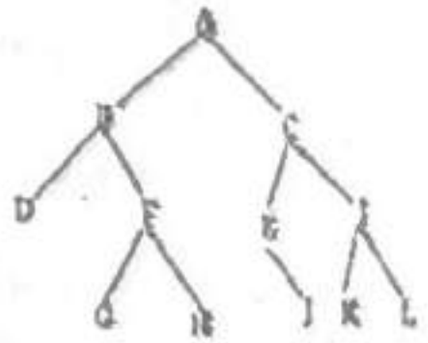

Figure 4

[4 M] [CO3] [BTL 3]

Q5 (a) Apply Kruskal's algorithm to find a Minimum Spanning Tree to the graph shown in Figure 5:

Vertices = {A, B, C, D}

Edges = {(A-B), (B-C), (C-D), (D-A), (B-D)}

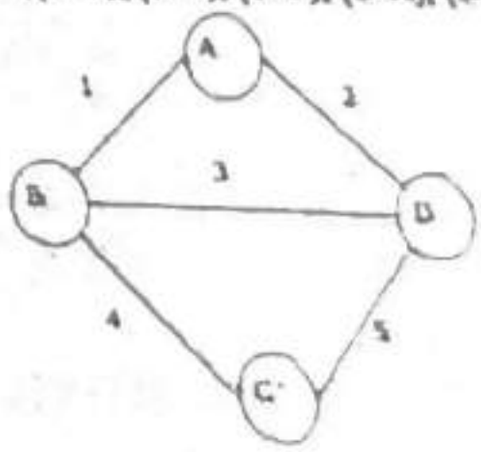

Figure 5

[4 M] [CO6] [BTL 3]

(b) Consider the graph given in Figure 6. Determine the shorte path from vertex A to vertex E using Dijkstra's algorithm. Wha

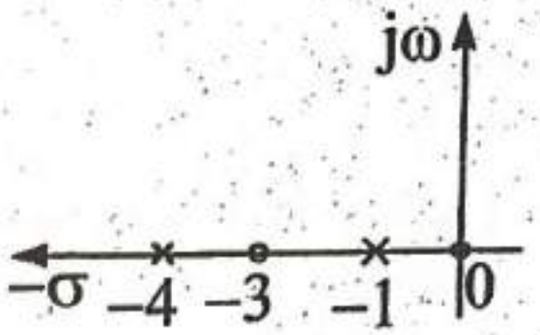

Fig. 5

6 Discuss the properties of LC immittance function. The input impedance for the network shown in Fig.6 is [10][CO5] [BTL2], [BTL5]

$$Z_{in}(s) = \frac{s^3 + 2s}{3s^4 + 2s^3 + 12s^2 + 4s + 9}$$

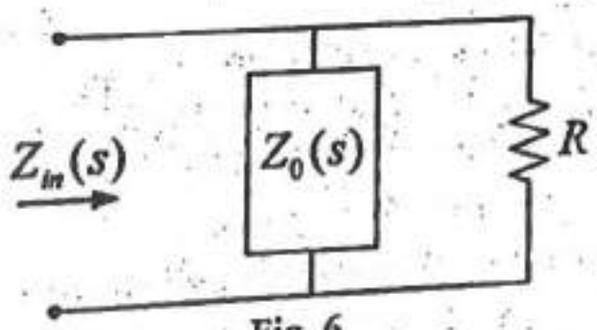

Fig. 6

If $Z_0(s)$ is LC network: (a) Find the value of R and the expression for $Z_0(s)$ (b) Synthesize $Z_0(s)$ as Foster parallel network and a Second Cauer network.

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Total No. of Pages 04 Roll No. __
SECOND SEMESTER B.TECH(EC)
END SEMESTER EXAMINATION MAY, 2025

EC104 Network Analysis & Synthesis

Time: 3Hours *Max. Marks: 50*

Note: Answer **ANY FIVE** questions. Any required data not explicitly given, may be suitably assumed. **Use the answer sheet space judiciously.** Symbols have their usual meanings.

1[a] Describe the complete response. Determine and analyze the type of response for v(t) and i(t) for all value of t in the circuit of Fig.1(a). [6][[CO1], [CO2], [CO3] [BTL2], [BTL3], [BTL4]

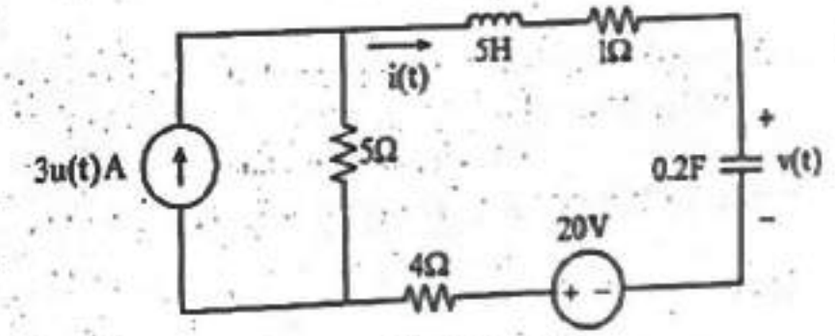

Fig.1(a)

1[b] Determine $i_1(t)$ and $i_L(t)$ for all value of t in the circuit of Fig.1(b). [4][CO1], [CO2], [CO3] [BTL3]

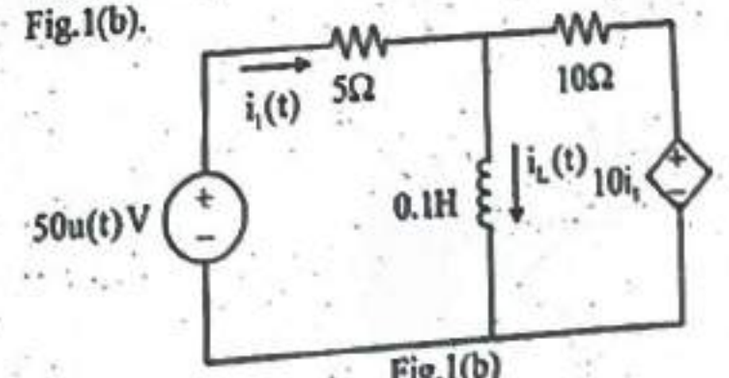

Fig.1(b)

2[a] In the circuit of Fig.2(a) switch has been closed for a long time and at t=0 it is opened. Determine and analyze the type of response for $i_L(t)$ and $i_C(t)$ for all value of t for this circuit. [6][CO1], [CO2], [CO3] [BTL3], [BTL4]

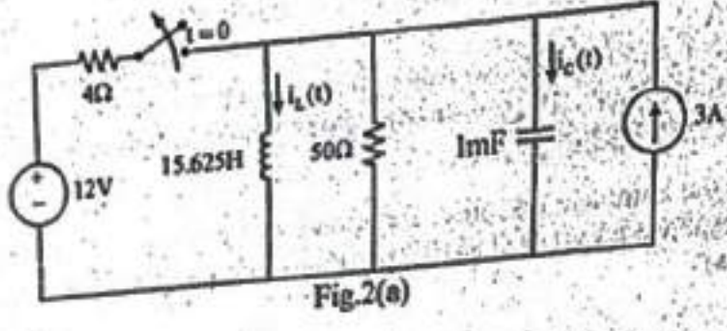

Fig.2(a)

2[b] Design and draw a RLC band pass filter with lower cutoff frequency of 1KHz and band width of 3KHz.What is the center frequency and quality factor of this filter? (Assume L=10mH) [4][CO1], [CO2] [BTL5]

3[a] Explain the open-circuit parameter for a two port Network. Networks a and b are connected as shown in the Fig.3(a). [6] [CO4] [BTL2], [BTL3]

Determine $\frac{V_o}{V_s}$. Where

$$[y_a]=\begin{bmatrix} 2mS & 0S \\ 0S & 10mS \end{bmatrix} and [h_b]=\begin{bmatrix} 0\Omega & 1 \\ -1 & 10mS \end{bmatrix}$$

{Hint: S is ℧ (mho), i.e. inverse of Ω (ohm)}

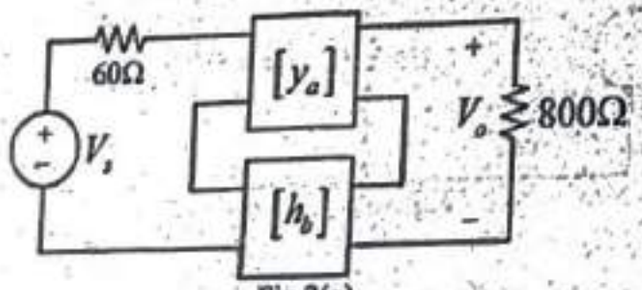

Fig.3(a)

3[b] Determine the ABCD (transmission parameter) for the network shown in Fig.3(b). [4] [CO4] [BTL3]

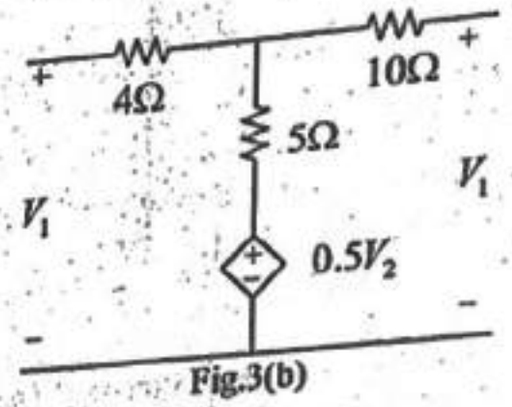

Fig.3(b)

4[a] Describe the properties of positive real function. Determine whether the given admittance function Z(s) is positive real. [5][CO5] [BTL2], [BTL3]

$$Z(s)=\frac{s^2+\frac{6}{5}s+\frac{6}{5}}{s^2+s+5}$$

4[b] Describe the properties of Hurwitz polynomial. Determine whether given polynomial is Hurwitz. [5][CO5] [BTL2], [BTL3]

$$P(s)=s^7+3s^6+3s^5+2s^4+s^3+3s^2+3s+2$$

5 Discuss the properties of RC impedance function. An impedance function has the pole-zero pattern shown in Fig.5. If Z(–2) = 2, find Z(s) and synthesize this in Foster's first form and Cauer's first form of realization. [10][CO5] [BTL2], [BTL5]

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SECOND SEMESTER **B.TECH.(EC)**

END SEMESTER EXAMINATION **MAY, 2025**

EC104 Network Analysis & Synthesis

Time: 3Hours *Max. Marks: 50*

Note: Answer **ANY FIVE** questions. Any required data not explicitly given, may be suitably assumed. **Use the answer sheet space judiciously.** Symbols have their usual meanings.

1[a] Describe the complete response. Determine and analyze the type of response for v(t) and i(t) for all value of t in the circuit of Fig.1(a). [6][[CO1], [CO2], [CO3] [BTL2], [BTL3], [BTL4]

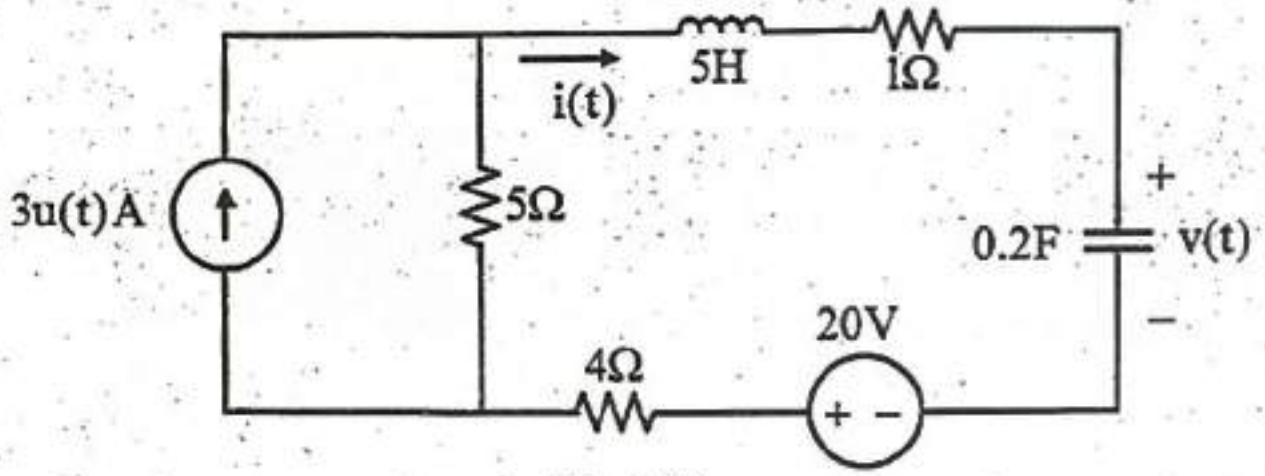

Fig.1(a)

1[b] Determine $i_1(t)$ and $i_L(t)$ for all value of t in the circuit of Fig.1(b). [4][CO1], [CO2], [CO3] [BTL3]

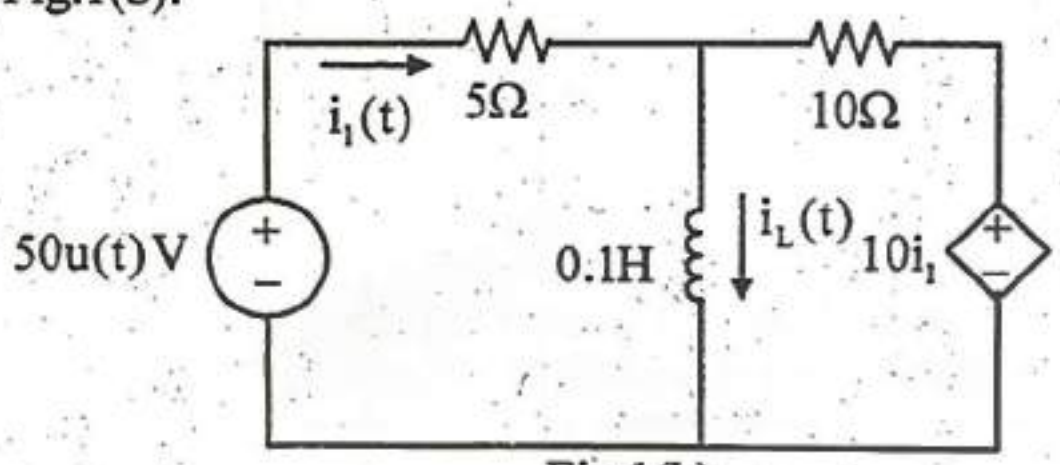

Fig.1(b)

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2[a] In the circuit of Fig.2(a) switch has been closed for a long time and at t=0 it is opened. Determine and analyze the type of response for $i_L(t)$ and $i_C(t)$ for all value of t for this circuit. [6][CO1], [CO2], [CO3] [BTL3], [BTL4]

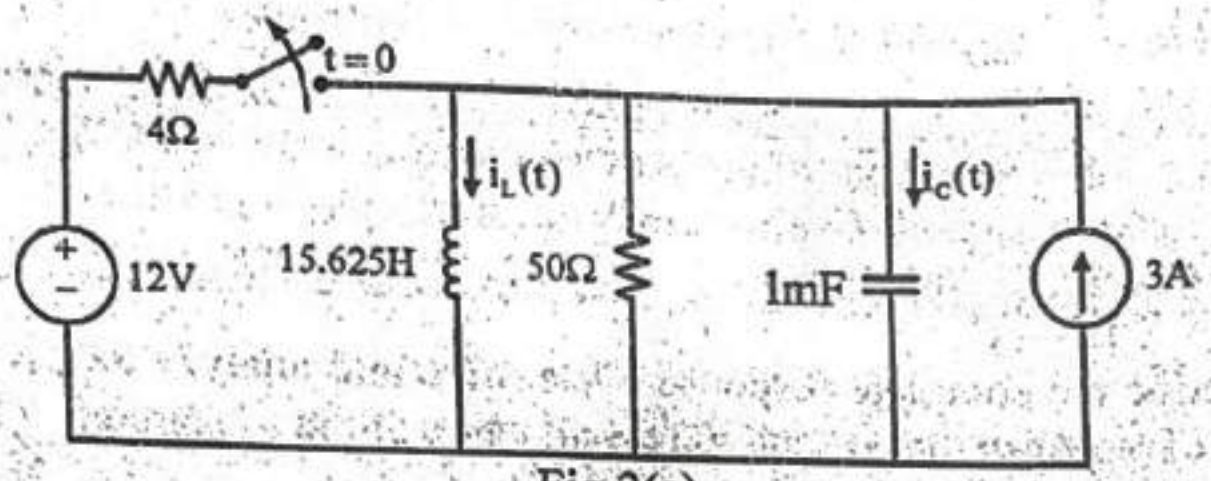

Fig.2(a)

2[b] Design and draw a RLC band pass filter with lower cutoff frequency of 1KHz and band width of 3KHz. What is the center frequency and quality factor of this filter? (Assume L=10mH) [4][CO1], [CO2] [BTL5]

3[a] Explain the open-circuit parameter for a two port Network. [6] [CO4] [BTL2], [BTL3]

Networks a and b are connected as shown in the Fig.3(a). Determine $\frac{V_o}{V_s}$. Where

$$[y_a]=\begin{bmatrix} 2mS & 0S \\ 0S & 10mS \end{bmatrix} and [h_b]=\begin{bmatrix} 0\Omega & 1 \\ -1 & 10mS \end{bmatrix}$$

{Hint: S is ℧ (mho), i.e. inverse of Ω (ohm)}

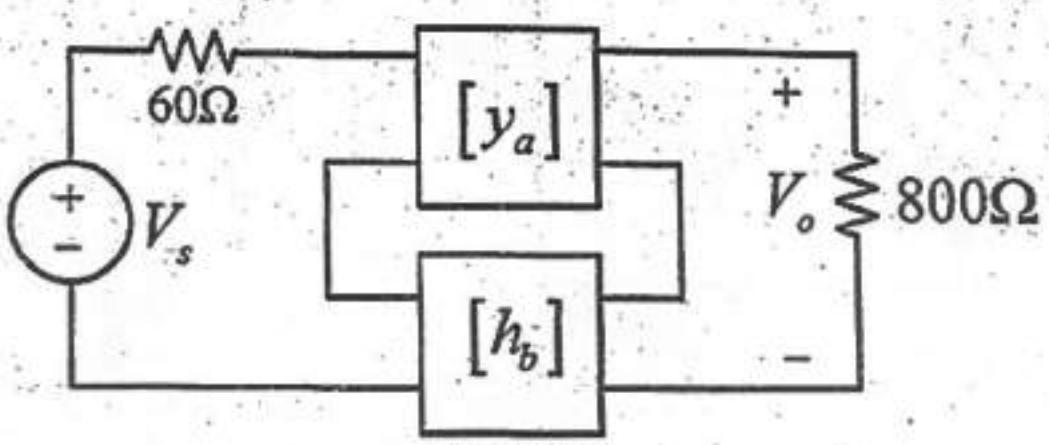

Fig.3(a)

225

3[b] Determine the ABCD (transmission parameter) for the network shown in Fig.3(b). [4] [CO4] [BTL3]

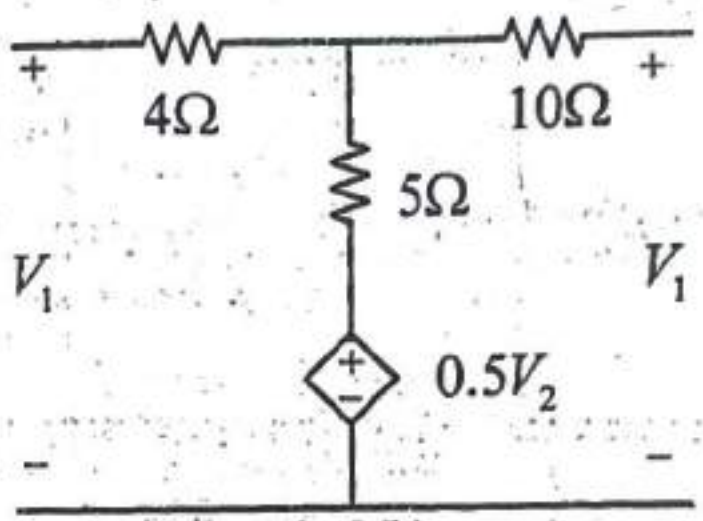

Fig.3(b)

4[a] Describe the properties of positive real function. Determine whether the given admittance function Z(s) is positive real. [5][CO5] [BTL2], [BTL3]

$$Z(s) = \frac{s^2 + \frac{6}{5}s + \frac{6}{5}}{s^2 + s + 5}$$

4[b] Describe the properties of Hurwitz polynomial. Determine whether given polynomial is Hurwitz. [5][CO5] [BTL2], [BTL3]

$$P(s) = s^7 + 3s^6 + 3s^5 + 2s^4 + s^3 + 3s^2 + 3s + 2$$

5 Discuss the properties of RC impedance function. An impedance function has the pole-zero pattern shown in Fig.5. If $Z(-2) = 2$, find Z(s) and synthesize this in Foster's first form and Cauer's first form of realization. [10][CO5] [BTL2], [BTL5]

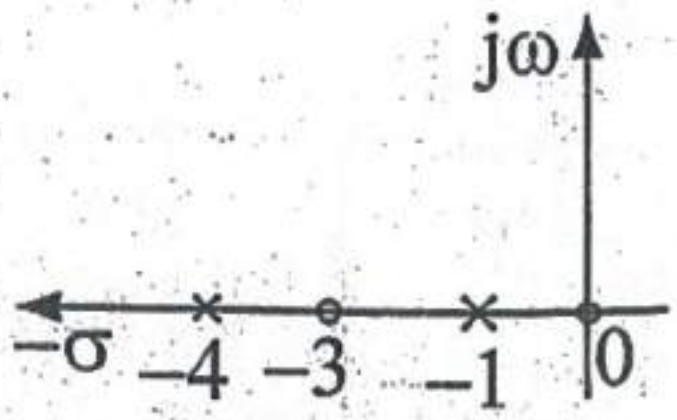

Fig. 5

6 Discuss the properties of LC immittance function. The input impedance for the network shown in Fig.6 is [10][CO5] [BTL2], [BTL5]

$$Z_{in}(s)=\frac{s^3+2s}{3s^4+2s^3+12s^2+4s+9}$$

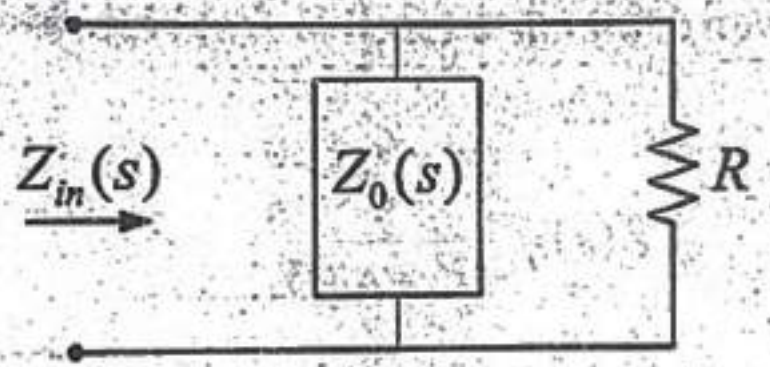

Fig. 6

If $Z_0(s)$ is LC network: (a) Find the value of R and the expression for $Z_0(s)$ (b) Synthesize $Z_0(s)$ as Foster parallel network and a Second Cauer network.

-END-

Total no. of Pages: 02 Roll no.....

IV SEMESTER

B.Tech (Electronics & Communication Engineering)

END TERM EXAMINATION ***MAY-2025***

EC202n / EE262 ELECTROMAGNETICS

Time: 3:00 Hours ***Max. Marks: 50***

Note: Attempt any five questions.
Assume suitable missing data, if any.

Q.1[a] Find a unit vector, which is normal to a surface given by $xy^2 + 3xz^2 = 0$ at point P(1,-3, 2). [3][CO1] [L5]

[b] Prove that the divergence of the curl of any vector field is zero. [3][CO1][L3]

[c] Derive the Helmholtz equation for electric field & magnetic field from the Maxwell's equation. [4][CO1][L2]

Q.2[a] The conductivity of sea water $\sigma = 5$ S/m and $\varepsilon_r = 100$. What is the range of EM wave (distance travel by EM wave) 'corresponds to 99% attenuation at 20 KHz and 50 MHz. [4][CO2][L5]

[b] What is Brewster's angle? Derive formula for Brewster's angle in case of perpendicular and parallel polarised oblique incidence. [3][CO2][L3]

[c] In free space ($x \leq 0$), a plane wave with $\mathbf{E} = 5\ \mathrm{Cos}\ (10^8\, t - \beta x)\ a_y$ V/m is incident normally on a lossless medium ($\varepsilon_{r1} = 2$, $\mu_{r1} = 5$) in region $x \geq 0$. Determine magnetic field components of transmitted and reflected wave. [3][CO2][L5]

Q.3[a] In a Non-magnetic medium, $E = 5\sin(2\pi \times 10^7 t - 0.5x)\,\widehat{a_z}\ V/m$. Calculate the average power carried by the wave and total power passing through 20 cm^2 area of plane $x + 2y = 10$. [5][CO3] [L6]

[b] Calculate power of transmitted and reflected wave if wave transmitted from free space (first medium) to second medium ($\varepsilon_{r2} = 2$, $\mu_{r2} = 5$ and $\sigma = 0$) with normal incidence and electric field in first medium is $\mathbf{E} = 10\ \mathrm{Sin}\ (10\pi \times 10^6\, t - \beta x)\ a_z$ V/m. [5][CO3][L5]

Q.4[a] Prove that distance between consecutive current maxima and current minima is $\lambda/4$ for open circuit transmission line. [4][CO4][L3]

[b] Calculate VSWR of lossless transmission line if L= 0.4 μH/m, C = 40 pF/m, f = 100 MHz, Length = 50 m and $Z_L = (50 + j\,100)\ \Omega$. [3][CO4] [L5]

[c] What is need of impedance matching of transmission line? Explain λ/4 impedance matching techniques with advantages and limitations. [3][CO4][L2]

Q.5[a] Prove that for rectangular waveguide wave propagation is possible only if $f \geq fc$. [4][CO5][L3]

[b] An open wire transmission line having characteristic impedance of 50 Ω is terminated by a resistive load of 20 Ω. Give arrangements for single stub and double stub matching. [6][CO4][L5]

Q.6[a] Explain the following terms related to rectangular waveguide: -

i) Dominant Mode

ii) Power losses [2 + 4][CO5][L1]

[b] Calculate the values of λ_g, V_g and Z_g for all possible modes of (3 x 2) cm rectangular waveguide for 25 GHz signal. [4][CO5][L4]

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Total no. of Pages:04

4th SEMESTER

Roll no.....

B.Tech. ECE

END TERM EXAMINATION

May-2025

COURSE CODE: EC204

Digital Design II

Time: 03:00 Hours

Max. Marks: 40

Note : All questions carry equal marks:
Attempt any 5 questions
Assume suitable missing data, if any.

Q.1[a]Using enumerated type, design a VHDL description of the following FSM. Also use attribute to perform one-hot state assignment:

[4][CO1][BTL1,2,3]

PS	NS (AB)				Z
	00	01	10	11	
INIT	A0	A0	A1	A1	0
A0	OK0	OK0	A1	A1	0
A1	A0	A0	OK1	OK1	0
OK0	OK0	OK0	OK1	A1	1
OK1	A0	OK0	OK1	OK1	1

Q.1[b] Explain the different types of delays available in VHDL. Also state their significance/applications. [4][CO1][BTL1,2,4]

Q.2[a] A sequential circuit has one input and one output. When the input sequence "110" occurs, the output becomes 1 and remains 1 until the sequence "110" occurs again, in which case the output returns to 0. The output remains 0 until "110" occurs a third time, etc Develop a mealy FSM for the circuit. [2][CO2][BTL3,4,6]

Q.2[b]Minimize the following incompletely specified state table using the merger table method. Also, draw its compatibility graph showing a closed covering.

[6][CO3][BTL1,2,3,4]

PS	NS, Z			
	I1	I2	I3	I4
A	-	A,1	E,1	B,1
B	E,0	-	-	-
C	F,0	F,1	-	-
D	-	-	B,1	-
E	-	F,0	C,0	D,1
F	A,0	-	B,0	A,1

Q.3 Explain the difference between critical and non-critical race with the help of an example. An asynchronous sequential circuit has two inputs (a and b) and two state variables x and y, where the next state variables are given by:

X= a'b +by'+x

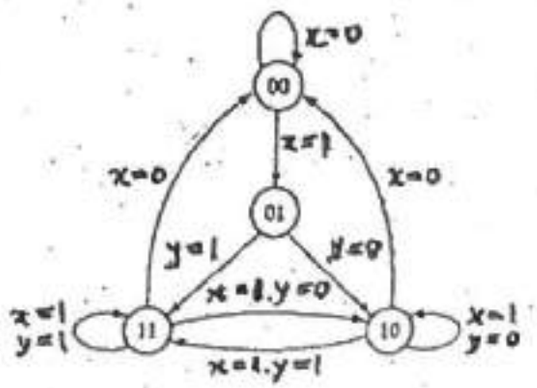
Y=ab+by+y'a'b'+a'b'x'

[a] Find all the races in this circuit and indicate those that are critical and those that are not.

[b] Find another assignment that contains no critical races.

[c] Are there any possibilities of hazards in this circuit? Suggest a solution to avoid those hazards. [8][CO4][BTL1,2,3,4]

Q4[a] Design the control using multiplexers whose state diagram is given Below- [4][CO5][BTL1,2,3,4,6]



[4][CO5][BTL1,2,3,4,6]

Q.4[b] An asynchronous sequential circuit with two inputs, x1 and x2, and one output, z. The initial input state is x1=x2=0. The output value is to be 1 if and only if the input state is x1=x2=1 and the preceding input state is x1=0,x2=1. Design the primitive flow table for the circuit.

[4][CO3][BTL,2,3,6]

Control Input	Present State	Next State
0	1000	1000
0	0100	0100
0	0010	0010
0	0001	0001
1	1000	0100
1	0100	0010
1	0010	0001
1	0001	1000

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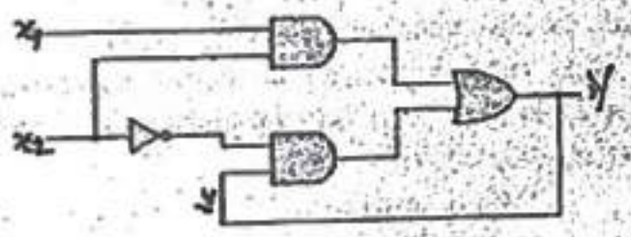
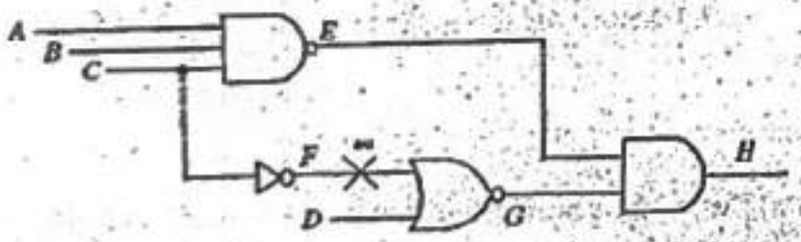
Q.5[a] Redesign the circuit given below using an SR latch. What advantage does one get in redesigning this circuit using an SR latch?

[4][CO3][BTL,2,3,4,5,6]



Q.5[b]Determine all the test vectors to detect a stuck-at-1 fault on line F in the Figure below. [4][CO4][BTL 2, 3,4]



Q.6[a]Implement the following Boolean function on PLA, PAL (4- input OR gate) and ROM (of suitable size): [4][CO5][BTL1,2,3,4,]

F (A, B, C) = π (0,3,6,7).

Q.6[b] Develop a state diagram and an ASM chart for a 4-bit rotate right shift register as shown in the Table below. Consider that the initial value is 1000

Total no. of Pages: 03 Roll no.....

3rd SEMESTER

B.Tech (ECE)

END TERM EXAMINATION ***May-2025***

EC 206 Communication Systems

Time: 03:00 Hours *Max. Marks: 40*

Note: All questions carry equal marks.
Assume suitable missing data, if any.

ATTEMPT ANY 4 QUESTIONS

Q.1 a) An AM signal contains 500W at its carrier frequency and 100W in each of its sidebands. [3] [CO1] [L3]

a) Determine the percentage modulation of the AM signal

b) Determine the power allocation (Carrier and Sidebands) if percentage modulation change to 60%.

b) Define modulation and explain its need in communication systems. [2] [CO1] [L1]

c) Explain the working of a balanced modulator. Draw its block diagram and discuss how it is used to generate a DSB-SC signal. Also, describe what happens if there is a phase mismatch during demodulation. [5] [CO2] [LT 2]

Q.2 a) Explain the Sampling Theorem with a detailed proof using frequency domain analysis. [2] [CO3] [L2]

b) Draw the block diagram of a Pulse Code Modulation (PCM) system and compare it with a Differential Pulse Code Modulation (DPCM) system. [3] [CO3] [L2]

c) An FM signal is given by [5] [CO2] [L 3]

$$s(t) = 5cos(4\pi * 10^6 t + 4sin(10\pi * 10^3 t))$$

Determine:

Total No. of Pages: 03 *Roll no.* _____

II SEMESTER

B.Tech. (MCE)

END TERM EXAMINATION ***May-2025***

MC102 DISCRETE STRUCTURES

Time: 3:00 Hours ***Max. Marks: 50***

Note: Assume suitable missing data, if any.

Q.1 Let P(x): x is even, Q(x): x is prime. Infer and translate the following into English: **[2][CO2][L4]**

a) $\forall x \in Z, P(x) \rightarrow \neg Q(x)$

b) $\exists x \in N, Q(x) \wedge P(x)$

Q.2 The Fibonacci sequence is defined as F(0)=0, F(1)=1, F(n)=F(n−1)+F(n−2). **[3][CO1][L4]**

Prove by induction: $F(1)+F(3)+\cdots+F(2n-1)=F(2n)$ for $n \geq 1$.

Q.3 From a committee consisting of 6 men and 7 women, in how many ways can be selected a committee of: **[5][CO3][L4]**

a) 3 men and 4 women

b) 4 members which has atleast 1 woman.

c) 4 members which has atleast 2 men.

d) 4 members of both genders

e) 4 persons in which Mr. and Mrs. Kannan is not included

Q.4 Write a short note on operations on a set with the help of an example. **[5][CO1][L4]**

Q.5 Let R be a relation on R^2 where $(x_1, y_1)R(x_2, y_2)$ iff $x_1^2 + y_1^2 = x_2^2 + y_2^2$. **[2+3][CO1][L1]**

a) Show that R is an equivalence relation.

b) Describe the partition induced by R. What do the equivalence classes represent geometrically?

Q.6 Let the recurrence relation be: **[5][CO1][L3]**

$a_0 = 1, a_1 = 1, a_2 = 2, a_n = 5a_{n-1} - 8a_{n-2} + 4a_{n-3} = 0$ for $n \geq 3$.

Use generating functions to determine a closed-form expression for a_n.

Q.7 Let G be a group and let H and K be subgroups of G.

[2+3+3][CO3][L3]

a) Prove that the intersection $H \cap K$ is also a subgroup of G.

b) Show by example that the union $H \cup K$ is not necessarily a subgroup of G

c) Determine the necessary and sufficient condition under which $H \cup K$ is a subgroup of G. Prove your claim.

Q.8 Check whether Q_8 is a group. Is it an abelian group? **[2][CO3][L3]**

Q.9 Consider $L = \{0, 5, 10, 15, 20, 25\}$ with the following operations:

Meet: $a \wedge b = \gcd(a, b)$

Join: $a \vee b = \text{lcm}(a, b)$

Analyse if this structure is a lattice. Identify the least and greatest elements. **[5][CO4][L4]**

OR

Q.10 Let $G = M_2(Z_6)$, the group of 2x2 matrices over Z_6 under addition modulo 6, and $H = Z_3$ under addition. Define $\varphi: G \rightarrow H$ by $\varphi(A) = (a+d) \bmod 3$, where $A = [[a, b], [c, d]]$. **[2+3][CO2][L3]**

a) Determine the image of φ.

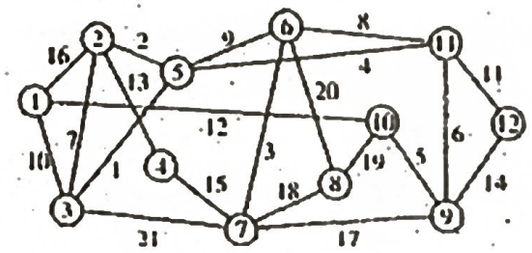
b) Justify whether φ is injective or surjective.

Q.11 Use a 3-variable Karnaugh Map to minimize the following Boolean function in both SOP and POS forms: **[5][CO4][L5]**

F(A, B, C)=A'B'C+A'BC' + AB'C' + ABC + A'BC + AB'C + A'B'C'

Construct the K-map for the given function. Find the minimized SOP (Sum of Products) form. Find the minimized POS (Product of Sums) form.

Q.12 Define the minimum spanning tree. Consider the following graph. If we start with node 10 as the starting node and use Prim's algorithm to design a minimum spanning tree, state the order in which nodes will be accessed. Also, compute the minimum total weight. **[5][CO5][L1]**



OR

Q.13 Draw and illustrate the resultant tree with the following traversals:

Preorder: G, B, Q, A, C, K, F, P, D, E, R, H

Inorder: Q, B, K, C, F, A, G, P, E, D, H, R

Also, determine the postorder traversal of the tree. **[5][CO5][L4]**

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Total No. of Pages: 02

Roll No:.....

SECOND SEMESTER

END SEMESTER EXAMINATION

B.Tech.

May, 2025

MC104 - Complex Analysis

Time: 3 Hr.

Max. Marks: 50

Note: Attempt any five questions. Each question carry equal marks.

[5] CO-1 [L-3] 1. (a) Show that the triangle with vertices z_1, z_2 and z_3 is equilateral if

$$\frac{1}{z_1 - z_2} + \frac{1}{z_2 - z_3} + \frac{1}{z_3 - z_1} = 0.$$

[5] CO-1 [L-2] (b) Define stereographic projection. Hence, find a point in the complex plane corresponding to $(1/3, -2/3, 2/3)$ on the Riemann sphere $X^2 + Y^2 + Z^2 = 1$.

[5] CO-2 [L-4] 2. (a) Show that the function $f(z) = \sqrt{|xy|}$ is not analytic at the origin even though the Cauchy-Riemann equations are satisfied at origin.

[5] CO-2 [L-2] (b) Determine the harmonic conjugate $v(x, y)$ of $u(x, y) = e^x \cos y$ and the analytic function $f(z) = u + iv$.

[5] CO-3 [L-4] 3. (a) Construct a bilinear transformation that maps the points $z = 1$, i and -1 onto the points $w = i$, 0 and $-i$.

[5] CO-3 [L-1] (b) Define conformal mapping and determine where the complex mapping $f(z) = \cos(z^2 + z)$ is conformal.

[5] CO-4 [L-3] 4. (a) Evaluate $\int_C \frac{z^3}{(z-2)^4} dz$, where C is the circle $|z - 2| = 1$.

(b) Apply deformation of contours to evaluate $\int_C \frac{dz}{z^2+1}$, where C is the circle $|z|=4$. [5] CO-4 [L-4]

5. (a) Find the circle and radius of convergence of the given power series [5] CO-5 [L-5]

(a) $\sum_{k=0}^{\infty} \frac{(z-2i)^k}{(1-2i)^{k+1}}$ (b) $\sum_{k=0}^{\infty} (1+3i)^k (z-i)^k$

(b) Expand $f(z) = \frac{1}{(z-1)^2(z-3)}$ in a Laurent series valid for $0<|z-3|<2$. [5] CO-5 [L-5]

6. (a) State Cauchy residue theorem and use it to evaluate $\oint_C \frac{e^z}{z^4+5z^3} dz$, where the contour C is the circle $|z|=2$. [5] CO-5 [L-6]

(b) Find the image of infinite strip $1/4 < y < 1/2$ under the transformation $w = 1/z$. [5] CO-3 [L-6]

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Total No. Of Pages: 01 *Roll No.....*

Third Semester

B.Tech.

End term Examination **May, 2025**

MC 202 Real Analysis

TIME : 3 Hours **Max Marks : 50**

NOTE: Attempt all questions. All questions carry equal marks.

Q1 (a) Prove that a subset bounded below in R has its infimum.

(b) State and prove Archimedean property of real numbers.

Q2 State and prove Bolzano-Weierstrass theorem for sequences.

Q3 Let (X ,d) be a metric space. Show that d_1 defined by $d_1(x, y) = \min\{1, d(x, y)\}$ for all x and y in X is a metric on X. Show that an open set in (X , d) is open in (X , d_1).

Q4 Show that a mapping f from a metric (X , d) to a metric space (Y , e) is continuous if and only if the inverse image under f of any open set in Y is open in X.

Q5 Define a Cauchy sequence. Give an example and justify that a Cauchy sequence need not converge in a metric space.

Q6 Show that a real valued continuous function defined on [a ,b] is Riemann integrable. Give a non-continuous function on [a, b] which is Riemann integrable.

Total no. of Pages:03

4th SEMESTER

Roll no.....

B.Tech./B.Des./BBA/BAE/MAE/M.Sc./M.Des./M.Tech./MBA/EMBA/MBA(BA) Ph.D/ B.Tech. (Eve)

END TERM EXAMINATION

May-2025

COURSE CODE **MC202** COURSE TITLE **OPERATING SYSTEMS**

Time: 03:00 Hours

Max. Marks: 40

Note : All questions carry equal marks. DO ANY 5
Assume suitable missing data, if any.

Q1. [a, b]– CO1, [c, d] – CO3, [a, b] – BTL 2, [c, d] – BTL 2, (2+2+2+2)

a. State True/false and justify the answer
   1) Batch operating systems require user interaction during the execution of jobs.
   2) Time-sharing operating systems do not support the concept of multiprogramming.

b. What is the difference between a mode switch and a process switch?

c. Describe the problems and advantages of One to One and Many to one Multi-Threading Models.

d. List the resources, that are typically shared by all the threads of a process?

Q2. [a] – CO3, [b] – CO3, [a] – BTL3, [b] – BTL 3, (5+3)

a. Consider a paging system with a page table stored in memory. Suppose: TLB lookup time = 20 ns, TLB hit ratio = 80% and memory access time = 75 ns. swap page time = 500,000 ns and 50% of pages are dirty. OS uses a single level page table.
   1. What is the effective access time (EAT) if we assume the page fault rate is 0%? (Show your work.) Assume the cost to update the TLB, the page table, and the frame table (if needed) is negligible.
   2. What is the effective access time (EAT) if we assume the page fault rate is 10%?

   (Show your work.) Assume the cost to update the TLB, the page table, and the frame table (if needed) is negligible.

Consider logical address space of eight pages of 1024 bytes each mapped onto a physical memory of 32 frames.

i. How many bits are there in the logical address?

ii. How many bits are there in the physical address?

Q3. [a] – CO4, [b] – CO4, [a] – BTL 3, [b] – BTL 3, (5+3)

a. Consider the following snapshot of a system:

Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	3	0	2	1	4	2	4	2	1	0	0	0
P1	0	1	0	1	0	2	2	2				
P2	1	2	0	0	3	2	1	0				
P3	0	1	1	2	1	1	1	2				
P4	0	0	1	1	1	0	2	1				

i. What is the content of the Need matrix?

ii. Is the system in a safe state? If yes, give a safe sequence of processes. If not, explain why the system is not in a safe state.

iii. If a request from process P4 arrives for (1,0,0,0), can the request be granted immediately? Please state the reason.

b. Assume you have a system in which there is circularity in the wait-for graph of the system. Is this a definitive sign of a deadlock? Justify your answer with the help of an example.

Q4. [a], – CO5, [b, c] – CO5, [a] – BTL 1, [b; c] – BTL1 (4+2+2)

a. Write a short on the following
   a. Interrupts and Traps
   b. On-disk and In-memory data structures for File management
b. State four system calls used each for Inter Process Communication
c. List and briefly explain five storage management responsibilities of a typical OS.

Q5. [a] – CO2, [b] – CO2, [a] – BTL 5, [b] – BTL 3, (4+4)

a. Does the following solution to the critical section problem for two processes satisfy the desired mutual exclusion requirements? Justify your response by discussing each of the critical section requirements, if the solution is correct; or one of the critical section requirements, if the solution is not correct.

have two flags (shared variables): Cole and Lope
have neon sign (shared variable) which flashes either "Nicole" or "Penelope"
initially: both flags are down and sign flashes "Nicole"

```
Nicole
repeat
  [play with kids];
  raise Cole;
  while (Lope is up) {
     if (SIGN == Penelope) {
        lower Cole;
        while (SIGN == Penelope)
             [do nothing];
        raise Cole;
     }
  }
  [eat dinner];
  SIGN = Penelope
  lower Cole;
forever;
```

```
Penelope
eat
 [call Tom];
 raise Lope;
 while (Cole is up) {
    if (SIGN == Nicole) {
       lower Lope;
       while (SIGN == Nicole)
            [do nothing];
       raise Lope;
    }
 }
 [eat dinner];
 SIGN = Nicole
 lower Lope;
forever;
```

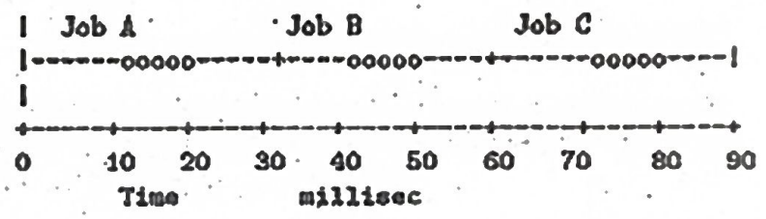
b.

Suppose that a disk drive has 5000, cylinders numbered from 0 to 4999. This drive is currently a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests in FIFO order is 86, 1470, 913, 1774, 130. Starting from the current head position, what is the total distance (in cylinder) that the disk arm moves to satisfy the entire pending request for the following disk scheduling algorithms?

a. SSTF
b. LOOK

Q6. [a] – CO1, [b] – CO2, [a] – BTL 4, [b] – BTL 4, (5+3)

a. The figure below shows how three jobs would run on a single user system like Linux. Explain how multitasking can increase the throughput of the system.



b. Consider the set of process:

Process ID	Arrival Time	Burst Time
P1	0	5
P2	0	10
P3	4	15
P4	18	10
P5	22	20

Draw the GANTT chart for the **Round Robin** (time quantum = 5) scheduling algorithm and calculate the Average Waiting time and Average Turnaround time.

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B.Tech.

nd Term Examination MAY-2025

MC- 204 (scientific computing)

ime : 3:00 Hrs Max Marks = 40

NOTE : Attempt any five questions. All questions carry equal marks.

Assume any missing data.

1. Compute the values of y(0.1), y(0.2) and y(0.3) with Runge-Kutta fourth order method for the initial value problem

$$\frac{dy}{dx} = x + y,\ y(0) = 1,$$

Use Milne method to compute y(0.5) with step size h = 0.1 till last two consecutive iterations are equal up to five decimal places. [CO-5]

[L-1,2,3,4][8]

2. (a) Prove that if the coefficient matrix A of the linear system Ax=b is strictly diagonally dominant then the Gauss- Seidel method converges for any initial iterate.

(b) Apply Newton-Raphson's method to determine a root of the equation

$$f(x) = \cos x - x e^x = 0$$

such that $|f(x_*)| < 10^{-8}$, where x_* is the approximation to the root. Take the initial approximation as $x_0 = 1$.

[4+4] [CO-1,2][L-2,4]

3. (a) Construct the divided difference table for the following data, find the interpolating polynomial and an approximation to the value of f(7).

x	0.5	1.5	3.0	5.0	6.5	8.0
f(x)	1.625	5.875	31.0	131.0	282.125	521

(b) Show that

(i) $\delta = \nabla(1-\nabla)^{-1/2}$, (ii) $\mu = \left[1 + \frac{\delta^2}{4}\right]^{1/2}$

[5+3] CO-3][L-3,5,6]

4. Given the following values of f(x) = log x, find the approximating value of f'(2.0) and f'' (2.0) using newton interpolation.

i	0	1	2
x_i	2.0	2.2	2.6
f_i	0.69315	0.78846	0.95551

[8][CO-4.5][L-1,5]

5. (a) Given the initial value problem

$u' = -2t u^2$, $u(0) = 1$ on [0,1] with h = 0.2,

estimate u(0.4) using the modified Euler method.

(b) Calculate the spectral radius, l_1, l_∞ and Frobenius norm of the matrix

$$\begin{bmatrix} 1 & -2 & -2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$$

[4+4][CO-2,5][L-1,2,5]

6. (a) Find the missing term of the following table using lagrange's interpolation

x	0	1	2	3	4
y	1	3	9	_	81

(b) Find the approximate value of

$$I = \int_1^2 e^{x^2}\, dx$$

using (i) trapezoidal rule, (ii) simpson's 1/3 rule.

[4+4][CO-3,5][L-4,5,6]

c) Differentiate between Complexity Classes NP and NP complete with the help of suitable examples. (3) [CO][BTL2]

5)

a) Describe independent set problem? Prove that the independent set problem is NP-complete (Hint: Use an instance of 3-SAT problem to prove). (5) [CO4][BTL5]

OR

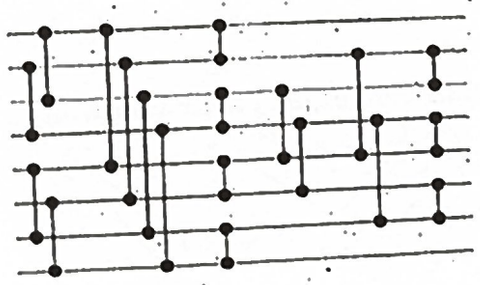
Describe set cover problem? Prove that the vertex cover problem reduces to set cover (Hint: Use an instance of vertex cover problem to prove). (5) [CO4][BTL5]

b) Compute Prefix Function utilised for Knuth Morris Pratt string matching method to calculate the π table is as follows:

```
COMPUTE-PREFIX-FUNCTION(P)
1  m ← length[P]
2  π[1] ← 0
3  k ← 0
4  for q ← 2 to m
5       do while k > 0 and P[k + 1] ≠ P[q]
6            do k ← π[k]
7       if P[k + 1] = P[q]
8         then k ← k + 1
9       π[q] ← k
10 return π
```

Apply the above algorithm on pattern P = a b a b a b a b c a to obtain π table. Derive the time complexity of Compute Prefix Function. (3) [CO5][BTL3]

c) Apply the following sorting network on (37, 5, 82, 19, 46, 11, 68, 23) inputs and verify whether the network is valid or not? (2)[CO5][BTL4]



**********All the Best**********

Total No. of Pages: 04 *Roll No.:.....*

IV SEMESTER
B.Tech.

END TERM EXAMINATION **May-2025**
MC 206/CS 262 Algorithm Design and Analysis

Time: 3 Hours **Max. Marks: 50**

Note: Attempt all questions. Assume suitable missing data, if any.

1) Solve the following recurrences

a) Evaluate the time complexity of following snippet of code:

```
for(i=1; i<=n; i++)
    for(j=1; j<=n; j=j*2)
        x=x+1;
```

(2) [CO2][BLT2]

b) Solve for x using Chinese remainder theorem

$x \equiv 7 \pmod{11}$
$x \equiv 5 \pmod{7}$ (2) [CO5][BTL3]

c) Describe edge relaxation process. Explain consequences of applying Dijkstra method on a graph with negative weight cycle for single source shortest path (SSSP) problem. (3) [CO3][BLT4]

d) Discuss the category of problems for which backtracking or branch & bound approaches works better in comparison to dynamic programming approaches using a real-world problem with proper justification. (3)[CO1][BLT5]

2)

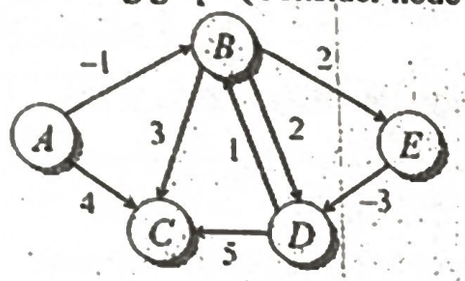
a) The change-making problem addresses the question of finding the minimum number of coins (of certain denominations 1₹, 2₹, 5₹, and 10₹) that add up to a given amount of money. Design a greedy algorithm to solve the problem. A coin system is canonical if the greedy algorithm always yields the minimum number of coins required to make change for any amount. Show that a coin system with denominations 1₹, 3₹, and 4₹ is not canonical (5) [CO3][BTL6]

OR

Given an array A which stores 0 and 1, such that each entry containing 0 appears before all those entries containing 1. One of the instances is {0, 0, 0,..., 0, 0, 1, 1,..., 111}. Design an algorithm to find out the small

index i in the array A such that A[i] = i with O($logn$) time complexity algorithm along with correctness? (5)[CO3][BTL6]

b) Discuss how Bellman-Ford algorithm overcomes the problem discussed in Question 1(c). Apply the Bellman-Ford algorithm on the following graph (Consider node A as source).



(5) [CO3][BTL6]

3)

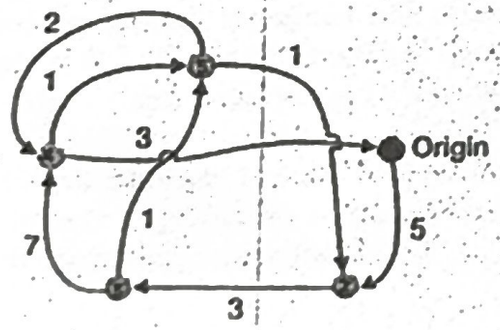
a) Justify why dynamic programming is the appropriate method for some of optimization problems. Given four matrices M1, M2, M3 and M4 with dimensions (4×10), (10×3), (3×6), and (6×5) respectively, find the optimal parenthesization which takes minimum scalar multiplication. (5) [CO2][BTL5]

OR

Justify why dynamic programming is the appropriate method for some of optimization problems. Apply dynamic programming on the following instance of 0/1 knapsack problem with knapsack capacity 5 unit. (5) [CO2][BTL5]

Item	Weight	Value
1	2	$40
2	2	$40
3	3	$50
4	5	$85

b) Explain the problem statement of Travelling Salesman along with time complexity for solving the problem using Dynamic programming. Apply the Dynamic Programming on the following network to solve TSP problem.



(5) [CO3][BTL3]

4)

a) Differentiate between the branch & bound and backtracking approach. Discuss least-cost branch and bound in brief. Apply branch & bound on the following instance of 0/1 knapsack problem with knapsack capacity 5 unit.

Item	Weight	Value
1	2	$40
2	2	$40
3	3	$50
4	5	$85

(5) [CO1][BTL5]

OR

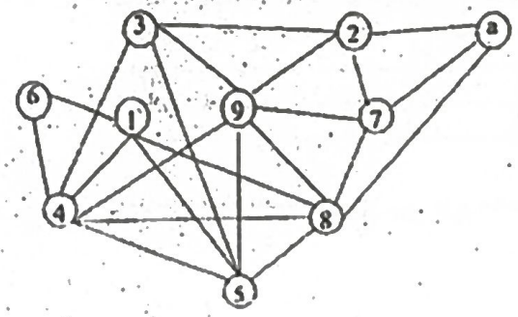
Differentiate between the branch & bound and backtracking approach. Given a set of positive integers and a target sum, the Subset Sum Problem aims to answer the whether there exists a subset of the numbers whose sum is exactly equal to the target. Design backtracking algorithm to solve subset sum problem and discuss its time complexity using. Apply the approach on set S = {3, 34, 4, 12, 5, 2} with the target sum T = 9, to determine whether there exists a subset of S that sums to 9. (5) [CO1][BTL5]

b) The approximation algorithm to find the min vertex cover is given as:

APPROX-VERTEX-COVER(G)

```
1  C ← ∅
2  E' ← E[G]
3  while E' ≠ ∅
4        do let (u, v) be an arbitrary edge of E'
5           C ← C ∪ {u, v}
6           remove from E' every edge incident on either u or v
7  return C
```

Apply above algorithm on the following graph.



(2)[CO5][BTL3]

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Total No. of Pages: 02

FOURTH SEMESTER

Roll No:.....

B.Tech[MC]

END SEMESTER EXAMINATION

May 2025

MC208, Linear Algebra

Time: 3.0 Hours

Max. Marks: 50

Note: ***QUESTION-1 IS COMPULSORY*** *. Attempt* ***ANY*** *eight questions from Questions 2-11. All questions carry 5 marks except Q1. Assume suitable missing data, if any.*

1. State and prove Rank-Nullity theorem. [10 marks] [CO-1,2][L-2]

2. let $T : V_3 \to V_3$ be the linear transformation defined as $T(x, y, z) = (x + 2y - z, x - y + z, x + y + z)$. Find a basis and dimension of its range and kernel. [CO-3][L-2,3]

3. Find a linear transformation $T : V_3 \to V_3$ such that the set of all vectors (x_1, x_2, x_3) satisfying the equation $x_1 - 3x_2 + 2x_3 = 0$ is the range of T. [CO-3][L3,4]

4. Let W_1 and W_2 be the subspaces of R^4 given as

   $W_1 = \{(a, b, c, d) : b+c+d = 0\}$ *and* $W_2 = \{(a, b, c, d) : a+b = 0, c = 2d\}$

   Find the basis and dimension of $W_1 + W_2$ and $W_1 \cap W_2$. [CO-3][L-2,4]

5. Transform the given basis $\{(1, 1, 1, 1), (1, 1, 2, 4), (1, 2, -4, -3)\}$ of a subspace W in R^4 into the orthonormal basis of W. [CO-4][L-3,4]

6. Let V be an inner product space and $x, y \in V$, then prove that

   $$\|x + y\|^2 + \|x - y\|^2 = 2(\|x\|^2 + \|y\|^2)$$

   [CO-3,5][L-3, 4]

7. Write the symmetric matrix corresponding to the quadratic form

   $$Q(x, y, z) = 2x^2 + 2xy + 3y^2 + 2xz + 4yz + 5z^2$$

   and check whether $Q(x, y, z) > 0 \ \forall \ \{x, y, z\} \neq 0$? [3+2][CO-4][L-2, 5]

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Total No. of Pages: 02

FOURTH SEMESTER

Roll No:.....

B.Tech[MC]

END SEMESTER EXAMINATION

May 2025

MC208, Linear Algebra

Time: 3.0 Hours

Max. Marks: 50

Note: ***QUESTION-1 IS COMPULSORY*** *. Attempt* ***ANY*** *eight questions from Questions 2-11. All questions carry 5 marks except Q1. Assume suitable missing data, if any.*

---

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   Find the basis and dimension of $W_1 + W_2$ and $W_1 \cap W_2$. [CO-3][L-2,4]

5. Transform the given basis $\{(1, 1, 1, 1), (1, 1, 2, 4), (1, 2, -4, -3)\}$ of a subspace W in R^4 into the orthonormal basis of W. [CO-4][L-3,4]

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   [CO-3,5][L-3, 4]

7. Write the symmetric matrix corresponding to the quadratic form

   $$Q(x, y, z) = 2x^2 + 2xy + 3y^2 + 2xz + 4yz + 5z^2$$

   and check whether $Q(x, y, z) > 0 \ \forall \ \{x, y, z\} \neq 0$? [3+2][CO-4][L-2, 5]

Y12

8. Find the angle between the matrices $A = \begin{bmatrix} 9 & 8 & 7 \\ 6 & 5 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$. [CO-4][L-3,5]

9. Define the adjoint of a linear transformation T and hence write the adjoint of

$$T(x, y, z) = (3x + 2y - 4z, x - 2y + z, x + 2y - 3z)$$

[CO-3,4][L-5]

10. Find the Jordan canonical form J and an invertible matrix Q such that $J = Q^{-1}AQ$ where $A = \begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$ [CO-5][L-4]

11. Let f be a bilinear form given by $f((x_1, x_2), (y_1, y_2)) = x_1y_1 + 2x_1y_2 - x_2y_1 + 3x_2y_2$. Find the matrix of f relative to basis $\{(1,0), (1,1)\}$. [CO-2][L-4]

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Total No. of Pages 02

Roll No. .....

FOURTH SEMESTER

B.TECH[MATHEMATICS & COMPUTING]

END SEM EXAMINATION **MAY 2025**

MC-210 DIFFERENTIAL EQUATIONS

Time: 3:00 Hrs. *Max. Marks: 40*

Note: Answer any five questions. Assume suitable missing data, if any.

Q.1 (a) Find the general solution to the system $x' = Ax$, where

$$A = \begin{pmatrix} 3 & 1 & -1 \\ 1 & 3 & -1 \\ 3 & 3 & -1 \end{pmatrix} \text{ and } \quad x = [x_1, x_2, x_3]^T.$$

[4M][CO1][L3]

(b) Form the partial differential equation from the solution

$\phi(xy + z^2, x + y + z) = 0.$ [4M][CO2][L6]

Q.2 (a) Find the general solution of the linear system of equations

$y' = Ay + h, \quad where\ A = \begin{pmatrix} -1 & 3 \\ 2 & -2 \end{pmatrix}, \ h = \begin{pmatrix} 4 \\ 1 \end{pmatrix} e^{-4t}.$

[4M] [CO1] [L5]

(b) Solve $x(z - 2y^2)p + y(z - y^2 - 2x^3)q = (z - y^2 - 2x^3).$

[4M][CO3][L3]

Q.3 (a) Form the partial differential equation from the solution

$z = f(2x + 3y) + g(2x + y).$ [4M][CO2][L6]

(b) Find all the eigen values and corresponding eigen functions for

$y'' + \lambda y = 0, \quad y(0) = 0, \ y(2\pi) = 0.$

[4M][CO1][L4,5]

Q.4 (a) Obtain the solution of linear equation $u_x - u_y = 1$, with Cauchy's data $u(x, 0) = x^2.$ [4M][CO3][L2]

(P.T.O.)

(b) Solve and discuss the critical point, nature and stability of the linear system $x' = -5x + y, \quad y' = 4x - 2y, \quad x(0) = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$.

Draw the phase portrait for the same. [4M] [CO2][L2,3]

Q.5 (a) Using Charpit's method, solve

$$2z + p^2 + qy + 2y^2 = 0.$$

[4M][CO3][L3,4]

(b) Solve $(D^3 - 2D^2D')z = 2e^{2x} + 3x^2y$. [4M][CO4][L3]

Q.6(a) Use the method of separation of variables, solve

$$u_x = 2u_t + u, \qquad u(x, 0) = 6e^{-3x}.$$

[4M][CO4][L2,3]

(b) A rod of length 'a' has its ends A and B kept at 0^0C and 100^0C respectively, until the steady state conditions prevail. If the temperature at B is reduced suddenly to 0^0C and kept so, while that of A is maintained, find the temperature $u(x,t)$ at a distance x from A and at time t.

[4M][CO5][L4,6]

Q.7(a) Solve the following partial differential equation.

PDE: $u_{xx} + u_{yy} = 0, \ 0 < x < a, \ 0 < y < b,$

BC's: $u_x(0,y) = 0, \ u_x(a,y) = 0,$

$u_y(x,0) = 0, \ u_y(x,b) = f(x).$ [4M][CO5][L4,6]

(b) Classify the following partial differential equation and hence find the characteristic curves.

$$3u_{xx} + 10u_{xy} + 3u_{yy} = 0.$$ [4M][CO5][L2,3]

****

Q6 [CO2], [a - BTL 5, b - BTL 1], [4+1+3]

a. Consider a database to store information for a social networking website. Design an ER Diagram for keeping track of information about votes taken in the U.S. House of Representatives during the current two-year congressional session.

The database needs to keep track of each U.S. STATE's Name (e.g., 'Texas ', 'New York', 'California') and include the Region of the state (whose domain is {'Northeast', 'Midwest', 'Southeast', 'Southwest', 'West'}). Each CONGRESS_PERSON in the House of Representatives is described by his or her Name, plus the District represented, the Start_date when the con-gressperson was first elected, and the political party to which he or she belongs.(whose domain is {'Republican', 'Democrat', 'Independent', 'Other'}). The database keeps track of each BILL (i.e., proposed law}, including the Bill_name, the Date_of_vote on the bill, whether the bill Passed_or_failed (whose domain is {'Yes', 'No'}), and the Sponsor (the congressperson(s) who sponsored - that is, proposed - the bill). The data-base also keeps track of how each congressperson voted on each bill (domain of Vote attribute is {'Yes', 'No', 'Abstain', 'Absent'}).

b. A pilot can fly three types of planes and a plane can be piloted by any qualified pilot. What is the type of pilot-plane relationship?

c. Explain the advantages of a Database Management System application in comparison to that of file system

X--------END---------X

Total no. of Pages:04 *Roll no.....*

6th SEMESTER **B.Tech.**

END TERM EXAMINATION *May-2025*

MC302: DATABASE MANAGEMENT SYSTEMS

Time: 03:00 Hours ***Max. Marks: 40***

All questions carry equal marks. DO ANY 5
e suitable missing data, if any.

Q1. [CO1], [BTL 5], [5+3]

a. Consider the schedule given below. R(·) and W(·) stand for 'Read' and 'Write', respectively

time	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}
T_1	R(A)		W(A)						R(B)		W(B)
T_2				R(C)	R(A)		W(A)			W(C)	
T_3		R(B)				W(B)		R(A)			

i. Is this schedule serial?
ii. Give the dependency graph of this schedule.
iii. Is this schedule conflict serializable? If "yes", provide the equivalent serial schedule. If "no", briefly explain why.
iv. Is this schedule view serializable?

b. Assume that we are using strict two-phase locking, and the objects being locked are pages. RS indicates a request for a shared lock on a page, and RX indicates a request for an exclusive lock on a page. No transactions commit or abort during this time.

i. Draw the arrows for the waits-for graph at the end of this schedule.
ii. Does the schedule lead to deadlock?

T1	RS(D)							RX(D)	
T2		RS(A)							RS(C)
T3			RS(D)	RX(B)	RX(A)				
T4						RX(C)	RS(B)		

Q2. [CO4], [BTL 3], [5+3]

a. Consider the relation schema with attributes, E = {W, X, Y, Z} and the functional dependencies: XY → W, X → Z, W → X.

i. List all the candidate key(s) for E.
ii. Is the relation E in 3NF? If yes, explain. If not, give a 3NF decomposition of E that is lossless, dependency preserving, and has as few tables as possible.
iii. Is the relation E in BCNF? If yes, explain. If not, give a BCNF decomposition of E that is lossless, dependency preserving, and has as few tables as possible.

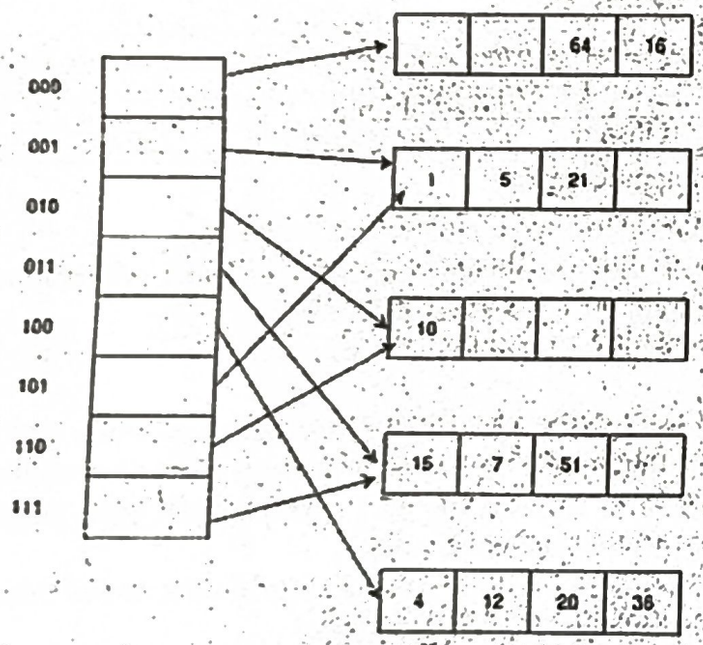
b. Given the attribute set R = ABCDEFGH and the functional dependency set F = {BC → GH, AD → E, A → H, E → BCF, G → H}, decompose R into BCNF by decomposing in the order of the given functional dependencies.

Q3. [CO 5], [a. – BTL 2, b. – BTL 3, c. – BTL 4], [2+3+3]

a. Consider a most dense B-trees of order d = 5 that contains all the integer keys 1, 2, . . ., 120. How many nodes does the structure have?

b. Consider an extendible hash table, where the last insertion forced its directory to double in size, from n_{old}=8 to n_{new}=16 directory entries. how many buckets have exactly one directory entry pointing to them?

c. Starting from the hash table given below, delete keys 36, 12, and plot the resulting table.



Q5. [b. c. – CO 3 a. – CO 1], [BTL 1], [4+2+2]

a. State True/ False and justify your answer

i. In the shrinking phase of strict 2PL, locks cannot be released until the end of the transaction.

ii. At most 2 distinct entity sets can be associated with any relationship set R.

iii. A weak entity set must have total participation in its identifying relationship set.

iv. ER diagrams are used to model the physical schema of a database.

b. Differentiate between primary index and Clustering index.

c. Define Natural Join with the help of an example

Q4. [CO 3], [BTL 3], [5+3]

a. Given the following database schema, write the given query in SQL.

STUDENT (Student_ID, Student_Name)
FACULTY(Faculty_ID, Faculty_Name)
IS_QUALIFIED (Faculty_ID, Course_ID, Date_Qualified)
SECTION (Section_ID, Course_ID) COURSE (Course_ID, Course_Name)
IS_REGISTERED (Student_ID, Section_ID, Semester)

i. Display all courses (Course_ID, Course_Name) for which Prof. A. P. Shaw has been qualified.

ii. How many Instructors are qualified to teach a course with Course_ID "ISM 3113"?

iii. List the Instructors which are qualified to teach course "ISM 3113" but not qualified to teach course "ISM 4930".

iv. How many students are enrolled in section "2714" during semester "I-2001"?

v. Which students were not enrolled in any courses during semester "I-2001"?

b. Consider the relations of a database for the 2016 Olympics as given below. These relations record the athletes, events, and outcomes/results of the 2016 Olympic games.

Athletes: For every athlete, we record a unique athlete id, the country they represent, their name, and their age.

Events: This table lists all the events that are part of the 2016 Olympic games with unique integer event id and a name.

Event Results: Lists the outcomes of all events with the event id of the event, the athlete id of the athlete that won a medal in the event, and the standing of the athlete (i.e., gold, silver or bronze).

athlete_id	country	name	age

- Athletes Table

event_id	name

- Events Table

event_id	athlete_id	result

- Event Results Table

Answer the following-

a. List the names of the athletes that have won at-least one gold medal, eliminating duplicate names, using Relational Algebraic expression.

b. Describe what the following expression does

$$\pi_{athlete\_id,event\_id}(\text{Event\_Results}) \div \pi_{event\_id}(\sigma_{athlete\_id='A5'}(\text{Event\_Results}))$$

c. Describe what the following expression does

$$\pi_{A.athlete\_id}(\rho_A(\text{Athletes})) - \pi_{ER1.athlete\_id}($$
$$\rho_{ER1}(\text{Event\_Results}) \bowtie_{ER1.athlete\_id=ER2.athlete\_id \wedge ER1.result \neq ER2.result} \rho_{ER2}(\text{Event\_Results}))$$

Total no. of Pages: 03 *Roll no... .....*

VI SEMESTER

B Tech

End Term Examination **May 2025**

MC304 Theory of Computation

Time:3 hours **Marks 50**

Note: Attempt all Questions

Q1. Answer the following questions with Justifications. **[10][CO1,2][L5]**

(a)The set of all strings over {a, b}of even length is represented by which of the following regular expressions

(i) $(ab + aa + bb + ba)^*$ (ii) $(aa + bb)^*$

(b) If L is the set of all strings over {a, b} containing at least one a then it is not represented by which regular expression

(i) $(a + b)^*a(b + a)^*$ (ii) $b^*a\ (a + b)^*$ (iii) $(a + b)^*a$

(c)$\{a^n | n \geq 1\}$ is a which type of grammar

(i) context free but not regular (ii) regular (iii) context sensitive but not context free

(d) Consider the grammar G which has the following productions $S \rightarrow aB|bA, A \rightarrow aS|bAA|a\ B \rightarrow bS|aBB|b$ state which of the following statement are true or False

(i) $abbbaa \in L(G)$ (ii) $aab\ not \in L(G)$ (iii) $L(G)$ has some strings of odd length

(e)$\{a^n b^n | n \geq 1\}$ is accepted by a pda then which one is correct;

(i) accepted by null store and also by final state

(ii) Accepted by null store but not by final state

Q2 (a) Consider the more machine described by the transition table given bellow. Construct the corresponding mealy machine **[5] [CO1][L2]**

Present state	Next state		Output
	$a = 0$	$a = 1$	
$\rightarrow q1$	q1	q2	0
$q2$	q1	q3	0
$q3$	q1	q3	1

Figure 1 Moore to mealy machine construction

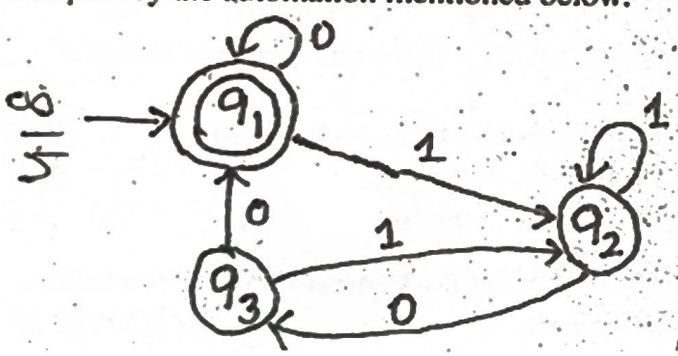
(b) Construct a minimum state automation equivalent to the finite automation whose transition table is given bellow. 5][CO1][L6]

State	0	1
→ q0	q1	q5
q1	q6	q2
Final (q2)	q0	q2
q3	q2	q6
q4	q7	q5
q5	q2	q6
q6	q6	q4
q7	q6	q2

continuing

Q3(a) Using Pumping Lemma prove that the language $\{1^p \mid p \text{ is prime}\}$ is not a context free language [5][CO2][L4]

(b) Using Algebraic methods for Arden's theorem find the regular expression accepted by the automation mentioned below. [5][CO1][L6]



Q4 Attempt any two parts of the questions

(a) Given the grammar $S \to AB,\ A \to a,\ B \to C|b, C \to D,\ D \to E, E \to a$, Find the equivalent grammar, which is reduced and has no unit productions [5][CO4][L2]

(b) Reduce the following grammar to Chomsky Normal form, $S \to 1A\,|0B,\ A \to 1AA|0S|0, B \to 0BB|1S|1$ [5][CO4][L2]

(c) State and prove the Pumping Lemma for context free Language [5][CO4][L2]

Q5. Attempt Any Two parts of the questions

(a)Construct a pda accepting the empty store of the following language $\{a^n b^m c^n \mid m, n \geq 1\}$ [5][CO3][L6]

(b) Consider the Turing machine descriptions given in table mentioned bellow and draw the computation sequence of the input string 00, up to fifteen terms [5][CO3][L4]

Transition table of Turing machine to Question 5(b)

Present state	Tape Symbols		
	b	0	1
→ $q1$	1Lq2	0Rq1	
$q2$	bRq3	0Lq2	1Lq2
$q3$		bRq4	bRq5
$q4$	0Rq5	0Rq4	1Rq4
Final $q5$	0Lq2		

(c) Design a Turing machine over {1, b}, which can compute a concatenation function over $\Sigma = \{1\}$. If a pair of words (w1, w2) is the input the output has to be w1w2. [5][CO3][L6]

Total no. of pages :2

6th SEMESTER 419 Roll No._____

END SEMESTER EXAMINATION B.Tech (MC- Engg.)

MC – 306 Financial Engineering MAY 2025

Time : 3 hrs Max. Marks: 50

Note: Q.No.1 is compulsory, answer any other three questions.
Statistical table is allowed. Assume missing data, if any.

1.	(a)	The current stock price is Rs. 125. A six month call option on this stock with strike price Rs. 130 is priced in two steps. It is given that continuously compounded risk free rate is 6%. stock pays no dividend and the volatility of the stock is 22%. Determine the price of call options.	5	CO1 CO3 BL3
	(b)	Consider a portfolio of two assets a1 & a2 with no short sell, with the following statistical parameters $\mu_1 = 12\%, \mu_2 = 18\%$, $\sigma_1 = 20\%$, $\sigma_2 = 35\%$, $\rho_{12} = -0.18$. Find the value of minimum risk, the expected return and weight of the assets.	5	CO2 CO5 BL3
	(c)	$\{N(t), t \geq 0\}$ be a Poisson process with parameter λ. Prove that $\{N(t) - \lambda t, t \geq 0\}$ is a martingale.	5	CO3 BL4
	(d)	The stock price is Rs.90. The continuously compounded risk free interest rate is 5% and the annual volatility is 20%. European Call options are written with a strike price of Rs.95 and time to expiration of 6 months. The stock will pay a dividend continuously at the rate of 1%. Use the Black – Scholes formula to find the price of one such Put option.	5	CO4 BL3
2.	(a)	A stock price following SDE $dS(t) = \mu S(t)dt + \sigma S(t)dW(t)$ has an expected return of 12% and a volatility of 25%. Find the distribution of the stock price in 2year. Find the expected price after 2 year if the current price is Rs.80.	5	CO4 BL3
	(b)	Solve the SDE $dX(t) = 2X(t)\,dW(t)$ with $X(0) = 2$.	5	CO4 BL3

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3. (a) Evaluate $\int_0^T W^2(t)dW(t)$ using Ito – Doeblin formula of version two. — 5 CO4 BL2

(b) A stochastic process $\{S(t), t \geq 0\}$ is governed by $dS(t) = aS(t)dt + bS(t)dW(t)$, where a & b are constants. Find the SDE of $log(S(t))$. — 5 CO4 BL3

4. (a) Obtain the equation of Markovitz curve for the portfolio of two assets a_1 & a_2 with the following statistical parameters $\mu_1 = 5\%$, $\mu_2 = 15\%$, $\sigma_1 = 15\%$, $\sigma_2 = 30\%$, $\rho_{12} = 0.5$. and using the curve equation find value of minimum risk and the expected return. — 5 CO5 BL5

(b) Prove that portfolio with minimum risk has weights given by $$W = \frac{C^{-1}e}{e^T C^{-1} e}$$ — 5 CO2 CO5 BL1

5. (a) A portfolio with three securities a_1, a_2, a_3 with expected returns, $\mu_1 = 10\%$, $\mu_2 = 14\%$, $\mu_3 = 8\%$, standard deviations of returns, $\sigma_1 = 20\%$, $\sigma_2 = 26\%$, $\sigma_3 = 14\%$, and the correlation between returns, $\rho_{12} = 0.3$, $\rho_{13} = -0.25$ and $\rho_{23} = 0.4$. If risk free interest rate is 8% then compute the weight vector for market portfolio. — 5 CO5 BL5

(b) Suppose the market portfolio is (σ_M, μ_M). Show that the expected return of an asset a_i is given by $\mu_i = \mu_{rf} + \beta_i(\mu_M - \mu_{rf})$, where $\beta_i = \frac{Cov(r_i, r_M)}{\sigma_M^2}$ — 5 CO5 BL1

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Total No. of Pages: 02

*Roll No.*_____

VI SEMESTER

B.Tech. (MC)

END TERM EXAMINATION

May-2025

MC308 COMPUTER NETWORKS

Time: 3:00 Hours

Max. Marks: 50

Note : All questions carry equal marks. Answer all the questions. Assume suitable missing data, if any.

Q.1 Explain the following: [2+3][CO1][BTL1]

a) Advantages of optic fiber as a transmission media.

b) Types of addressing.

Q.2 For an 8-bit dataword 00111001, the initial check bit stored was 0111, and the calculated check bits are 1101. Using the Hamming code technique with even parity, determine the correct dataword. The error bit can be identified using the XOR of the check bits.

[5][CO2][BTL3]

Q.3 Answer ***any one*** of the following: [5][CO2][BTL2]

a) Explain the Distance Vector Routing protocol with the help of an example.

b) Explain an IPv4 datagram in detail.

Q.4 A company is assigned the IP address 201.70.64.0 with a default subnet mask of 255.255.255.0. The company needs to divide the network into six equal-sized subnetworks. Calculate the new subnet mask and determine the network address, broadcast address, and range of valid host addresses for each of the six subnets.

[5][CO5][BTL3]

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Q.5 [5+5][CO3][BTL4]

a) Illustrate and compare the TCP and UDP headers in detail.

b) Analyse and state the significance of the additional fields in the TCP header and discuss how they support TCP's reliability features, which are absent in UDP.

Q.6 Answer *any one* of the following: [5][CO4][BTL3]

a) Step-wise determine and illustrate, what data will be sent from host P to host Q after compressing the following input substring using the Lempel-Ziv encoding technique: BAABABBBAABBBBAA.

b) Step-wise determine and illustrate the original substring transmitted from host P to host Q before compressing the following data using the Lempel-Ziv encoding technique: B, A, 2B, 3B, 1A, 4B.

Q.7 A set of characters along with their frequency is mentioned in the given table. Using Huffman coding, design and evaluate the correct code for each of the characters. What is the value of the topmost node? [5][CO4][BTL5, BTL6]

Character	Frequency
A	24
B	12
C	10
D	8
E	8

Q.8 Write a short note on: [5+5][CO4][BTL1, BTL3]

a) DNS and its importance in the Application layer

b) E-mail and demonstrate the use of UA and MTA

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Total No. of Pages: 02

Roll No. _____

VI SEMESTER

B.Tech (MCE)

END TERM EXAMINATION May-2025

COURSE CODE: MC310

COURSE TITLE: SOFTWARE ENGINEERING

Time: 03 Hours Max. Marks: 50

Note : Attempt any five questions. All the questions are of 10 marks each. Assume suitable missing data, if any.

Q.1. (a). Explain coupling and cohesion. How do they impact system modularity? [CO1] [L2][5 marks]

(b). Explain the five levels of the SEI CMM (Capability Maturity Model). How does maturity level impact software quality and process? [CO2][L2][5marks]

Q.2. (a). What are design principles in software engineering? Explain abstraction and refinement with examples. [CO3][L6][5 marks]

(b). Compare and contrast the Spiral and RAD models. Discuss a situation where RAD would fail but Spiral would succeed. [CO5][L4][5 marks]

Q.3. (a). Explain the components of a Risk Management Plan. Create one for a flight booking software. [CO4][L2][5 marks]

(b). Describe any two software reliability growth models. Compare their applicability and limitations. [CO5][L6][5 marks]

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Q.4. (a). Consider a program for the determination of the nature of roots of a quadratic equation. Its input is a triple of positive integers (say a,b,c) and values may be from interval [0,100]. The program output may have one of the following words:
[Not a quadratic equation; Real roots; Imaginary Roots; Equal roots]
Design the boundary value test cases.

[CO6][L3] [5 marks]

(b). What is equivalence class testing? Identify the equivalence class test cases for output and input domains for the above problem.

[CO6][L2] [5 marks]

Q.5. (a) A software of 25 KLOC is to be developed. Using Intermediate COCOMO (organic type), estimate the effort if:

a = 3.2, b = 1.05, Effort Adjustment Factor (EAF) = 1.15.

[CO4] [L5][5 marks]

(b). Write short notes on:

[CO3, CO6] [L1][5 marks]

i. Integration testing
ii. Alpha and Beta testing
iii. Data Dictionary
iv. Cyclomatic Complexity
v. Reverse engineering

Q.6. (a) Describe Requirement Elicitation Techniques. Which one would you use for a banking system and why?

[CO2] [L2][5 marks]

(b). Compare structured design and object-oriented design with diagrams.

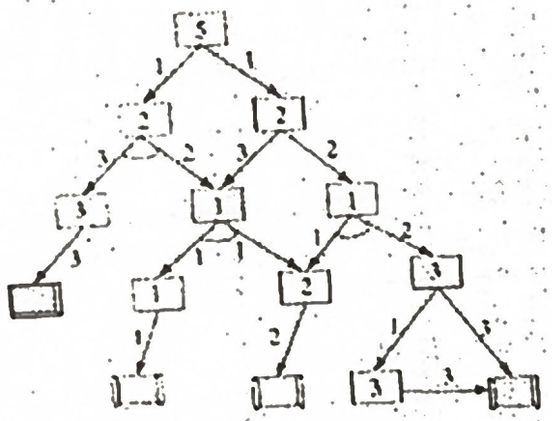
[CO1][L4][5 marks]

**********END**********

Translate the above sentences into formulas in Predicate Logic. Further, prove that the statement "John likes peanuts" is true using predicate logic. [8 marks][CO4][L3]

Q.6. (a). Consider the following AND OR graph. The terminal nodes (marked by double line) are completely solved and have zero cost. The arcs represent the cost of transforming. Values written inside the nodes are the heuristic values of solving that node. Run the AO* algorithm on the graph and determine the cost of solving the problem. Also determine whether the cost returned by the AO* algorithm is the optimal cost for this problem?

[5 marks][CO1][L4]



(b). Explain how Divide and Conquer Frontier Search prunes the closed list for any puzzle. [3 marks] [CO1][L4]

**********END**********

Total No. of Pages: 04

Roll No. _____

VI SEMESTER

B.Tech. (MCE)

END TERM EXAMINATION

May-2025

COURSE CODE: MC312

COURSE TITLE: Artificial Intelligence

Time: 03 Hours

Max. Marks: 40

Note : Attempt any five questions. All the questions are of 8 marks each. Assume suitable missing data, if any.

Q.1. (a). Explain how the following statements will be stored in Prolog:

a. Abhishek is happy.

b. Rahul listens to music.

c. Abhishek plays guitar if he listens to music and he is happy.

d. Rahul plays guitar if he listens to music or he is happy.

What will the output of the query "?- playsGuitar(Rahul)" in Prolog? [4 marks][CO5][L2]

(b). Discuss, with an example, the concept of CUTS in Prolog. [4 marks] [CO5][L2]

Q.2. (a). Given the information below for two attributes and a class label: [4 marks] [CO6][L6]

Attribute 1	Attribute 2	Class Label
T	F	+
T	T	+
T	T	+
T	F	-
T	T	+
F	F	-

F	F	-
F	F	-
T	T	-
T	F	-

Evaluate the information gain for both the attributes. Hence, determine which attribute is better for building the decision tree classifier.

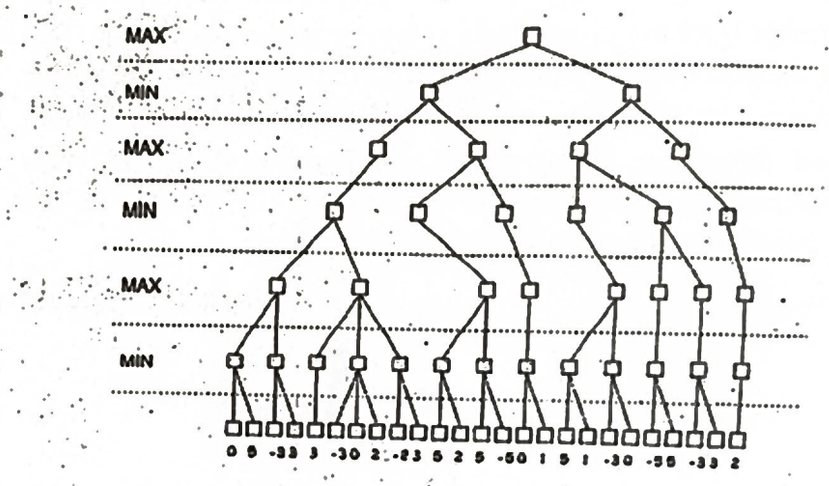
(b). Consider the data given below: [4 marks] [CO6][L6]

A	B	C	Class Label
0	0	0	+
0	0	1	-
0	1	1	-
0	1	1	-
0	0	1	+
1	0	1	+
1	0	1	-
1	0	1	-
1	1	1	+
1	0	1	+

Given a test sample [A=0 B=1 C=0]. How can you predict the class label for this given test sample with Naïve Bayes classifier ?

Q.3. Given an initial state: {On(A, B), OnTable(B), On(C, D), OnTable(D), ArmEmpty, clear(A), clear(C)}. Suppose the goal state is {On(A, D), On(C, B)}. Explain how Plan Space Planning will achieve this goal state. Also write down the plan returned by the algorithm that will achieve the given goal state. [8 marks] [CO2][L1]

Q.4. (a). Consider a game tree given below that consists of alternate levels for MAX and MIN players. The evaluation function for each of the leaf nodes is written in the last level. The evaluation function values for the leaf nodes starting from the leftmost leaf to the rightmost leaf node is {0, 5, -3, 3, 3, -3, 0, 2, -2, 3, 5, 2, 5, -5, 0, 1, 5, 1, -3, 0, -5, 5, -3, 3, 2}. Evaluate the number of alpha cutoffs and beta cutoffs on the game tree if we apply the Alpha-Beta pruning technique on this given tree. Also, describe which leaf nodes will be evaluated and which leaf nodes will be pruned with Alpha-Beta pruning. [5 marks][CO3][L5]



(b). Consider the game tree given in the above question. If we apply MIN-MAX algorithm, will the MAX make the same move as selected with the Alpha-Beta technique ? [3 marks][CO3][L5]

Q.5. Consider the following sentences:

(i) John likes all kinds of food.

(ii) Apples are food.

(iii) Chicken is food.

(iv) Anything anyone eats and if he/she is not killed by is food.

(v) Bill eats peanuts and is still alive.

(vi) Sue eats everything Bill eats.

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VIIIth Semester B Tech *End Term Examination May2025*

Paper Code MC418 Subject Optimization Technique

Max Mark 40 Time3 hours

Answer all questions, Assume suitable missing data any

1(a) Check whether the following optimization problem is convex or not. Give reasons {EasyL1}[4][CO1]

$$\text{Max } z = -\ln(1+x) + y$$

$$\text{Subject to: } 2x + y \leq 3$$

$$xy \leq 2$$

$$x, y \geq 0$$

(b) Apply Lagrange's multiplier method to solve the following optimization problem {mod L1}[4][CO1]

$$\text{Max } z = \frac{1}{2}(x_1^2 + x_2^2 + x_3^2)$$

$$\text{Subject to: } x_1 - x_2 = 0, \quad x_1 + x_2 + x_3 - 1 = 0$$

2(a) Derive Karush Kuhn Tucker (KKT) conditions for the following optimization Problem {mod L1}[4][CO1]

$$\text{Max } z = x^2 + y^2$$

$$\text{Subject to: } x + y \leq 1, \; x + 2y \leq 5, \quad x, y \geq 0$$

(b) Let $S \subseteq R^n$ be an open convex set and $f: S \to R$ be a pseudo convex function on S. Then f is a quasi-convex functions on S. But converse need not be true. {Easy L1}[4][CO1]

3(a) Let $S \subseteq R^n$ be an open convex set and $f: S \to R$ be differentiable. Then f is a convex function on S if and only if for all $x, u \in S$, we have $(x-u)^T[\nabla f(x) - \nabla f(u)] \geq 0$ {EastL1} [4][CO1]

(b) Solve the following nonlinear optimization problem {Dif L1}[4][Co2]

Max $z = 2x^2 + 2xy$

Subject to: $x - y \geq 2,\ \ 2x + 5y \geq -5,\ \ x < 3$

4(a) Explain briefly Charnes and Cooper method to solve fractional programming problem and solve the following stock cutting problem of minimizing the ratio of waste material and the used amount of raw material

{Mod L2}[4][CO12]

Max $z = \frac{x}{x+y+1}$

Subject to: $x + y \leq 4,\ \ x + 2y \leq 1,\ \ x, y \geq 0$

(b) Let $f \in R^n$ and $g_i \in R^n,\ \ i = 1,2,..,m$ be real valued functions, consider the following optimization problem

(P) Min $z = f(x)$

Subject to $g_i(x) \leq 0$

Obtain the Lagrange dual (D) of the above Primal problem

{Easy L1}[4][CO2]

5(a) Solve the following Optimization problem by Frank and Wolfe's method, give 2 iterations

Min$f(x, y) = (x-3)^2 + y^2$

Subject to: $x + 2y \leq 9$

$-x + y \leq 3$

$x, y \geq 0$

Take [1,0] as the initial point

{Diff L2}[4][CO2]

(b) (i) State and Prove Weak duality Theorem for Lagrange's Dual

(ii) State and Prove strong Duality theorem for Lagrange's Dual

{Mod L2}[4][CO2]

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Total no. of Pages:2

Roll no.....

_____SEMESTER

B.Tech

END TERM EXAMINATION *May-2025*

COURSE CODE/Name: MG302 - Fundamental of Management

Time: 03:00 Hours *Max. Marks: 50*

Note : All questions are compulsory
Marks are indicated along with the questions.

Q.1 ClarityTech Solutions, a growing IT services company, recently appointed Neelam Kapoor as its new General Manager. Neelam previously worked in a highly centralized organization with a tall hierarchy, while ClarityTech operates with a flat structure and encourages participative decision-making. Teams are used to working with autonomy, but there's growing concern over missed deadlines, unclear accountability, and low motivation among mid-level managers. Neelam is considering implementing a more defined structure and centralized controls, but she worries it may demotivate employees.

A. Using Herzberg's Two-Factor Theory, identify specific motivators and hygiene factors Neelam should address to improve mid-level managerial motivation at ClarityTech. **(CO1)(BTL 3)(5 Marks)**

B. Should Neelam adopt a more centralized decision-making model with clear hierarchical lines or preserve the current flat, decentralized system? Analyze the pros and cons of each in the context of ClarityTech's situation. **(CO1)(BTL 4)(5 Marks)**

Q.2 Answer the following **(Any two)** : **(8x2=16 Marks)**

A. Define Corporate Social Responsibility (CSR) and explain its importance in today's business environment. How does CSR contribute to the long-term sustainability of an organization? **(CO2)(BTL 2)(8 Marks)**

B. You are the finance manager at *UrbanCart Retail*, a mid-sized retail company that recently experienced a sudden surge in customer demand following a viral marketing campaign. The management is concerned about how this increased demand might strain the company's short-term financial resources.

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In this context, define working capital and explain its significance in maintaining day-to-day operations. Then, based on the situation, outline how you would manage the company's working capital to ensure uninterrupted operations during this demand spike. Support your response with practical measures and basic calculations, if required. **(CO3)(BTL 3,4)(8 Marks)**

C. You are a Manager in a multinational consulting firmtasked with the Knowledge management. The company has a vast repository of expertise across different regions, but employees are struggling to effectively share knowledge across departments and locations. Describe the techniques you would implement to overcome these challenges and enhance the sharing of knowledge. **(CO5)(BTL 2,3)(8 Marks)**

Q.3 Paper Boat, a beverage brand by Hector Beverages, is known for offering traditional Indian drinks in modern packaging. The brand has built a strong emotional connection with consumers through its storytelling and focus on health and authenticity. Despite its success, growth in a competitive FMCG market requires constant innovation and exploration of new customer bases.

The leadership team at Paper Boat is now considering entering untapped customer segments in India that align with its core brand values but are not currently being served through existing marketing and product strategies.

Based on your understanding of the brand and market environment:
A) Analyze and identify the segment(s) currently targeted by Paper Boat. **(4 Marks)(CO4)(BTL4)**
B) Recommend one new untapped customer segment the brand could focus on and Propose a suitable Segmentation, Targeting, and Positioning strategy for this new segment. **(10 Marks) (CO4)(BTL5,6)**

Q.4 Write short notes on following (Any Two) **(5x2=10 Marks) (CO1,5) (BTL1,2)**

A. Matrix Structure

B. E-Governance

C. Management vs Administration

Total no. of Pages: 03

Roll no.....

II SEMESTER

B.Tech. (Production Engineering)

END TERM EXAMINATION MAY-2025

PE104n Engineering Materials & Metallurgy

Time: 3:00 Hours Max. Marks: 40

Note: All questions are compulsory.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Define Unit cell, Bravais lattice and APF. Calculate the APF for FCC unit cell. Find the planner density of (100) Iron at 100°C.
[Marks 4][CO1][BTL3]

Q.2 Define electrochemical corrosion in metals. Explain the rusting of iron and provide the relevant electrochemical reactions involving dissolved oxygen. Differentiate between galvanic corrosion and stress corrosion cracking, highlighting key features and examples.
[Marks 4][CO2][BTL2]

Q.3 Define the different categories of stainless steels, explain the roles of α (ferrite) and γ (austenite) stabilizers in stainless steels, and list the advantages of duplex stainless steel.
[Marks 4][CO3] [BTL5]

Q.4 Define ferrite, cementite, and pearlite, and determine the relative amounts of ferrite, cementite, and pearlite microconstituents for a 99.10 wt% Fe–0.90 wt% C alloy at a temperature just below the eutectoid. Determine the following:
(a) The fractions of total ferrite and cementite phases
(b) The fractions of the proeutectoid cementite and pearlite
[Marks 4][CO3][BTL3]

Q.5 Draw TTT diagram for Eutectoid carbon steel. Explain microstructures form from the austenite to coarse and fine pearlite transformation on the curve, and its practical application. Differentiate between spheroidizing and stress relief annealing of carbon steel?

[Marks 4][CO4][BTL2]

Q.6 Define brittle fracture in metals and alloys, and explain the mechanisms of brittle fracture, including factors that increase a metal's susceptibility to brittle failure. A large glass plate is subjected to a tensile stress of 50 MPa. Given the specific surface energy of the glass as 0.3 J/m² and its modulus of elasticity as 70 GPa, calculate the maximum allowable length of a surface flaw that will not lead to fracture.

[Marks 4][CO4][BTL5]

Q.7 Define fatigue in metals, state the factors influencing fatigue failure and the types of stress cycles, and differentiate between the S–N curves of mild steel and aluminum alloys. Provide a practical example of fatigue resistance can be improved in a real-world application of carbon steels.

[Marks 4][CO5][BTL6]

Q.8 Define creep and its stages of failure. Explain the effect of stress and temperature on the creep of metals. A steel member of 3 m long is subjected to an axial tensile load of 45.4 KN at an operating temperature of 400. Determine the cross sectional area required for an estimated life of 20 years based on an allowable creep rate of 0.001 mm per mm per year using creep relation:
$C = \varepsilon/t = B(S/S_0)^n$, Where $n = 7$, $S_0 = 7$ Mpa and $B = 5.2 \times 10^{-12}$ mm per mm per day.

[Marks 4][CO5] [BTL6]

OR

Q.8' Define composite materials, classify them based on the type of reinforcement with suitable examples, and differentiate between Polymer-Matrix Composites (PMCs) and Metal-Matrix Composites (MMCs)

[Marks 4][CO5]][BTL4]

Q.9 Explain how the type, shape, size, and orientation of particles or fibers influence the mechanical properties (such as strength, stiffness, and toughness) of composite materials, and discuss their applications in the automotive industry.

[Marks 4][CO6][BTL3]

Q.10 Explain the powder metallurgy process used in the manufacture of self-lubricating bearings. Describe the key steps—powder selection, compaction, and sintering—and discuss how each step contributes to developing the porosity required for lubricant retention.

[Marks 4][CO6][BTL2]

OR

Q.10' Differentiate between the mechanisms of solid-phase and liquid-phase sintering processes with neat sketches. Also, discuss the advantages and disadvantages of each process, providing suitable examples. Explain how the compressibility of powder is calculated.

[Marks 4][CO6][BTL1]

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Total No. of Pages: 02 *Roll No. .....*

B. Tech. FOURTH SEMESTER [PE]

END TERM EXAMINATION **May 2025**

PE202n/ME260 MACHINE DESIGN

Time: 3 Hours **Max. Marks: 40**

Note: Attempt any *FIVE* questions.
All questions carry equal marks.
Assume suitable missing data, if any.
Use of Design Data Handbook is permitted.

1. (a) Explain the phenomenon of stress concentration. How is it caused and how can it be reduced? [CO#1] 4
   (b) Explain the unilateral and bilateral systems of tolerance. [CO#2] 4

2. Design a knuckle joint for connecting two high carbon steel rods to withstand a tensile load of 200 kN. The permissible stresses in tension, shear and crushing are 200 MPa, 100 MPa and 230 MPa respectively. [CO#3] 8

3. (a) How do you consider the initial tightening load when external forces are acting on a bolt? [CO#4] 3
   (b) A 0.35 m x 0.4 m diesel engine running at 300 rpm has a compression pressure of 2.5 N/mm^2 and a maximum explosion pressure of 3.5 N/mm^2. The head is held in place by eight M16 x 2c bolts arranged on a 0.35 m bolt circle. A thin asbestos gasket is used. Determine the stresses induced in the bolt due to (i) applied load and (ii) tightening. [CO#4] 5

4. Design completely a close-coiled helical spring to absorb 450 Nm of energy whose mean diameter of coils is 6 times the wire diameter. The initial compression of the spring is 45 mm and the additional compression is 105mm while absorbing the shock. [CO#5] 8

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5. A countershaft made of cold-rolled steel transmits 45 kW at 300 rpm and is supported on bearings 1.5 m apart. It carries two pulleys mounted upon it. One pulley is 0.5 m in diameter and is located 0.35 m to the right of left hand bearing and it receives power in a horizontal direction from a pulley at its right. The second pulley 0.65 m in diameter is located 0.4 m to the left of the right hand bearing and delivers power in a vertical direction to a machine below it. Design the shaft and compare the stress developed in the shaft with the design stress as obtained from the code. [CO#6] 8

6. Design a rigid protected type flange coupling for connecting shafts 50 mm in diameter running at 1000 rpm while transmitting 18 kW power. [CO#6] 8

Jobs

Contractors	A	B	C	D
1	15	24	25	15
2	12	22	28	12
3	16	26	32	10
4	9	20	34	16

7 Write brief notes on CO1,2 L1-2 8
a) Product design process
b) Break even analysis
c) Learning Curve
d) Plant layout principles

Total No. of Pages 04 **B.Tech: 4th Sem**

END SEMESTER EXAMINATION May -*2025*

PE 204 Industrial Engineering and Operations Research

Time: 3:00 Hours ***Max. Marks : 40***

Note: 1. Attempt any FIVE questions; assume missing data if any

1a What do you understand by a Production System? Explain design, planning and control aspects of a production system CO1,2 L-1,2 4

1b Briefly discuss the nature of production and material handling equipment requirements for Mass, Batch and Job shop production systems. Where we need Line Balancing? CO2,3 L-2,3 4

2a With the help of an example, discuss the features of Product Layout. Why such layouts are not good for batch production. CO2,3 L-3 4

2b Explain the procedure for conducting ABC analysis. How ABC and VED analysis can help in deciding the safety stock. CO4 L-2,3 4

3a Briefly discuss the Qualitative techniques of Demand Forecasting. CO4 L-4 4

A retail store located in Delhi needs to forecast the demand of mobiles at its store. It believes that the sales at its store is related to the sales of its industry in Delhi. The data of last seven months is as below. If the next month industry sales in Delhi is expected to be 7 crores, forecast the next month sales of the store.

Industry Sales in Crores	2	3	5	4	6	5	3
Store sales in Lakhs	8	9	12	8	10	11	8

3b Weekly demand of 3hp motors for the past 8 weeks is given below. Using Exponential Smoothing Method with Alpha = 0.3 and 0.8, forecast the demand for 9th week. Calculate the forecast error and comment. CO4 L-4 4

Week	Demand	Week	Demand
1	18	5	19
2	17	6	14
3	12	7	16
4	14	8	15

4a With the help of a neat diagram, discuss the Q-R inventory systems for procurement and Production cases. CO2,3 L-2,3 4

Develop the relation for Economic Order Quantity for the procurement system.

4b Convert the following Primal into Dual by following all the steps: CO4 L-4 4

Max Z = 6x1 + 3x2 + 5 x3

Subject to

X1+5X2 +X3<=20

3X1+2X2 +7X3=15

2X1+5X3 >=25

X1, X2 >=0, X3 is unrestricted

5a ABC Ltd sells two products A and B. To produce one unit of A, 1 units of material X and 3 units of material Y are required. To produce one unit of B, 2 units of material X and 3 units of material Y are required. As the raw material is in short supply not more than 20 units of each material (i.e. X and Y) can be used. The profits per unit from selling A and B are Rs 20,000 and Rs 4,000 respectively. At least 4 units of B must be produced and sold. You are required to formulate a mathematical model and solve it graphically so as to maximize its profits. CO4 L-4 4

5b Solve the following problem using Simplex Method CO4 L4 4

Max $Z = 5x_1 + 3x_2$

s.t. $x_1 + x_2 \leq 2$

$5x_1 + 2x_2 \leq 10$

$3x_1 + 8x_2 \leq 12$

$x_1, x_2 \geq 0$

6a Solve the following transportation problem to minimize the cost of transportation. Use North West Corner rule to find the initial feasible solution. CO4 L4 4

		Destinations				
		D	E	F	G	Supply
Sources	A	5	3	4	6	100
	B	7	5	4	2	120
	C	5	7	3	4	80
	Demand	60	90	75	75	

6b Tool room has four major jobs for which an equal number of skilled persons are available. The time required by each person for the jobs is given in the matrix. Find the assignment which minimize the total time to complete all the four jobs, when each person has to be assigned at least one job. CO4 L4 4

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Total no. Of pages : 2

FOURTH SEMESTER B.Tech. *Roll No.*
(Branch -Production-)

END SEMESTER EXAMINATION MAY 2025

PE 204n / PE 202 THERMAL ENGINEERING-II

Time : 3 hr Max Marks: 40

Answer any FIVE questions. Assume missing data suitably if any.

1(a) Derive the expression for air standard cycle efficiency and mean effective pressure of Diesel cycle. Draw pV and Ts diagram.

(b) In an air standard otto cycle the compression ratio is 6 and at the beginning of isentropic compression the initial pressure and temperature of air are 1 bar and 373 K respectively. Heat is added at constant volume until the pressure reaches to 35 bar. Determine (i) pressure and temperature at all salient points (ii) work done per kg of air (iii) air standard cycle efficiency.

(4,4) [CO1][BTL3,BTL5]

2(a) Name the main components of a gas turbine and state the function of each component.

(b) State the difference in the working of an open cycle and a closed cycle gas turbine.

(c) An open cycle gas turbine power plant takes in air to the compressor at 1 bar and 300 K and the maximum temperature in the cycle is limited to 975 K. The pressure ratio is 5.5. The compression is carried out in two stages with perfect intercooling in between them and expands in single stage turbine. Assuming the following data, find (i) thermal efficiency of plant (ii) power developed. Take air flow rate 1.2 kg/s; both compressor efficiency 85% ; turbine efficiency 90%; Neglect the fuel quantity.

(2,2,4) [CO2][BTL1,BTL2,BTL5]

3(a) Define the following terms in relation to reciprocating compressor (i) isothermal efficiency (ii) volumetric efficiency and set up an expression for

volumetric efficiency of single stage reciprocating compressor in terms of pressure ratio and clearance ratio.

(b) Air is compressed in a single stage reciprocating compressor from a pressure at 1 bar and 30 C and delivers 0.6 kg of air per min at 6 bar.The bore and stroke of the compressor are 10 cm and 15 cm and the clearance volume is 3% of swept volume Determine (i) volumetric efficiency of the compressor (ii) the power required and (iii) speed of the compressor in rpm. Assume n= 1.3 (4,4) [CO3][BTL4,BTL5]

4(a) Name the main components of a centrifugal compressor and state the function of each component. Draw the velocity diagrams for centrifugal compressor.

(b) Explain the phenomenon of surging and choking in compressors. (4,4) [CO4][BTL1,BTL4]

5(a) Explain the various modes of heat transfer.

(b) Derive the expression for rate of heat transfer and overall heat transfer coefficient for three layered composite cylinder wall. (4,4) [CO5][BTL2,BTL3]

6(a) A furnace wall comprises of three layers of steel plate 10 mm thick (k=35 W/m/K), silica brick with 150 mm thick (k=2 W/m/K) and on outside with magnesia brick 200 mm thick(k=5.2 W/m/K). The inside and outside surfaces of the wall are at 923 K and 398 K respectively. Determine the heat flux through the wall and intermediate surface temperatures of wall.

(b) Explain the significance of the following in convection heat transfer (i) Prandtl number (ii) Nusselt number (iii) Reynolds number (iv) Grashoff number. (4,4) [CO5, CO6][BTL5,BTL6]

7 Explain the following:

(a) Gas turbine cycle with regeneration

(b) Planck's law and Wien's law of black body radiation. (4,4) [CO2,CO6][BTL2,BTL3]

Total no. of pages: 03

FOURTH SEMESTER

END SEMESTER EXAMINATION

Roll No. .....

B.Tech. [PIE]

May- 2025

PE 206: Fluid Mechanics and Machinery

Time: 3:00 Hours ***Max. Marks: 40***

Note: Answer all questions by selecting any two parts from each question.
All questions carry equal marks.
Assume suitable missing data, if any.

1 **[A]** Briefly explain the constructional and working details of a Bourdon pressure gauge with a neat sketch.

[4] [CO1] [L3]

[B] What is capillarity? Drive the expression for capillarity rise and fall with neat diagram in terms of surface tension of liquid, density of liquid, height of rise or depression in tube, angle of contact between liquid and glass tube, diameter of glass tube and acceleration due to gravity.

[4] [CO1] [L4]

[C] Drive three-dimension continuity equation in partial differential form.

[4] [CO1] [L3]

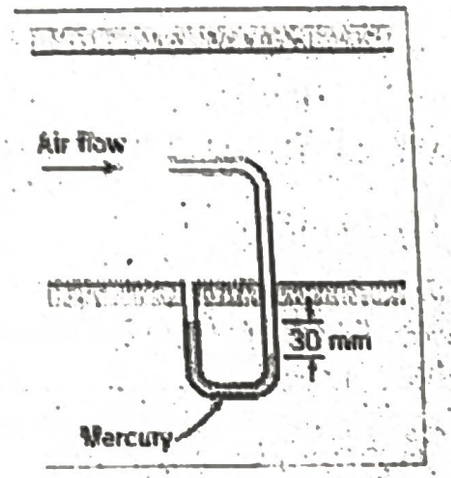
2 **[A]** What do you mean by equivalent pipe? Obtain an expression for the equivalent pipe.

[4] [CO2] [L3]

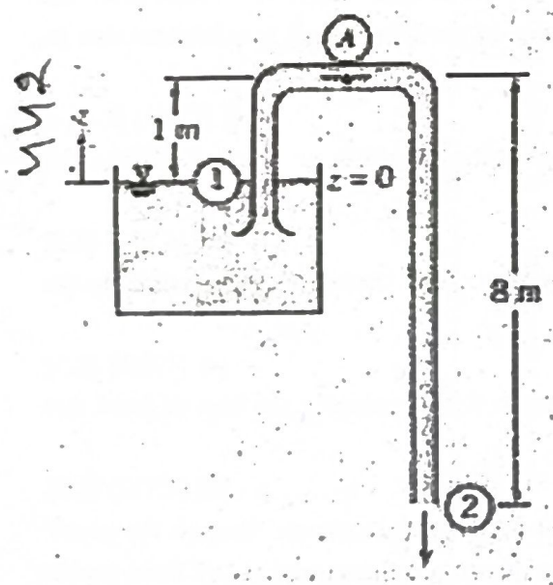
[B] Drive Darcy-Weisbach formula for calculating the loss of head due to friction in a pipe.

[4] [CO2] [L3]

[C] Drive the expression for the power transmission through the pipes. Find also the conditions for maximum transmission of fluid power and corresponding efficiency of transmission.



3. A U-tube acts as a water siphon. The bend in the tube is 1 m above the water surface; the tube outlet is 7 m below the water surface. The water issues from the bottom of the siphon as a free jet at atmospheric pressure. Determine (after listing the necessary assumptions) the speed of the free jet and the minimum absolute pressure of the water in the bend.



[CO4][L5]

4. Explain Boundary layer separation. Draw pressure distribution around a smooth sphere for laminar and turbulent boundary layer flow,compared with inviscid flow [CO5][L3]

5. Derive an expression for condition of maximum fluid power transmission through pipe. [CO5][L3]

6. Develop an expression for theoretical power and torque for a Pelton wheel turbine as a function of bucket speed and plot them. [CO4][L4]

7. A Francis turbine works under a total head of 25 m. The outer and inner diameters of the runner are 0.70 m and 0.35 m respectively. The vane tip is radial at the inlet and the flow leaves the turbine radially. The inlet guide vane angle is 12^0. Calculate the speed of the runner and the vane angle at the exit, if the velocity of flow is constant at 4.0 m/s. Assume the hydraulic efficiency as 0.90 [CO6][L5]

8. A centrifugal pump impeller is 40 cm in outer diameter and 2.5 cm wide at the exit. Its blade angle at the outlet is 30^0. When run at a speed of 1500 rpm, the flow rate though the pump is 80 Liters/s. (i) Calculate the radial, relative and absolute velocities at the impeller exit. (ii) If there is no inlet whirl, what would be the theoretical head added to the water by the impeller? [CO6][L5]

9. The following data pertains to a Pelton turbine:

Bucket angle at bucket outlet = 165^0	Coefficient of velocity of the nozzle = 0.98
Net head = 340 m	Jet diameter = 12 cm
Pitch diameter of runner = 2.25 m	Speed ratio = 0.46

Due to bucket friction, the relative velocity at bucket exit is found to be 5% less than the relative velocity at inlet to the bucket. Calculate (i) water power, (ii) speed of the turbine, and (iii) power lost in discharge [CO6][L5]

10. A 100-m length of smooth horizontal pipe is attached to a large reservoir. A pump is attached to the end of the pipe to pump water into the reservoir at a

Total No. of Pages 03

Roll No.

4th Sem

B.Tech .

END SEMESTER EXAMINATION

May-*2025*

PE 208 Industrial Engineering

Time: 3:00 Hours

Max. Marks : 40

Note: 1. Answer ALL the questions; assume missing data if any
2 Use of Statistical tables permitted.

1a	Define Industrial Engineering. Outline 3-4 important historical developments in the field of Industrial Engineering.	4	CO1,2 L1,2
1b	What is Productivity, Labour productivity and Total productivity? Through a method improvement study and increasing the number of persons from 6 to 7, the output of a certain system increased from 20 units per hour to 24 units per hour by. Calculate the improvement in the productivity of the system.	4	CO2,3 L-2,3
2a	Differentiate between production system and service system. Explain the product development process. Identify the factors to be considered for Make – Buy decision by original equipment manufacturer (OEM) for the components.	4	CO2,4 L-5
2b	The selling price of and item is Rs 120 per unit and it can be manufactured by either of the two processes A and B. For the process 'A', the fixed cost is Rs 50,000 per year and the variable cost of manufacturing is Rs 80 per unit. For process 'B', the fixed cost is Rs 90,000 per year and the variable cost is Rs Rs 60 per unit. Calculate the Break Even point for the processes A and B. Select the process for a demand of 1800 unit per year.	4	CO4 L-4
3a	Differentiate between Product Layout and Process Layout.	2	CO2 L2

3b	For a Petrol Pump in your locality, a) Draw the layout and justify/ improve the same by considering the principles of layout planning. b) Perform manpower planning by considering appropriate assumptions. c) Develop wage payment plan for the manpower.	6	CO4, L-5,6
4a	What do you understand by Short term, medium term and long term demand forecasting.	2	CO1,2 L-2
4b	For a Car service centre, a) What type of decisions needs to be taken based on demand forecasting. b) Discuss ABC Analysis; VED Analysis and their relevance in the Inventory Management for the centre.	6	CO4,5 L-5
5a	Discuss Gilberth's contributions in micro motion study.	2	CO2 L-2
5b	Write the procedure to conduct a activity sampling study to determine the utilization of class rooms in a university. Assume that the university has 200 class rooms. Also determine the number of observations to be made at 95% confidence level with ± 5% accuracy, if the initial study shows 80% utilization.	6	CO4,5 L-5
6a	A manufacturer uses 10,000 units of an item during the year. The ordering cost is Rs. 200 and the cost of carrying inventory is Rs 4 per unit per year. Find the optimal order quantity, number of orders per year, time period per order and total cost.	4	CO4 L-4
6b	Briefly explain Standard Time, Allowances, Job Evaluation and Learning curve.	4	CO1,2 L-2
7a	Weekly demand of ceiling fans at a retail shop for the past 8 weeks is given below. Using Exponential Smoothing Method with Alpha = 0.4 and 0.7, forecast the demand for 9th week. Calculate the forecast error and comment.	4	CO4 L-4

Week	Demand	Week	Demand
1	20	5	9
2	17	6	4
3	12	7	6
4	14	8	5

7b	For the following data of Assembly Line, Balance the line for a 10 minutes cycle time using the Ranked Positional Weight Technique. Also calculate balance delay and smoothness index.	4	CO4 L-4

Task	a	b	c	D	e	f	g	h	J	k	l	m
Task Time (Minutes)	4	3	5	2	4	6	2	3	5	2	3	4
Immediate predecessor	-	a	b	-	c	e	-	d, g	H	-	k	l

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Total No. of Page 02 *Roll No. .....*

FOURTH SEMESTER **B.Tech. (PE)**

END SEMESTER EXAMINATION ***May-2025***

PE208 Metal Cutting & Tool Design

Time: 3:00 Hours ***Max. Marks: 40***

Note: Answer any FIVE questions.
All questions carry equal marks.
Assume suitable missing data, if any.

1a In an orthogonal cutting set up, the depth of cut is 12 mm, feed 1 mm/revolution, cutting speed 70m/min, back rake angle 8° chip thickness ratio 0.30 and shear stress of the material at zero compressive stress is 100 kg/cm^2. Assume that the value of the constant k in the equation
$2\phi+\beta-\gamma = \text{Cot}^{-1}k$
is 0.22. Calculate the resultant force, rate of metal removal, shear strain and horse power at the tool per cubic centimeter of metal removed per minute. [5][CO#2] [BTL#3]

b. Differentiate between orthogonal and oblique cutting. [3][CO#1] [BTL#4]

2a Why does the tool become hot during metal cutting? [5][CO#3]
Show that, when cutting metal orthogonally with a tool of zero rake angle, the rate of heat generation (P_s) in the shear zone is given by [BTL#3]
$P_s = F_c.V(1-\mu r_c)$
where F_c = Cutting force
V = Cutting speed
μ = Mean coefficient of friction on the tool face
r_c = Cutting ratio

b What does the term ploughing forces and size effect mean in metal cutting? [3][CO#2] [BTL#1]

3a What are the various forms of wear found in cutting tools? Show with a neat sketch. [5][CO#4] [BTL#2]

b Which cutting fluid would you recommend for the machining of [3][CO#3]

	the following materials? (i) Cast Iron (iii) Copper alloys	[BTL#5]	
4a	Derive an expression for optimum cutting speed for maximum rate of production in turning.	[5][CO#4] [BTL#3]	
b	A carbide tool with mild steel workpiece was found to have a life of 1 hour and 40 minutes when cutting at 50 meter per minute. Find the tool life if the tool is to operate at speed 30% higher than previous one. Also calculate the cutting speed if tool is required to have a life of 2 hours and 45 minutes. Assume Taylor's exponent n = 0.28.	[3][CO#4] [BTL#3]	
5a	How is the hardness of the wheel affected by grinding conditions? Derive an expression used.	[5][CO#5] [BTL#3]	
b	Why are specific energy values so much higher in grinding than in traditional metal cutting processes?	[3][CO#5] [BTL#4]	
6a	A 10° back rake tool is to be used for machining on a lathe at a speed of 60 m/min. The diameter of the workpiece is 100 mm. The maximum permissible deflection at the tool point is 0.012 mm and the maximum allowable stress in the tool shank is 7.5 kg/mm^2. Find the cross-section of a rectangular tool shank with height to width ratio 1.6 and the tool overhang as 1.3 times the height. The recorded value of cutting force under these processing conditions is 250 kg. Assume the value of Young's Modulus as 20×10^3 kg/mm^2.	[5][CO#6] [BTL#3]	
b	How are carbide tipped tools classified?	[3][CO#6] [BTL#2]	
7a	Elaborate upon the tool geometries of slab milling cutter and end milling cutter with neat diagrams.	[5][CO#6] [BTL#4]	
b	What are Jigs and Fixtures? Explain the concept of principles of location.	[3][CO#6] [BTL#2]	

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Roll No. .....

FOURTH SEMESTER

B.Tech (ME)

END SEM. EXAMINATION [MAY 2025]

PE252 MANUFACTURING MACHINES

(For re-registered students only)

Time: 3 Hrs. *Max. Marks: 40*

Note: Question no. 1 is compulsory and answer *any three* questions from the rest. Assume suitable missing data, if any.

1(a) Explain the following briefly.
(i) Machine tools (ii) Eccentric turning (iii) Spot facing (iv) Shaper specification (v) Fly milling cutter 5 (CO1,2,3,4,5] L1

(b) With a neat sketch discuss the thread cutting operation to cut RH metric thread on a centre lathe. Also calculate the change gears required to cut a LH thread having 6 mm pitch on a lathe having lead screw of 4 TPI.

5 [CO2] L3

2 (a) A steel plate 250 mm×200 mm×30 mm is to be shaped along the longer side with cutting speed of 20 m/minute for roughing and 28 m/minute for finishing. The ratio of return time to cutting time is 2:3. The feed per stroke is 1 mm for roughing and 0.5 mm for finishing. The maximum depth of cut may be taken as 2 mm for roughing and 0.5 mm for the finishing. Tool over-travel and approach are 20 mm each. Calculate the machining time and metal removal rate for the given plate having final thickness 26 mm. 5 [CO4] L3

(b) With a neat sketch explain the construction and working of a crank and slotted link mechanism of a standard shaper. Describe how stroke length, cutting speed, and stroke position are adjusted on this shaper.

5 [CO4] L6

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3 (a) With a neat sketch explain the construction and working of a Radial drilling machine. Also write its applications. 5 [CO 3] L6

(b) In steel a mild steel plate of 30 mm thickness, 4 holes of 20 mm diameter each are to be drilled by standard twist drill. The cutting speed can be taken as 28 m/min and feed rate as 0.15 mm/rev. Calculate the machining time and the metal removal rate for the operation. 5 [CO 3] L3

4 [a] Classify the milling cutters. Also sketch and discuss the construction and applications of the following types of milling cutters. (i) Gear cutter (iii) Shell end mills 5 [CO5] L2

[b] What do you mean by the term specification of a grinding wheel? Discuss the importance of the individual elements which are used to specify a grinding wheel. 5 [CO 6] L1

[5] Write short notes on the following *[Any Four]*

(i) Cutting fluids and their selection

(ii) Tailstock set over method for taper turning

(iii) Indexing

(iv) Up milling and down milling

(v) Loading and glazing 10 [CO 1,2,4,5,6] L2

END

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SIXTH SEMESTER

Roll No. .....

B.Tech. (PE)

END SEMESTER EXAMINATION

May-2025

PE302 Welding Technology

Time: 3:00 Hours

Max. Marks: 40

Note: Answer any FIVE questions.
All questions carry equal marks.
Draw neat and proportionate sketches wherever applicable
Assume suitable missing data, if any.

1a How is brazing different from soldering? Describe the reactions that take place in an oxyfuel gas torch. [5][CO#1] [BTL#4]

b Discuss the self-adjustment of welding arc and the type of power source, which will be selected for this purpose. [3][CO#3] [BTL#2]

2a Determine the change in welding current if the arc length changes from 5mm to 6mm for the power sources with the following static volt-ampere characteristic [5][CO#3] [BTL#3]

(i) $I^2 = -8000(V-80)$

(ii) $V = 30+I^{1.01}/50$

Assume that arc length (l) and arc voltage (V) are related by the expression V=20+4l.

b How does the Lorentz force help in detachment of molten droplet from the tip of the electrode? What is Transition current? [3][CO#2] [BTL#2]

3 Discuss the salient features of the following processes: [8][CO#2,6] [BTL#2]
(i) Plasma arc welding
(ii) Laser beam welding

4a What is the feature that distinguishes FCAW process from other welding process? What are the process variables in explosive welding? [5][CO#2,6] [BTL#4]

b Justify, why is FSW, a green welding technology? Which are the welding processes that qualify as green processes and why? [3][CO#6] [BTL#5]

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5a	A magnetic particle method may be used for detecting defects in a welded joint: (i) Describe the principle of this method. (ii) What type of defects may be revealed?	[5]	[CO#4] [BTL#2]
b	Mention the advantages and applications of Electroslag welding process.	[3]	[CO#2] [BTL#1]
6a	Discuss the principle of operation and applications of Ultrasonic welding process.	[5]	[CO#6] [BTL#2]
b	Define weldability. Identify the factors that affect weldability.	[3]	[CO#5] [BTL#1]
7a	What are the defects that are generally found in welding? Explain any three weld defects with regard to their causes and remedies.	[5]	[CO#4] [BTL#4]
b	State the welding characteristics of copper and its alloys.	[3]	[CO#5] [BTL#1]

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Total no. of pages: 02

Roll No.....

SIXTH SEMESTER
B. Tech. [PE]
END SEMESTER EXAMINATION
May- 2025
PE304 Precision Manufacturing

Time: 3.00 hrs
Max. Marks: 40

Note: All questions carry equal marks. Draw neat diagrams wherever necessary. Assume suitable missing data, if any.

Q1. What is meant by precision manufacturing in terms of material selection, dimensional size, and accuracy? Describe the TiC CVD-coated cutting tool used in precision manufacturing, with a neat sketch. (4 Marks)(CO1)(BTL1, 2)

Q2. Differentiate between error, precision, and accuracy. List the types of errors related to the relative location of surfaces. Explain three methods used for evaluating roundness errors. (4 Marks)(CO2)(BTL3)

Q3. How the static stiffness influence on machining accuracy. Over all compliance of machine tool is given by

$W_T = 1000/3EI\,(L\text{-}x/L)^2\,x^2 + W_{hs}\,(L\text{-}x/L)^2\;W_{ts}\,x^2/L^2 + W_c$

Given $W_{hs} = 0.508$ µm/kgf $W_{ts} = 0.704$ µm/kgf $W_c = 0.635$ µm/kgf

Work material MS; $E = 2.1 \times 10$ kgf/mm^2, $L/D = 4$, $D = 15$ mm

Calculate the minimum and maximum compliance and draw the shape of workpiece after machined. (4 Marks)(CO3)(BTL4)

Q4 Explain the operation of a hydrostatic bearing of a machine tool with a neat sketch. What are design criteria of hydrostatic bearing? Also, explains coefficient of friction for hydrostatic bearing. (4 Marks)(CO3)(BTL5)

Q5 Derive the thermal error index for length measurement in precision machine. List the thermal deformations in machine tool column and show loss of accuracy from temperature is minimized in compound type machine.
(4 Marks)(CO4)(BTL5)

OR

Q5" Explain working principle of excimer lasers, copper vapour and femtosecond laser and how is it used in micro fabrication with a neat diagram.
(4 Marks)(CO4)(BTL6)

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Q6. Define the guideway of a machine tool spindle of a machine tool (with a neat sketch). What are the functions of the guideway? Describe the different types of antifriction guideways used in machine tools. (4 Marks)(CO4)(BTL2)

Q7. Explain the working principle of EDM, Wire EDM and μ EDM process and its applications. Discuss the issues of electrode and workpiece preparation in μ EDM process. (4 Marks)(CO5)(BTL3)

OR

Q7' Explain mechanical micro-machining processes. What are the geometric characteristics of typical micro cutting operations? Show that the under the same load maximum stress of a micro shaft is scale down factor (S^2) times of a conventional shaft. (4 Marks)(CO5)(BTL4,6)

Q8. Explain the steps involved in the photolithography and photoresist process used in MEMS fabrication with diagrams. (4 Marks)(CO5)(BTL2)

Q9. List the stamping techniques for micro and nano-fabrication. With neat sketches, describe the nanotransfer printing and application in unconventional electronic system. (4 Marks)(CO6)(BTL3)

Q10. Differentiate between vacuum pressure and centrifugal microcasting process with a neat sketch. For micro casting, what are the properties of casting alloy, investment materials, and microstructure of microcast part? (4 Marks)(CO6)(BTL4)

—End—

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SIXTH SEMESTER

B. Tech.

END-TERM EXAMINATION **MAY-*2025***

PE306 METROLOGY AND QUALITY ASSURANCE

Time: 3:00 Hours **Maximum Marks: 40**

Note: Answer any FIVE questions.
All questions carry equal marks.
Assume suitable missing data, if any.

1 (a) Explain the role of light wave standard in the future of precision measurements. [4][CO1][L2]
(b) Explain the difference between a comparator and measuring instrument. State the fields of application of comparator. [4][CO3][L3]

2 (a) Describe sigma comparator and clearly explain the magnification method adopted in it. [5][CO4][L4]
(b) Explain the working of back pressure type pneumatic comparator with sketch. [3][CO1][L3]

3 (a) Explain the method of interferometer with sketch. [3][CO3][L2]
(b) Calculate the limits of tolerance and allowance for a 25 mm shaft and hole pair designated H_8d_9. Given 1T7=16i, 1T8=25i, 1T9=40i, 1T10=64i. Diameter steps specified by ISI are 6-10, 10-18, 18-30, 30-50, 50-80 mm. [5][CO5][L5]

4 (a) Explain how the flatness of a surface plate, approximately 1200 x 900 mm of size, may be tested by means of a sprite level. [5][CO5][L5]
(b) Explain the term "interchangeability" and "selective assembly" with an example. [3][CO3][L3]

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5 (a) Explain the method of measurement of Taper Plug Gauge with sketch. [3][CO4][L4]

(b) How the alignment of milling machine is checked? Explain with neat sketch. [5][CO4][L4]

6 Write short notes on any FOUR of the following: [8][CO2][L2]

a) Types of fit
b) Surface roughness
c) Dial indicator
d) Angle gauge
e) Parkinson gear tester

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Total no. of Pages: 2

Roll no.....

VI SEMESTER

B.Tech.

END TERM EXAMINATION

May-2025

PE 308 Green Energy Technology

Time: 03:00 Hours

Max. Marks: 50

Note : All questions carry equal marks.
Assume suitable missing data, if any.
Answer any two from each question

Q.1 (a) Analyze the role of India in global renewable energy transition efforts and mention key initiatives taken by the government. [5][CO1][BTL4]

(b) Describe the working principle and applications of any two instruments used for measuring solar radiation. [5][CO2][BTL1]

(c) How can green energy technologies contribute to climate change mitigation and the achievement of Sustainable Development Goals? [5][CO5][BTL3]

Q.2 (a) Compare different types of solar PV technologies in terms of efficiency, cost, and suitability. [5][CO2][BTL2,3]

(b) Describe the construction, working, and applications of flat plate and evacuated tube solar collectors. Compare their performance. [5][CO2][BTL1,2]

(c) Ocean Thermal Energy Conversion power plant utilizes the naturally occurring temperature gradient between warm surface seawater and cold deep seawater to generate electricity. The system operates under the following conditions: surface seawater temperature is 20°C, and deep seawater temperature at a depth of 700 meters is -5 °C. During heat addition, the surface water temperature decreases by 5°C. The plant is designed to produce a net power output of 100 MW. [5][CO4][BTL5]

Q.3 (a) Describe the working principle and components of a horizontal axis wind turbine (HAWT). How does it differ from a vertical axis wind turbine (VAWT)? [5][CO3][BTL1,2]

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(b) Differentiate between small, mini, and micro hydropower systems with suitable examples and their areas of application. [5][CO3][BTL2,3]

(c) From the following table of mean monthly discharge, draw the following curves.

(i) Hydrograph (ii) Flow duration curve

Month	Discharge (m^3/s)	Month	Discharge (m^3/s)
January	100	July	1100
February	325	August	1300
March	400	September	1000
April	700	October	800
May	850	November	600
June	900	December	300

(iii) Find the power developed if the head available is 90m and the overall efficiency of generation is 90%. Assume each month of 30 days.

[5][CO3][BTL5,6]

Q.4 (a) Explain the operational parameters influencing the performance of biogas plant. [5][CO3][BTL2]

(b) Describe in detail the gasification technologies used for biomass energy conversion. What is general composition of gas produced and what is its heating value? What are its main applications?

[5][CO3][BTL1,2]

(c) Explain working principle of single-basin tidal power plant and also discuss key factors affecting energy generation, limitations and challenges in achieving high efficiency in tidal power generation. [5][CO4][BTL2]

Q.5 (a) Describe the working principle of a geothermal power plant with a neat schematic. [5][CO4][BTL1]

(b) What are fuel cells? Describe the working principle of a Proton Exchange Membrane Fuel Cell (PEMFC). [5][CO4][BTL1,2]

(c) Describe any two carbon capture technologies used in thermal power plants. [5][CO5][BTL5]

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Total No. of Pages: 02 *Roll No.....*

06 SEMESTER B.Tech. [PE]

END TERM EXAMINATION *May 2025*

PAPER CODE: PE 312 TITLE OF PAPER: AUTOMOBILE ENGG.

Time: 3 Hours. *Max. Marks: 50*

Note: Answer any FIVE questions
All questions carry equal marks
Assume suitable missing data if any

Q.1 [a] Names all parts of the internal combustion engine. Write Materials, Construction, and Functions of following major parts:1) Cylinder 2) Piston [5] [CO – 1] [BTL1]

[b] What are the different types of fuel systems? State the Materials, Construction, and Functions of following major parts: 1) Fuel Pump 2) Fuel Injector [5] [CO – 1] [BTL3]

Q.2 [a] Name the different types of cooling systems. Explain them in brief. Also discuss the following in details:
1. Radiator 2. Thermostat [5][CO –2] [BTL2]

[b] What are functions of clutch in Transmission systems. With neat sketch describe the construction and working of single plate clutch. [5][CO – 2] [BTL2]

Q.3 [a] Describe principle of friction braking? With help of neat sketch explain the Hydraulic brakes in detail. [5][CO – 3][BTL4]

[b] What do you by Mechanical brake system, explain? With a neat sketch Explain power assisted brakes [5][CO – 3] [BTL3]

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Q.4 [a] Name the different suspension systems. With neat sketch Explain Independent system. [5][CO – 4] [BTL 3]

[b] Name the different types of axles. Explain rigid axle suspension system, and torsion bar. [5][CO – 4] [BTL4]

Q.5 [a] What is principle of steering? Explain Ackerman principle of correct steering [5][CO – 5] [BTL5]

[b] What do mean by center point steering? Explain in details the construction, working of power steering. [5][CO – 5] [BTL6]

Q.6 [a] What do you mean by Construction, Maintenance, and how many types of servicing. Explains. [5][CO – 6] [BTL6]

[b] What do mean by tuning up on engine? How will you tune up the Engine? How will you find fault and their remedies? [5][CO – 6] [BTL5]

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Total no. of Pages: 02

Roll no.....

EIGHTH SEMESTER

B.Tech. [PE]

END-TERM EXAMINATION *May-2025*

PE-404 TOTAL QUALITY MANAGEMENT

Time: 3:00 Hours *Max. Marks: 50*

Note: Answer any FIVE questions. All questions carry equal marks. Assume suitable missing data, if any. ***Use of statistical tables is allowed.***

1. [a] Discuss quality philosophies of Crosby and Taguchi.
   [b]Describe the importance of quality planning in manufacturing sector. What are the key components of a quality plan. (5 X2) [CO# 1][L1]

2. [a] Draw a 'p' chart for the following data. Revise the trial control limits if required and interpret the chart for assignable cause. (5) [CO#3][L3]

Sample size:	100	100	100	100	100	100	100	100	100	100
No. of defectives:	9	6	4	5	11	6	17	9	7	4

   [b] Define process capability.
   The quality assurance manager is assessing the capability of a process that produces a machining component. The design specifications for a component are 90±0.5, whereas the process report shows that process average is 89.8 mm and the standard deviation is 0.15. Calculate the appropriate process capability measure(s). (5) [CO#2][L3]

3.[a] Explain the OC curve with reference to sampling inspection and the meaning of the terms: (i) AQL (ii) LTPD (iii) IQL (iv) Producer's risk (v) Consumer's risk. (5) [CO#1][L2]

[b]In a double sampling plan, N=4000, n_1=100, c_1=1, n_2=150 and C_2=2. Use Poisson distribution to compute the probability of acceptance of a 1% defective lot. (5) [CO#4][L4]

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4.[a] Explain DMAIC principles of six sigma with the help of a suitable example. (5)[CO#2] [L2]

[b] Discuss implementation and registration process of ISO. (5) [CO#2][L3]

5.[a] The time to failure, in years of a mechanical component has the following PDF: (5) [CO# 3][L5]

$$f(t) = \frac{200}{(t+10)^3} \quad for\ t \geq 0$$

(i) Derive the reliability function.

(ii) What is the design life for a reliability of 0.98.

[b] Calculate the reliability of the given system. (5) [CO# 3][L5]



6.[a] Discuss various types of redundancies to improve the system's reliability. (5) [CO# 1][L2]

[b] Explain the design for reliability. (5) [CO# 2][L1]

7. Write short notes on any two topics out of the following:

[a] Maintenance policies
[b] Markov model
[c] Application of Six Sigma in service sector
[d] Quality cost (5X2) (CO#1)[L1]

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Total No. of Pages 02

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Second SEMESTER

B.Tech. (SE)

END-TERM EXAMINATION

May-2025

SE-102n Fundamentals of Computers

Time: 3 Hours

Max. Marks: 50

Note: Attempt any 5 questions. All questions carry equal marks.
Assume suitable missing data, if any.

Q1.[a] What is the computer system? Also explain the generation of computers. [5][CO1][L1]

[b] Explain the importance of MAR and MDR in accomplishing processor to memory communication. [5][CO2][L2]

Q2.[a] What is the difference between Static RAM and Dynamic Ram? List different types of static RAM and Dynamic RAM. [5][CO2][L2]

[b] Define input and output devices. Also Explain the types of input and output devices. [5][CO2][L1,2]

Q3. [a] What is the process management module in the operating system? Discuss process management chart.. [5][CO4][L2]

[b]Calculate average waiting time and turnaround time by drawing Gantt chart Using FCFS CPU scheduling. [5][CO4][L5]

Process	Arrival Time	Burst Time
P1	0	4
P2	1	3
P3	2	2
P4	3.	2

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Q5.[a] Explain different types of DBMS system architecture and their key features. [5][CO5][L2]

[b] Discuss various cyber attacks and some basic ethics for computer security. [5][CO5][L1]

Q6. [a] What is parallel instruction execution? Explain their phases with example. [5][CO5][L2]

[b] Explain different models of DBMS. [5][CO5][L2]

Q7. Discuss the block diagram of computer with all the components in details. Also discuss various types of registers with their application used in CPU. [10][CO1][L1,2]

Total no. of Pages:03

Roll no.....

2nd SEMESTER

[B.Tech.]

END TERM EXAMINATION *May-2025*

SE104 Fundamentals of Software Engineering

Time: 03:00 Hours *Max. Marks: 40*

Note : All questions carry marks equal marks.
Assume suitable missing data, if any.

Q.1. Differentiate between the increment process model and evolutionary process model. Explain an example for each. [8 M] [CO 1] [L_1,L_2,L_3]

Q.2. Explain Cohesion and Coupling with all its types. Also analyze the trade-offs involved between achieving high cohesion and low coupling while designing modules of large-scale enterprise software with diagram. [8 M] [CO 2] [L_2,L_4,L_6]

Q.3. Define Requirement Engineering in the context of Software Engineering. Explain in detail the major activities involved in Requirement Engineering, covering Objective/Purpose, Steps/Methods used, and Outcomes produced for each activity. Also, highlight the importance of avoiding project failures and improving software quality. [8 M] [CO 3] [L_4,L_6]

Q.4. An organization wants to develop an Online Food Delivery System that allows users to browse food items, place orders, make payments online, and track their deliveries. [8 M] [CO2,4] [L_3,L_5]

a) Identify the major external entities interacting with the system.
b) List the main processes involved in the system at a high level.

c) Draw the Level 0 (Context Diagram) for the system showing all external entities and major data flows.
d) Further decompose the Level 0 diagram into a Level 1 DFD, breaking the system into at least four sub-processes such as:
   - User Registration and Login
   - Menu Browsing and Item Selection
   - Order Processing and Payment
   - Delivery Management and Tracking

Ensure that:
- Data stores like User Database, Food Menu Database, and Order Database are properly shown.
- Each process is clearly labeled.
- Data flows are meaningful (e.g.,"Order Details", "Payment Info", "Delivery Status").

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OR

Q.4. Suppose a healthcare organization wants to build a COVID-19 Vaccination Appointment Management System. The system should allow citizens to register themselves, book vaccination appointments, view their appointment details, and receive vaccination certificates after completion. [8 M] [CO3,4] [L3,L5]

Based on the above scenario:

a) Identify and list the key entities, their attributes, and the primary keys.
b) Identify and describe the relationships between the entities clearly, mentioning the type of relationship (one-to-one, one-to-many, etc.).
c) Draw an Entity-Relationship (ER) Diagram representing:
   - Entities such as Citizen, Appointment, Vaccination Center, Vaccine, and Certificate.
   - Important attributes such as Citizen_ID, Name, Mobile Number, Appointment_ID, Date, Center_ID, Vaccine Name, etc.
   - Suitable Primary Keys and Foreign Keys.
   - Cardinalities (1:1, 1:N, M:N) between entities.

Ensure that:
- Each relationship is clearly labeled (e.g., "Books", "Issues", "Conducts").
- Attributes are shown properly (main attributes under each entity).
- The diagram uses standard ERD notation.

Q.5. Write a short note on **(ANY 2 ONLY):** [8 M]
a) Structure and Major contents of an SRS document. [CO1,4,5]
b) Functional and Non-Functional Requirements with examples. [L1,L2,L6]
c) Software Process Models.

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Total no. of Pages: 02 *Roll no.....*

4th Semester
B. Tech. (SE)

END TERM EXAMINATION **May-2025**

SE 202: Computer System Architecture

Max. Marks: 40 **Max. Time: 3 hours**

Note: Attempt any 4 from remaining. Assume suitable missing data if any.

Q.1 (a) What is pipelining with reference to computer system architecture? [CO1][BTL1][2]
(b) What is zero address type instruction? [CO3][BTL2][2]
(c) Why do we need I/O interface? [CO4][BTL2][2]
(d) What is bootstrap loader? [CO5][BTL3][2]
(e) Discuss algorithm steps for multiplication of floating point numbers. [CO3][BTL4][2]

Q2. (a) Explain the different computer generations. [CO1][BTL1][5]
(b) What is the significance of timing in register transfer with the help of timing diagram? [CO2][BTL2][5]

Q.2 (a) Explain how we can implement bus system using Multiplexers. [CO2][BTL3][5]

(b) What is the difference between hardwired control and microprogrammed control? Give the advantages and disadvantages of both approaches. [CO3][BTL4][5]

Q.3 . (a) Explain in detail horizontal and vertical microprogramming. [CO3][BTL2][5]

(b) Explain memory reference, register reference and input-output type instruction. [CO3][BTL1][5]

Q.4 (a) Explain the following instructions: OUT, SKI, SKO, ION, IOF. [CO3][BTL2][5]

(b) Differentiate between infix notation, polish notation and reverse polish notation with the help of an example. [CO4][BTL5][5]

Q.5 (a) What is an addressing mode? Discuss in brief the 10 types of addressing modes for general register organization.

[CO4] [BTL4][5]

(b) Differentiate between strobe pulse method and handshaking method for asynchronous data transfer. [CO4] [BTL3][5]

Q.6 (a) What is associative memory? Explain the hardware organization for associative memory using block diagram.

[CO5] [BTL2][5]

(b) Explain Booth algorithm for multiplying binary integers in signed-2's complement representation. Support your answer with block diagram for hardware implementation for Booth Algorithm. [CO3] [BTL2][5]

Q7. (a) What is the need of signed magnitude representation. Explain with example. [CO5] [BTL4][5]

(b) Explain different modes of Data transfer in detail with diagram.

[CO5] [BTL5][5]

Q8. (a) Elucidate the concept of daisy chaining and parllel priority interrupts. [CO6][BTL3][5]

(b) Delineate Memory hierarchy diagrammatically.

[CO6][BTL4][5]

B.Tech.

END TERM EXAMINATION

COURSE CODE: SE 202/SE 204n **May-2025**

COURSE TITLE: Object Oriented Software Engineering

Time: 03:00 Hours **Max. Marks: 40**

Note : All questions carry equal marks.
Assume suitable missing data, if any.
Attempt any five questions.

Q.1 (a) What are the steps of activities in process model for Coad and Yourdon method?

(b) What is RUP? Explain the life cycle of RUP

[8][CO1, CO2][BTL2]

Q.2 In the current digital era, healthcare systems are still plagued by manual appointment bookings, long waiting times, fragmented patient records, and inefficient communication between doctors, patients, and diagnostic centers. Patients often face difficulties in accessing timely medical consultations, tracking their prescriptions, or viewing diagnostic reports, especially in remote or busy urban settings.

The lack of an integrated solution leads to disorganized workflows, data inconsistency, and reduced patient satisfaction. Moreover, healthcare professionals struggle to manage appointments, maintain patient history, and share updates across different departments efficiently.

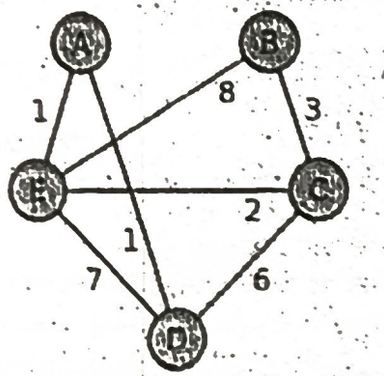
There is a clear need for a Smart HealthCare Appointment and Diagnostic System (SHADS) that:

- Enables patients to easily book physical or virtual appointments, receive prescriptions, and access their medical reports anytime.

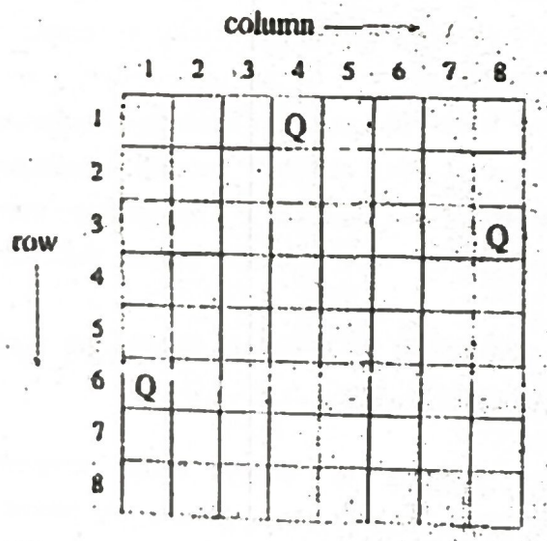
issue digital prescriptions.

4. (a)What is the travelling salesman problem? What is the Brute Force solution, and justify whether it is a P/ NP problem?] [L4][CO4,6][5]

(b) Solve the following TSP problem using dynamic programming. What is the complexity, and is it NP NP-complete/NP hard problem? [L4][CO4,6][5]



5. (a) Use backtracking to find a solution to the 8-queen problem if the initial board is as follows [L3[[CO5][5]



(b) What is the difference between non deterministic and deterministic problems? [L2][CO6][5]

6(a) . [a] Explain P, NP, NPC and NP hard classes with relationship between them? [L1][CO6][5]

[b] Consider the following number of activities with their start and finish time given below. In which sequence will the activity be selected in order to maximize the number of activities, without any conflicts? [L3] [CO3][5]

Activity	Starting time	Finish time
A1	1	2
A2	2	5
A3	1	5
A4	3	6
A5	6	8
A6	4	9

----------End----------

Total no. of Pages: 3

Roll no.....

SIXTH SEMESTER

B.Tech.

END TERM EXAMINATION

May-2025

SE302a Empirical Software Engineering

Time: 03:00 Hours

Max. Marks: 40

Note: Answer any *FIVE* questions. All questions carry equal marks. Assume suitable missing data, if any.

Q1. [a] Write the pseudocode (mathematical analysis) for a procedure to conduct systematic review.

[4][CO1][BTL4]

[b] Illustrate importance of empirical research from the perspective of software industries, academicians, and researchers with example. What is GQM method? Explain the phases of GQM method.

[4][CO1, CO2][BTL2, 4]

Q2. [a] The coupling values of a number of classes are provided below for two different samples. Test the hypothesis using F-test whether the two samples belong to the same population at 5% significance level.

Sample 1	47	42	33	40	78	32	20	35	41
Sample 2	29	31	31	35	32	30	31	78	52

[4][CO4][BTL3, 5]

[b] Compare and contrast various statistical tests with respect to their assumptions and normality conditions of the underlying data.

[4][CO4][BTL2]

Q3. [a] A software engineering team aims to evaluate the effectiveness of five different machine learning algorithms (A1, A2, A3, A4, A5) for software defect prediction. Each algorithm is applied to six software

modules, and the number of defects detected by each algorithm is given below:

Modules/ Algorithm	A1	A2	A3	A4	A5
M1	20	29	21	7	45
M2	29	12	15	13	34
M3	20	28	21	11	58
M4	30	19	12	8	51
M5	24	17	34	21	69
M6	16	8	79	15	37

i. Identify the appropriate statistical test to determine whether there is a significant difference in defect detection performance across five different machine learning algorithms. Justify your answer.

ii. Test the hypothesis with 5% significance level.

iii. If significant difference found in Q3. *i)* part, select appropriate post-hoc analysis test to determine whether the performance of A1 and A4 algorithm differs significantly from A2, A3, and A5 algorithm. Discuss the results briefly.

[8][CO4][BTL3, 4, 5]

Q4. [a] Identify the categories to which the following threats belong and threat mitigation for the following threats:

i. Confounding effects of variables
ii. Inadequate size and number of samples
iii. Exploring only open source systems
iv. Inappropriate use of performance measures
v. Reliability of measurement tools
vi. Inappropriate selection of subjects
vii. Errors while combining data
viii. Low statistical test ability

[8][CO4][BTL1, 4]

Q5. [a] Consider a corpus of six documents with six term t_1, t_2, t_3, t_4, t_5, t_6. The occurrence of each term in the corresponding document is given below.

Document/ Term	t_1	t_2	t_3	t_4	t_5	t_6
Document 1	10	30	41	0	20	50
Document 2	34	21	67	32	0	43
Document 3	45	0	23	50	90	56
Document 4	10	4	0	0	9	7
Document 5	64	41	52	12	21	0
Document 6	0	0	19	20	40	63

i. Identify which terms are most discriminative across documents by calculating their Inverse Document Frequency (IDF).

ii. Calculate the normalized Term Frequency (TF) for term t_3, t_6, and t_4 in all documents.

iii. Based on your analysis, compute the TF-IDF weights for all terms in Document 1 to Document 4 and discuss briefly which document appears most relevant to term t_3. [6][CO3][BTL5]

[b] Why mining relevant attributes is important before applying data analysis techniques? [2][CO2][BTL2]

Q6. Write a short note on *any four* of the following:

[a] Hypothesis Testing
[b] Empirical Studies
[c] Git
[d] Dynamic Software Metrics
[e] Data Collection Strategies

[2*4][CO1, 2, 3, 4][BTL2]

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Total no. of Pages: Roll no.....

__VI___SEMESTER **B.Tech.**

END TERM EXAMINATION *May-2025*

SE304a COMPUTER NETWORKS

Time: 03:00 Hours *Max. Marks: 40*

Note : All questions carry equal marks.
Attempt any 5 questions.
Attempt parts of a question together.
Assume suitable missing data, if any.

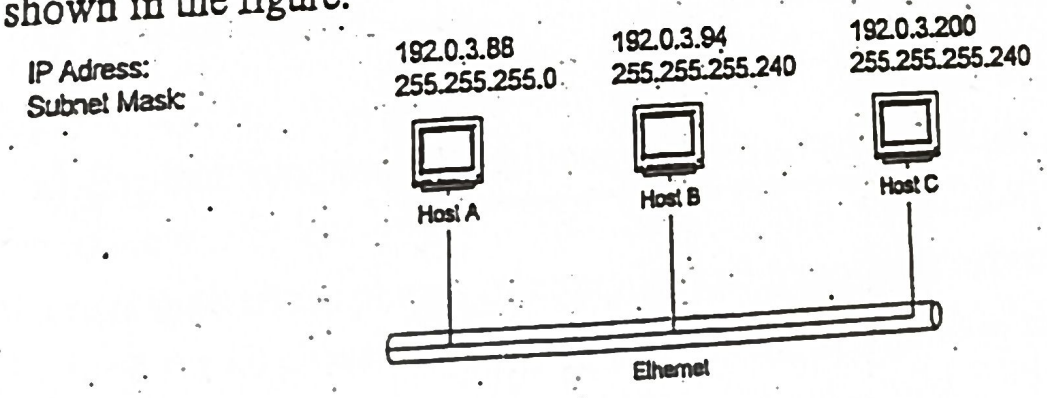
Q.1 Explain how the TCP layer helps in congestion control with advertised and congestion windows using slow start, congestion avoidance, and congestion detection. [L3][CO 4][8]

Q.2 a) What are the line encoding issues with constant voltage ? [L1] [CO 1][4]

b) A bit stream 10011101 is transmitted using the standard CRC method. The generator polynomial is x^3+1.
What is the actual bit string transmitted?
Suppose the third bit from the left is inverted during transmission.
How will the receiver detect this error?
[L3][CO 2][4]

Q.3[a] What is the IPV6 protocol and what advantages does it have over IPV4 ? [L1] [CO 3][4]

[b] Consider an Ethernet network with three hosts, Host A, Host B, and Host C. No machine is configured as an IP router, and there is no IP router on this network. Assume that the IP addresses and subnet masks are as shown in the figure. [L3][CO3][4]



For each of the following IP datagram transmissions, describe if the transmissions will be successful. If a transmission will not work, provide an explanation:

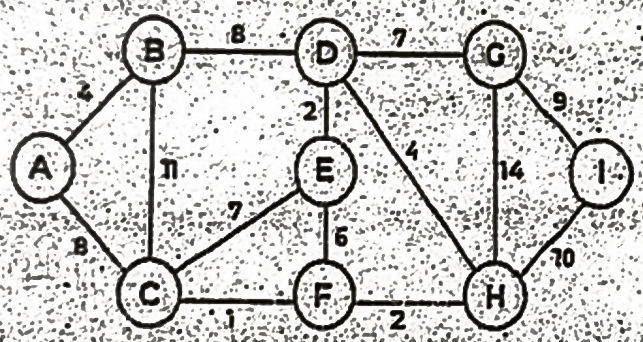
(i) Host C sends an IP datagram to Host A

(ii) Host A sends an IP datagram to Host B

(iii) Host A sends an IP datagram to Host C

(iv) Host B sends an IP datagram to Host C

Q.4 [a] What will be the routing table at A be using Link state routing protocol? [L4][CO3][4]



[b] How does Distance vector routing table converge bad news?

[L4[[CO 3][4]

Q.5 [a] What is the three-way handshake in TCP/IP meant for? What are examples of parameters that are negotiated? [L3][CO4][4]

[b] Given a bulky file that needs to be transferred without confidentiality, but with non repudiation, how will you ensure that the file transmission is correct? What overheads for storage would be needed to store any cryptographic keys? Use cryptography to explain. [L4][CO5][4]

Q 6 [a] What is Diffie-Hellman key exchange [L1][CO2][4]

[b] Explain the telnet application [4][L1][CO6]

——————End——————

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VI SEMESTER

B.Tech

END TERM EXAMINATION May-2025

COURSE CODE SE 306 COURSE TITLE -COMPILER DESIGN

Time: 03:00 Hours Max. Marks: 50

Note: Attempt Any Five questions. All questions carry equal marks. Assume suitable missing data, if any.

Q.1 a) Write the comparison among SLR Parser, LALR parser and Canonical LR Parser. [L1][5][CO2]

b) Explain the viable prefixes, token, lexeme, NFA, Melamechine. [L1][5][CO3]

Q.2 a) What is a shift-reduce parser? Explain in details the various type of conflicts that may occur during shift-reduce parsing. [L1][5][CO3]

b) Discuss call by need and call by value result parameter passing techniques with example. [L2][5][CO5]

Q.3 a) Explain three address codes and its types. How would you implement the three Address for x:=A[y, z] ? [L1,L2][5][CO4]

b) Discuss the various peephole optimization techniques in detail [L1,L2][5][CO2]

Q.4 a) Explain synthesized attribute and inherited attributed grammer with suitable examples. [L2,L3][5][CO2]

b) Disscuss the various phases of compiler and trace the program segment c=a+b for all phases.. [L2,L5][5][CO2]

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Q.5 a) Construct a CLR parsing table and DFA for the given context-free grammar. [L2,L6] [10M][CO4]

S- ->AA

A- ->aA|b

Q.6 What is DAG? Give Example and its Application. Construct the DAG for the following basic blocks. [L2,L3][10][CO3]

1. t1:=4*i
2. t2:=a[t1]
3. t3:=4*i
4. t4:=b[t3]
5. t5:=t2*t4
6. t6:=prod+t5
7. prod:=t6
8. t7:=i+1
9. i:=t7
10. if i<=20 goto 1

Q.7 What do you mean by DFA , NFA , Mealy and Moore machine ? Differentiate between DFA ,NFA and Mealy , Moore machine .Discuss with example. [L1][10][CO5]

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Total no. of Pages: 2 Roll no.....

6TH SEMESTER B.Tech.

END TERM EXAMINATION **MAY-2025**

SE308 - SOFTWARE RELIABILITY

Time: 03:00 Hours *Max. Marks: 50*

Note: All questions carry equal marks.
Assume suitable missing data, if any.
All questions are compulsory unless explicitly stated otherwise.

Q.1 Differentiate between any two: [10][CO2][BTL4]

i. Operational Reliability and Testing Reliability

ii. Counting Process and Renewal Process

iii. Exponential Distribution and Poisson Probability Distribution

Q.2. i. A software system has an MTBF of 250 hours. Calculate its failure rate. (λ). Using the exponential model, what is the probability that the system will operate without failure for 100 hours? [5][CO1][BTL3]

ii. What is Reliability Block Diagram. Explain System Reliability Function in series and in parallel arrangement. [5][CO1][BTL2]

Q.3 i. What are the assumptions of Jelinski-Moranda Model. If software has initially 20 faults and the fault detection rate is ϕ=0.01/sec, what is the hazard rate and pdf after the 5th fault has been corrected? [5][CO4][BTL1, BTL3]

OR

What are the basic assumptions of Musa's BET model. If a program has encountered 800 faults already and may encounter 1900 faults in infinite time with three failures per CPU hours, calculate the current failure intensity using BET model.

ii. Outline the key characteristics of Markovian and NHPP models. [5][CO3][BTL1]

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Q.4. SmartMeds is deploying a Hospital Management System (HMS) across multiple large hospitals. A key module in the system is Appointment Scheduling, which enables Receptionists to schedule/cancel/reschedule appointments; Doctors to view their schedules; Administrators to update appointment policies.

SmartMeds aims to engineer just-right reliability — not over-investing or under-protecting — by adopting Operational Profile-based testing, Quantitative failure intensity targets Tailored software reliability strategies. They gather operational data:

- *Receptionists*: 300 new appointments, 100 cancellations, 50 reschedules/month
- *Doctors*: 200 schedule views/month
- *Admins*: 20 rule updates/month

Initial analysis estimates a system-wide failure intensity objective of failures per 1000 operations for the Appointment Scheduling module. Admin operations are considered high-severity, and downtime must be minimized.

i. Generate operational profile in step-by-step manner for SmartMeds for the Appointment Scheduling module. Include how customer and user types influence the process. **[10][CO5][BTL5]**

Q.5 Consider the same scenario as in Q.4 and answer the following:

i. Based on SmartMeds' context, define what constitutes a "failure" in this module. Suggest a classification of failures by severity level and justify your classification. Also, differentiate between reliability and availability in the context of the HMS.

[5][CO5][BTL5]

ii. Explain why "number of operations" is a better natural unit than "execution time" for measuring failure intensity in this HMS module. Mention at least two criteria to support your answer.

[5][CO4][BTL4]

———End———

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SIXTH SEMESTER

B.Tech. [SE]

END SEMESTER EXAMINATION ***May-2025***

SE316—NATURAL LANGUAGE PROCESSING

Time: 3:00 Hours ***Max. Marks: 40***

Note: Attempt any four questions.
Attempt all parts of a question together.
All questions carry equal marks.
Assume suitable missing data, if any.

Q1 [a] For the following Grammer:

S→ NP VP NP→ ART ADJ N NP→ ART N
NP→ ADJ N VP→ AUX VP VP→V NP
the: ART yellow:ADJ man: N, AUX, V
catch: N, V book: N,V

Find the final chart for the sentence "the yellow man man catch the book" using bottom up chart parser?

[b] What is lexical cohesion? Discuss any two lexical cohesion devices.

[2x5=10] (CO2)[BTL4]

Q2 [a] What is text normalization? Explain different tasks involved in the process of normalization?

[b] Compute the edit distance (using insertion cost 1, deletion cost 1, substitution cost 1) of "Saturday" to "Sunday". Show your work using the edit distance grid.

[2x5=10] (CO1)[BTL2,5]

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Q3 [a] Explain the three subtasks of an NLG system alongwith the diagram showing input and outputs of respective subtasks?

[b] What makes machine translation difficult. Explain?

[2x5=10] (CO3)[BTL2]

Q4 [a] Explain the various information sources that can be utilized as knowledge sources in word sense disambiguation?

[b] Write the regular expression for the following:

i) Language that comprises of all strings of even length over {a,b}

ii) Language that comprise of all strings that contain exactly two a's over the alphabet{a,b}

iii) Language that have all strings ending with substring bcb over the alphabet {a,b,c,d}

iv) Language that have all strings with no two consecutive d's over the alphabet {a,c,d}

v) Shortest string that is not in the language represented by a*(ab)*b*

[2x5=10] (CO4)[BTL3,4]

Q5 Write short note on

[a] ELIZA

[b] Anglabharti &Anusaarak

[2x5=10] (CO5)[BTL2]

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VI SEMESTER

B.Tech. [Third Year]

END SEMESTER EXAMINATION *May-2025*

SE 326-MACHINE LEARNING

Time: 3:00 Hours *Max. Marks: 40*

Note: Attempt any five Questions. Each question carries equal marks. Assume Suitable data wheresoever required.

Q 1 Explain the following in brief. [8][CO4][L1]

a) Manifold Learning
b) Feature Engineering
c) One Hot Encoding
d) Neural Networks

Q 2 a) Explain in brief what is MDP and discuss its components drawing suitable diagram. [8][CO5][L4]

b) Differentiate between stochastic and deterministic MDP in terms of their basic definition.Write Bellman Equation used in value iteration system with description of each term.

Q 3 You are given the following 2D datasets with 4 data points. [8][CO3][L5]

$$X = [[2, 0], [0, 2], [3, 1], [1, 3]]$$

Considering above solve the following steps involved in PCA

a) Center the data (zero-mean).
b) Compute the covariance matrix.
c) Calculate the eigenvalues and eigenvectors
d) Identify the principal component direction.

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Q 4 a) Explain and discuss KNN algorithm. Write various steps involved in it. Discuss the effect of value of K on Model performance. Write advantages and disadvantages of KNN algorithm. [8][CO2][L3]

b) Define the terms Information Gain and Entropy. Also write formula to describe each. How does it help in building a decision tree? Describe with an example how they are used to select the splitting attribute.

Q 5 a) List and briefly explain the main steps involved in building a supervised machine learning model from scratch.Take an example of real world application to explain the steps. [8][CO1][L1]

b) Differentiate between Classification and Regression problems. Explain each taking suitable algorithm with mathematical deductions.

Q 6 a) Define Bias and Variance with the help of suitable example.What is Bias Variance trade off? [8][CO5][L4]

b) Discuss Over fitting and Under-fitting with respect to the degree of equation used to train the model. Enlist three methods each for Bias and Variance which are used to reduce them.

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EIGHT SEMESTER

B.Tech. [SE]

END SEMESTER EXAMINATION *May-2025*

SE406 Advanced Software Engineernig

Time: 3 Hours *Max. Marks: 40*

Note: Answer any 5 of the following questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Answer the following:

[a] What are the main goals of introducing formal methods in software development, and how do they differ from less formal approaches?

[4] [CO1] [BTL2]

[b] Discuss a real-world example where statistical usage testing would be critical.

[4] [CO1, CO2] [BTL3]

Q.2 Answer the following:

[a] Explain how statistical usage testing improves software reliability and user experience?

[4] [CO2, CO3] [BTL3]

[b] Illustrate Domain Engineering, and how does it contribute to the successful reuse of software components?

[4] [CO3, CO2] [BTL4]

Q.3 Answer the following:

[a] What are the key steps in the domain analysis process, and how do they help in identifying reusable software components?

[4] [CO3, CO4] [BTL4]

[b] How does structural modeling aid in the design of a component-based system, and what role do structural points play?

[4] [CO4, CO3] [BTL4]

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Q.4 Answer the following:

[a] Explain the importance of architectural design in client/server systems and how it differs from conventional design approaches for application software.

[4] [CO1, CO3] [BTL3]

[b] Why is process design iteration important in client/server software development? How does it impact database design?

[4] [CO1, CO3] [BTL4]

Q.5 Answer the following:

[a] Compare statistical usage testing with traditional testing techniques. What are the key differences?

[4] [CO2, CO4] [BTL4]

[b] What is software reengineering, and how does it contribute to improving existing systems or products?

[6][CO2, CO4] [BTL4]

Q.6 Answer the following:

[a] How do reverse engineering and forward engineering differ in the context of software reengineering?

[4] [CO2, CO4] [BTL4]

[b] What role does business process reengineering play in enhancing client/server architecture and user interfaces?

[4] [CO2, CO4] [BTL4]

Q 7. Answer the followings:

[a] What are the key steps involved in developing a small-scale Component-Based Software Engineering (CBSE) project using Java, .NET, or Python?

[4] [CO2, CO4] [BTL4]

[b] What deliverables are required to demonstrate component adaptation, composition, and reuse in the project?

[4] [CO2, CO4] [BTL4]

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SEMESTER

B.Tech.

END TERM EXAMINATION *May-2025*

VAC 3/FEC 6 Corporate social responsibility

Time: 02:00 Hours *Max. Marks: 50*

Note: All questions carry equal marks.
Question 1 is mandatory
Attempt any 4 questions out of remaining 5 questions

Q.1 A garment manufacturing company in Bangladesh seeks SA 8000 certification to attract global buyers. The audit reveals child labour and inadequate safety standards, which the company addresses by reforming hiring policies, increasing worker wages, and improving workplace safety. After certification, the company sees improved employee morale, reduced turnover, and increased demand from ethical brands.

1. What are the core principles of the SA 8000 standard, and how do they apply in global supply chains? [3]
2. How can SA 8000 certification influence a company's operational and ethical practices? [3]
3. Discuss the long-term advantages of investing in social accountability standards for export-oriented firms. [4]

[10M][BTL 6]

Q.2 A multinational firm faces ethical issues due to local customs like gift-giving and gender norms. Evaluate the influence of globalization and cultural diversity on business ethics. How can multinational companies balance local customs with universal ethical principles?

[10M][BTL2]

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Q.3 Ramsi incorp is a growing tech start-up in India is expanding rapidly. While chasing growth, the founders struggle with ethical dilemmas in hiring, data privacy, and advertising. They want to build a values-based organization but face pressure to cut corners. Define business ethics and examine its strategic role in shaping responsible corporate conduct. Illustrate your answer with contemporary examples.

[10M][BTL 3,5]

Q.4 EDP Ltd. a listed manufacturing company is criticized for vague CSR claims and insufficient information about its impact on local communities. Shareholders demand clarity, while social activists call for an independent assessment. Define social accounting and social auditing. How do these mechanisms support stakeholder engagement, ethical performance, and corporate transparency?

[10M][BTL 1,2,5]

Q.5 Nova Corp is under scrutiny for lack of board independence and delayed disclosures during a leadership change. Investors express concern about the company's governance practices. What are the core principles of corporate governance? Discuss how adherence to these principles contributes to corporate accountability and investor confidence.

[10M][BTL 1,3,5]

Q.6 EcoSource Ltd., an energy firm lacks clear climate risk disclosures in its CSR reports. Explain the role of sustainability reporting tools, such as GRI, SASB, and TCFD, in promoting transparency and accountability in CSR?

[10M][BTL1,3]

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Total No. of pages: 01 *Roll No.....*

2nd/4th Semester

End-Term Examination **May 2025**

VAC-5/FEC-28, Emotional Intelligence

Time: 02 hours **Max. Marks: 50**

Note: All questions are compulsory.
All questions carry equal marks.
Illustrate your answers with suitable examples, and incidents.

Q.1 Describe the state of 'flow' as an element of self-motivation. Explain how flow is a journey starting from a conscious effort to a state of self-forgetfulness with an example (either from your own personal life's example, if you have ever experienced, if not, then hypothetical or of some great personality).

10 marks [CO#1, 4] [L2,3]

Q.2 What are display rules? Why these rules are essentially required to fit a person adequately in different social situations? Substantiate your answer with suitable examples. 10 marks [CO#1, 5][L2,3,6]

Q.3 What is social competence? Explain dyssemia in the context of social incompetence. 10 marks [CO#1, 3][L3,5]

Q.4 How does the behaviour of youth get affected emotionally (positively and/or negatively) by social media? Which components of self-regulation can help a person in regulating his/her behaviour in an intelligent manner?

10 marks [CO#3, 6][L4,6]

Q.5 What is empathy? Explain and analyse the relation between empathy and moral behaviour with examples. 10 marks [CO#4, 6][L2,4,5]

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Total No. of Pages 1 *Roll No.....*

END SEMESTER EXAMINATION May 2025

VAC9/VAC10 : Introduction to biological Sciences

Time: 2:00 hour Max. Marks 50

Note: Answer all questions. Assume suitable missing data, if any.

Q1. Define and write one example [10][CO1,2,3,4][BTL 1]

a) Homologous organs
b) Pollution
c) Bioethics
d) Autoimmunity

Q2. What are the key benefits of biotechnology in food production? Give examples and discuss the ethical concerns associated genetically modified foods. [10][CO5][BTL2,5]

Q3. Discuss some recent developments in biology (any 4).

[10][CO1][BTL5]

Q4. A) Write the causative agents of following diseases.

[5][CO4][BTL1]

i. Elephantiasis
ii. Malaria
iii. AIDS
iv. Amoebic dysentry
v. Typhoid

B) Differentiate between active and passive immunity.

[5][CO4][BTL3]

Q5. Discuss the ways to eliminate pollution using biotechnological approaches. [10][CO3][BTL2,5,6]

OR

Differentiate between biodegradation and bioremediation.

Total No. of Pages 3

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FIRST/THIRD SEMESTER

B.Tech./B.Des

END SEMESTER EXAMINATION

May 2025

VAC-11/FEC-57 Leadership Mastery through Self-Management

Time: 2 hours

Max. Marks:50

Part A – Descriptive questions.

Attempt any five questions: **5 X 8 = 40 Marks.**

1. Differentiate Conscious and Subconscious Mind: Which Truly Drives Our Actions? What is the Role of the Subconscious Mind in Decision-Making: Intuition vs. Logic?

   Give three important points while explaining the above, and three real-life examples.

   CO 5

2. What do you mean by Heartful conversation (Non-violent communication)? What are the points to keep in mind while having a heartful conversation? How does it help you in your student life and professional life?

   CO 4

3. Differentiate between response and reaction. Give an example for each. When do we need to pause? What prevents us from pausing? Explain how to pause and discuss the benefits of pausing in managing difficult or high-pressure scenarios (give an example).

   CO 3

4. What is transmission (Pranahuti)? What are the benefits of meditation with transmission, with respect to meditation without transmission? As a student, how does meditation (with transmission) help your studies and daily life?

   CO 3

5. How does the Heartfulness practice help to achieve self-mastery? Please explain each techniques (Meditation, Cleaning, and Connecting to our inner self) and relate it to time management, befriending stress, and peak performance (give an example for each).

   CO 3

6. What is stress? How does it affect us? Give examples of stressful situations one faces in their personal and professional life. Please explain the heartfulness technique steps for stress detox.

   CO 5

Part B (Multiple choice question)

Attempt All Questions: **10 X 1 = 10 Marks.**

1. Regarding the power of suggestion, -------- is always most effective.

   A. forcefulness
   B. detachedness
   C. attentiveness
   D. subtleness

   CO 4

2. While doing cleaning/rejuvenation, if you try to remove a specific thing by force, you will actually _____ its effect.

   A. Lighten
   B. Deepen
   C. Remove totally
   D. Mess-up

   CO 1

M92

3. Our inability to deal with situations well and solve problems leads to accumulated effects of_____.

   A. Peace
   B. Complexity
   C. stress
   D. multiplicity

   CO 3

4. To reduce fast breathing (due to panic/restlessness) immediately, we do the technique of _____.

   A. spot cleaning
   B. left nostril breathing
   C. belly breathing
   D. right nostril breathing.

   CO 5

5. Relaxation can have deeper effects on _____.

   A. Entire body & mind
   B. Head
   C. Heart
   D. B & C

   CO 3

6. ---------- is the measure of disorder in any system.

   A. Stress
   B. Entropy
   C. Happiness
   D. Eustress

   CO 3

7. One attains Heartfulness meditative states when there is ------focus

   A. Intentional
   B. Effortless
   C. Concentrated
   D. No

   CO 1

8. To observe the tone of your conversation and let it flow evenly, we need to _____.

   A. Be sharp or alert
   B. Be loud to convey our thoughts
   C. Whisper.
   D. Remove any rise and fall in the pitch

   CO 3

9. What is Situation awareness?

   A. A type of artificial intelligence used in robotics
   B. The ability to multitask and perform multiple tasks simultaneously
   C. A type of psychological disorder that affects perception
   D. Being aware of your surroundings and understanding what's happening around you

   CO 2

10. Healthy Lifestyle is nothing but

    A. Eating whatever you want and exercising only on weekends
    B. Staying up late every night and sleeping in late every morning
    C. A balanced routine that includes regular exercise, healthy eating, and sufficient sleep
    D. Spending most of your time indoors and not interacting with others

    CO 1

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2nd/ 4th Semester
B.Tech. / B. Des.

End Term Examination **May-2025**

(VAC-13/ FEC-54) – Negotiations and Leadership

Time: 2:00 Hour **Max. Marks-50**

Q.1 a. Hiten had a car Maruti DesireVXI. The car got an accident. How Hiten should negotiate with insurance person to get the best deal. Explain in detail with steps on the basis of class discussion. [6]-CO5

b. Explain how you can be successful with collaborative negotiation? [4] –CO2

Q.2a. Explain top ten elements of culture which can affect your negotiation. [6]- CO1

b. Write notes on the Followings: - [2X2=4] -CO2

- Common ground between tenant & landlord
- Need for negotiation.

Q.3 a. What are three factors which tend to heavily influence the course of negotiation? [4]- CO3

b. Explain interest based negotiation Model. List out seven steps of negotiation preparation along with the preparation worksheet. [6] -CO3

Q.4 a. What are the four steps strategy for a successful every day negotiation explain & describe with examples? [6] - CO1

b. When negotiators do not want to give you what you are asking for. How can you get the conversation back on track ? 4] – CO4

Q.5 a. Explain the ingredients of difficult conversation. [3]- CO1

b. Describe the tools by which you can effectively engage in difficult conversation. [4]- CO4

c. How can you prepare for difficult conversation? [3]- CO5

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2nd/4th SEMESTER **B.Tech./B.Des.**

END TERM EXAMINATION ***May -2025***

COURSE CODE:-FEC27/VAC16

COURSE TITLE:- Professional Ethics and Human Values

Time: 02:00 Hours *Max. Marks: 50*

Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 What is environmental ethics? State the major challenges and problems in environmental ethics. Discuss the approaches to resolve these environmental problems.[10][CO#7.1][BTL2]

OR

What do you mean by computer ethics. Discuss the categories of ethical problems related to computer ethics and what steps can be taken up to overcome the ethical issues related to the use of computer. [10][CO#7.5] [BTL2]

Q.2 Explain in detail about the assessment of safety and Risk regarding Engineering product. What is the use of Risk-Benefit Analysis? [10] [CO#5.1] [BTL2]

Q.3 What do you mean by the term profession "Professional" and professionalism? Explain the five characteristics of morally responsible Professionals. [10][CO#2.1] [BTL2]

Q.4 What are codes of ethics? Explain the functions and needs of codes of ethics. [10][CO#8.1] [BTL2]

Q.5 What are the rights of a professional? Explain the concept of "Whistle Blowing" and "Intellectual Property Rights" in details.[10][CO#6.8] [BTL2]

OR

Explain the following:-

a. Different roles played by engineers.

b. Ethical Obligation of Engineering professionals. [10]

[CO#4. 1] [BTL2]

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2nd/ 4th Semester
B.Tech. / B. Des.

End Term Examination **May-2025**

(VAC-22/ FEC-25) -Universal Human Value(self & Family)

Time:2:00 Hour **Max. Marks-50**

Note: - All Questions are compulsory.
Marks indicated in all Questions.

Q.1 (Answer the following questions as per knowledge of the subject and class discussions)

- What do others think of you ?.What is the others impression/opinion of you? Give two examples of other people opinions about you that you like, and two examples of those you don't like?. Explain.
- What is your own impression/opinion of yourself?
- What impression/opinion you would expect others to have of you? Give two examples of impressions/ opinion that you would like the others to have of you (that they do not have currently)

(3.5+3+3.5=10)-CO5

Q. 2,a What is purpose of education?, How content should be discussed in education? [4]- CO1

b. What is the role of education Sanskar?. Define & Clarify. [4]- CO2

c. What is difference between traditional & progressive system of education [4]- CO3

Q.3 a. What is peer pressure? Explain Eriction's four stage peer pressure. How can you handle peer pressure? [5]- CO5

b. Describe the followings:- [2.5X2] -CO4

i) Process of Development of a child.
ii) Need,Activities & Response of Self & Body

[2X2.5]- CO1

Q.4. a. Write notes on the following:-

- Natural acceptance
- Justice in relationship

b. Explain five inter-connected complementary dimension of human order. [5] -CO3

Q.5 a. Descibe the core ideas of Buddhist economy as proposed by Schumacher in the book "Small is Beautiful". [5] -CO2

b. Explain the four Austerities which will result in four liberations as outlined by mother in the book "on Education". [5] -CO4

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II & IV SEMESTER

B.Tech

END SEMESTER EXAMINATION

May 2025

COURSE CODE: VAC-25/FEC47

COURSE TITLE: VALUE DRIVEN LEADERSHIP

Time: 2 Hours

Max. Marks: 50

Note: Attempt any 5 questions.
Assume suitable missing data, if any.

Q1. iTech Pvt. Ltd. was once celebrated as an innovative fintech startup, attracting thousands of customers with promises of transparency, fairness, and superior financial returns. However, beneath this image, the company consistently misled stakeholders. Critical risks associated with their products were hidden from customers, financial reports were manipulated to impress investors, and internal whistleblowers were either silenced or dismissed. Customer grievances were routinely ignored, and unfair practices like hidden fees became common. As these issues accumulated, customer trust diminished, employee morale fell, and negative publicity spread. Eventually, regulators intervened, investors withdrew their support, and iTech Pvt. Ltd. was forced into bankruptcy. The company's collapse highlighted how deeply the absence of honesty, integrity, trust, and fairness can damage an organization. Identify the key moral values missing in iTech Pvt. Ltd. operations and suggest measures the company could have taken to build a value-driven culture. **(10 Marks)** (CO1) (BTL 2,5)

Q2. How can organizations effectively align incentive structures with their core values to ensure that employees are motivated to act in ways that reinforce rather than undermine the organization's ethical principles and long-term goals? **(10 Marks)** (CO3) (BTL 2,3)

Q3. A leading organic food company, 'GreenHarvest', has built its brand around the principles of sustainability, fair trade, and community welfare. As competition from cheaper, less ethically conscious brands increases, GreenHarvest must decide how to strengthen its market position without compromising its core values.

As a marketing consultant, analyze how GreenHarvest can use value-based marketing strategies to not only retain loyal customers but also attract new ones. **(10 Marks)** (CO 4) (BTL 3,5)

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II & IV SEMESTER

B.Tech

END SEMESTER EXAMINATION

May 2025

COURSE CODE: VAC-25/FEC47

COURSE TITLE: VALUE DRIVEN LEADERSHIP

Time: 2 Hours *Max. Marks: 50*

Note: Attempt any 5 questions.
Assume suitable missing data, if any.

Q1. iTech Pvt. Ltd. was once celebrated as an innovative fintech startup, attracting thousands of customers with promises of transparency, fairness, and superior financial returns. However, beneath this image, the company consistently misled stakeholders. Critical risks associated with their products were hidden from customers, financial reports were manipulated to impress investors, and internal whistleblowers were either silenced or dismissed. Customer grievances were routinely ignored, and unfair practices like hidden fees became common. As these issues accumulated, customer trust diminished, employee morale fell, and negative publicity spread. Eventually, regulators intervened, investors withdrew their support, and iTech Pvt. Ltd. was forced into bankruptcy. The company's collapse highlighted how deeply the absence of honesty, integrity, trust, and fairness can damage an organization. Identify the key moral values missing in iTech Pvt. Ltd. operations and suggest measures the company could have taken to build a value-driven culture. **(10 Marks)** (CO1) (BTL 2,5)

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As a marketing consultant, analyze how GreenHarvest can use value-based marketing strategies to not only retain loyal customers but also attract new ones. **(10 Marks)** (CO 4) (BTL 3,5)

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Q4. A large oil company operating in a rural area of India earned record profits in a fiscal year. The management decided to use a portion of its profit to build a free community health clinic for local villagers. While this move was praised publicly, some shareholders questioned why company funds were being used for non-core activities that didn't directly contribute to profits. Explain Milton Friedman's approach to Corporate Social Responsibility. **(10 Marks) (CO2) (BTL 2)**

Q5. Explain Social Capital and its relevance for the organization. **(10 Marks) (CO5) (BTL 2,4)**

Q6. What is workforce diversity, and why is it important for employees in a modern organization? Illustrate your answer with examples of how diversity can influence employee engagement, creativity, and workplace culture. **(10 Marks) (CO2) (BTL 2)**

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I/II/III/IV SEMESTER B.Tech./B.Des.

END-TERM EXAMINATION May / 2025

VAC27 INTRODUCTION TO ENVIRONMENTAL SCIENCES

Duration: 2 Hours **Maximum Marks: 50**

Note: All questions are compulsory and carry equal marks.

	Marks	CO#	BTL#
Q. 1 Attempt the following questions			
a. Explain structural aspects of ecosystems.	5	CO1	BTL2
b. Explain products, overuse, threats, and remedies for threats to mineral resources.	5	CO1	BTL2
Q. 2 Attempt the following questions			
a. Apply environmental management in reducing the risks and consequences of floods.	5	CO2	BTL3
b. Examine the risks posed by oxides of nitrogen on the ecosystem.	5	CO2	BTL3
Q. 3 Attempt the following questions			
a. Analyse ecological successsion.	5	CO3	BTL4
b. Analyse the causes, effects, and control measures for noise pollution.	5	CO3	BTL4
Q. 4 Evaluate benefits and problems associated with dams and their impact on ecosystems and society.	10	CO4	BTL5
Q.5 Attempt ANY ONE of the following questions:			
a. Suggest control measures to minimize waste generation and promote sustainable waste management practices.	10	CO5	BTL6
b. Develop a detailed plan of any one activity/event to increase awareness of any one environmental issue at public level.	10	CO5	BTL6

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Roll No.....

4th Semester

B.Tech

END TERM EXAMINATION **May-2025**

VAC-43 Course Title: Meditation and Conscious Living

Time: 2 hours **Max. Marks 50**

Note: All Questions are Compulsory.

Section A: MCQ *[M 10, 1 M each]* (CO1)(L2,3,4)

1. We all have within us, a source of immense positive energy. (True/False)

2. Emotional quotient (EQ) is more important than intelligence quotient (IQ) in determining success in personal and professional relationships. (True/False)

3. What is the supreme benefit of Meditation?
   a. Emotional stability
   b. Improved focus
   c. Self-discovery
   d. All the above

4. Thoughts serve as the foundation for words and actions in human behavior. (True/False)

5. True selflessness is an expression of
   a. Pride
   b. Love
   c. Pity
   d. Self-esteem

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6. Anger affects the person most in whom it is generated. (True/False)

7. Happy hormones like serotonin, dopamine, endorphins, and oxytocin are neurotransmitters and chemicals that regulate your mood and emotions. (True/False)

8. To any event in life, one should have a balanced and positive approach. (True/False)

9. It is in the best interest of the person to keep control of emotions in adverse situations. (True/False)

10. Meditation is stillness of body and mind. (True/False)

Section B: Long and Short Answer Questions.

Q1. What strategies are effective in developing and sustaining the regular practice of meditation? *[M 10]* (CO2)(L3,4,6)

Q2. How can selfless service contribute to peace and harmony in society, and what are the various forms of selfless service that individuals can incorporate into their daily lives?

[M 10] (CO3)(L2,3,4)

Q3. Write Short note on the following: *[M 20, 5 M each]* (CO4)(L4,5,6)

a. Importance of empathy in human relationships.
b. Creating circles of peace can bring more joy into our lives.
c. Different brain wave frequencies, and their influence on mental states and activities.
d. Be conscious of thoughts, words, and deeds.

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Second Semester
End Term Examination

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Roll No.....
B. Tech(CEEE)
May-2025

Time: 03 Hours

Maximum Marks: 40

CEC-102n **ELECTRONIC DEVICES AND CIRCUITS**

Note: Answer **Any Five** questions.
Assume suitable value for missing data (if any).

1(a) Discuss the different types of junction breakdown that can occur in reverse biased PN junction diode. 4[CO1]

(b) What is extrinsic and intrinsic semiconductors? Compare them on the basis of their atomic structure and energy band diagram. 4[CO1]

2 Explain with neat circuit diagram and waveform the working of full wave bridge rectifier. Derive the expression for (i) average voltage (ii) RMS voltage (iii)efficiency(iv) ripple factor? 8[CO2]

3(a) Derive the expression for overall voltage gain, input resistance and output resistance for the common emitter amplifier. 4[CO3]

(b) For the circuit shown in Fig1 below determine the region of operation. 4[CO3]

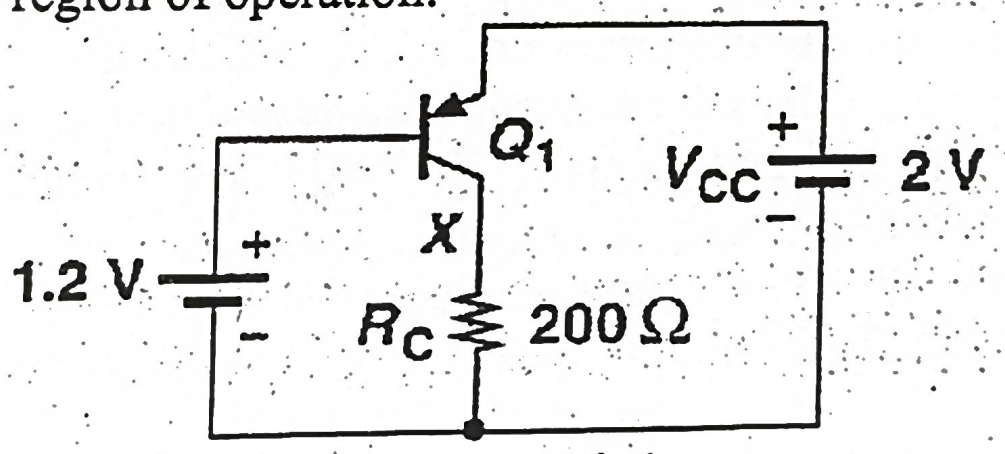

Fig1

4(a) Define stability factor and derive general expression for stability factor of a biasing circuit 4[CO3]

(b) For the collector to base biasing circuit shown in Fig2, find the operating points I_C and V_{CE}, assume current gain β=100 and V_{BE}=0.7V 4[CO3]

No. of Pages 02
Second Semester
End Term Examination

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Roll No.....
B. Tech(CEEE)
May-2025

Time: 03 Hours

Maximum Marks: 40

CEC-102n **ELECTRONIC DEVICES AND CIRCUITS**

Note: Answer **Any Five** questions.
Assume suitable value for missing data (if any).

1(a) Discuss the different types of junction breakdown that can occur in reverse biased PN junction diode. 4[CO1]

(b) What is extrinsic and intrinsic semiconductors? Compare them on the basis of their atomic structure and energy band diagram. 4[CO1]

2 Explain with neat circuit diagram and waveform the working of full wave bridge rectifier. Derive the expression for (i) average voltage (ii) RMS voltage (iii)efficiency(iv) ripple factor? 8[CO2]

3(a) Derive the expression for overall voltage gain, input resistance and output resistance for the common emitter amplifier. 4[CO3]

(b) For the circuit shown in Fig1 below determine the region of operation. 4[CO3]

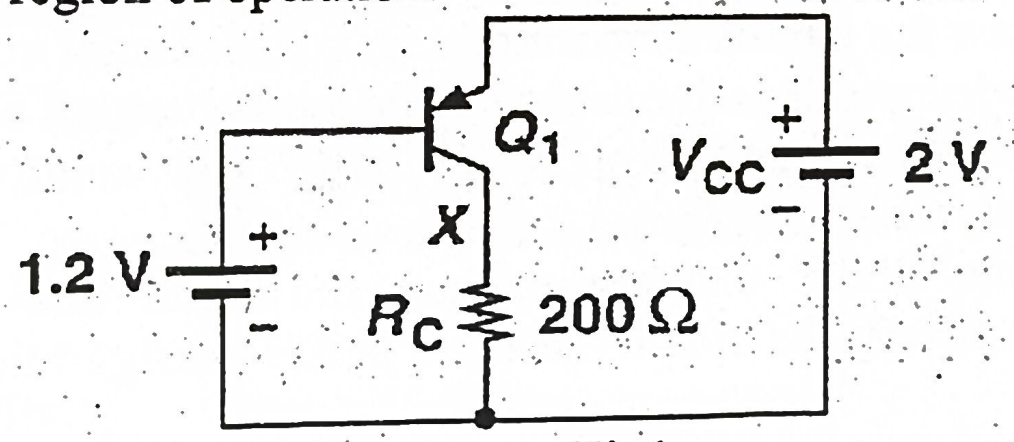

Fig1

4(a) Define stability factor and derive general expression for stability factor of a biasing circuit 4[CO3]

(b) For the collector to base biasing circuit shown in Fig2, find the operating points I_C and V_{CE}, assume current gain $\beta=100$ and $V_{BE}=0.7V$ 4[CO3]

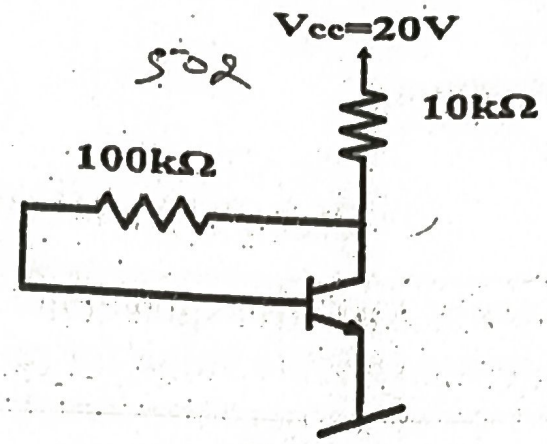

Fig2

5(a) For the voltage feedback amplifier shown in Fig3 find voltage gain, input resistance, output resistance. The transistor has β=150. 4[CO4]

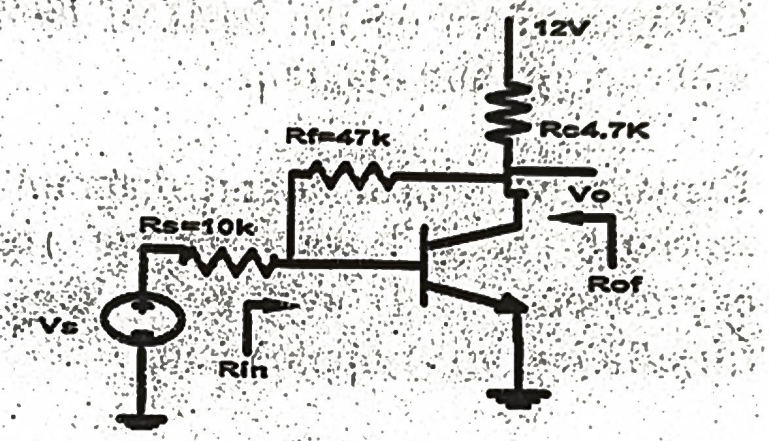

Fig3

(b) Draw the small signal model of a common emitter amplifier and determine its voltage gain and input impedance. 4[CO4]

6(a) Draw the circuit diagram of a BJT differential amplifier loaded with passive resistors and biased with a constant current source. Explain its large and small signal analyses. 4[CO4]

(b) With circuit diagram explain the input and output characteristics of npn transistor in CE configuration. 4[CO2]

7 Write short notes on any TWO of the following 4,4[CO1]

(a) Zener diode characteristics

(b) Self bias circuit for BJT

(c) Diode clipping circuits

Total No. of Pages:02 503 Roll no:.....

VI SEMESTER

B.Tech. (Evening)

END TERM EXAMINATION *May -2025*

CEC302 Microwave Engineering

Time: 3 Hours *Max. Marks: 40*

Note: Attempt any five questions. All questions carry equal marks
Assume suitable missing data, if any.

Q.1 a) What are the different types of waveguide discontinuities available? How do you achieve inductive and capacitive effects using tuning screw microwave components? [4M][CO1] [L2]

b) What is a precision rotary attenuator? Show that the attenuator is given in decibels by $A = 40 \log \sin\theta$. where the angle center resistive card is made in the direction of the electric field in a circular guide. [4M][CO1][L2]

Q.2 a) Construct an isolator using a three-port circulator. Find the *S* matrix for a matched isolator having an insertion loss of 0.5 dB and an isolation of 25 dB. [3M] [CO2] [L6]

b) A signal power 32mW is fed into one of the collinear ports of loss-less H-Plane Tee. Determine the powers in the remaining ports when other ports are terminated by means of matched load [2M] [CO3][L4]

c) Explain the working of a two-hole directional coupler with a neat diagram [3M] [CO 3] [L2]

Q.3 a) Derive the equation of velocity modulation for a two-cavity Klystron amplifier. [4M][CO4] [L3]

b) Explain the construction and operation of the Reflex Klystron Oscillator [4M][CO4] [L2]

[PTO]

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Q.4 a) With a schematic diagram, explain the working of a traveling wave tube [3M][CO4][L2]

b) An X-band pulsed cylindrical 8-cavity magnetron has V_0= 30 kV, I_0= 80 Amp, B_0=0.01 $\frac{wb}{m^2}$, cathode radius a =4cm and radius of the vane edge center b=8 cm. Calculate i) Cyclotron angular frequency ii) Hull Cut-off voltage iii) Hull Cut-off magnetic flux density iv) Phase difference between adjacent resonators in general. v) Value of integer (n) for the most dominant mode. [5M] [CO4][L3]

Q.5 a) A microwave tunnel diode has a negative resistance R_n and circuit resonance has a circuit resistance R_l. Derive an equation for the gain of a microwave tunnel diode amplifier. [2M] [CO5] [L3]

b) Explain the construction details of varactor diode and draw its equivalent circuit [2M][CO5] [L2]

c) A Gunn diode has the following parameters: electron drift velocity, v_d=2.5 x10^5 m/sec, negative electron mobility, μ_n= 0.015 m^2/Vs, relative dielectric constant, and ε_r = 13.1. Determine, the criterion for classifying the modes of operation. [4M] [CO5] [L4]

Q.6 a) How is plasma trapped in a TRAPATT diode? Why is the operating frequency of this diode lower than IMPATT? Give its major merits and demerits. [4M] [CO5] [L2]

b) Determine transit time of the carriers and operating frequency of the IMPATT diode. If an IMPATT diode has drift length of 4 μm and v_d=10^6 m/sec. [2M] [CO5] [L3]

c) Determine S-Matrix for magic ring [2M] [CO3] [L3]

**********END**********

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Total No. of pages:2 *Roll No.....*

B.Tech (ECE)(Evening)

End Semester Examination **May 2025**

CEC-304 Embedded Systems

Time : 3 Hrs **Maximum Marks: 40**

Note: Assume any missing data
All questions carry equal marks

Q1	a	Differentiate between RISC and CISC processor	2	CO2, L4
	b	What is the purpose of prescalar and postscalar in PIC and explain its role in CCP module	2	CO3, L3
	c	Explain the role of capture, compare and PWM mode in PIC microcontroller.	2	CO3, L2
	d	Analyze how the pipeline capabilities of ARM7TDMI microcontroller enhance the efficiency and discuss the limitations that affect this efficiency.	2	CO2, L4
Q2	a	let the value of r0 = 0x00000000 & r1 = 0x00009000 and Mem32[0x00009000] = 0x01010101 Mem32[0x00009004] = 0x02020202 Mem32[0x00009008] = 0x03030303 Mem32[0x0000900C] = 0x04040404 Evaluate the value of r0 and r1 after execution of LDR r0,[r1,#8]!	2	CO2, L3
	b	Explain the functions of following ARM instructions 1. MLA Rd, Rm, Rs, Rn 2. ORR r0, r1, r2; 3. ADC r0, r1, r2; 4. ADD r0,r1,r1 LSL#1 5. LDR r0,[r1,#4]! 6. LDMIB r1, {r3,r5,r6};	6	CO2, L2

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Q3		Attempt any two		
	a	Differentiate among privileged modes of ARM processor.	4	CO5, L4
	b	Draw, label and explain thumb architecture in ARM. What is the effect on code density in ARM processor in T-mode of operation? Justify your answer.	4	CO2, L3
	c	Explain the AMBA with neat diagram.	4	CO5, L2
Q4	a	Explain the working of a static RAM cell. Draw the timing diagram of a SRAM cell for write cycle and define all timing parameters	4	CO5, L2
	b	Differentiate between SRAM and DRAM	4	CO5, L4
Q5		Attempt any two		
	a	Differentiate the various addressing modes of DSP Processor and explain the rounding techniques.	4	CO4, L4
	b	What is a Very long Instruction Word (VLIW) Processor? Draw its simple architecture. Compare it with clustered VLIW.	4	CO4, L4
	c	Write an Assembly language program to copy 10 byte data from one memory location to another memory location	4	CO2, L5

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6th SEMESTER

B. Tech. (Evening)

END TERM EXAMINATION ***May-2025***

COURSE CODE: CEC 312 COURSE TITLE: SOFTWARE DEFINED RADIO & COGNITIVE RADIO

Time: 03:00 Hours ***Max. Marks: 50***

Note : All questions carry equal marks.
Assume suitable missing data, if any.

1. (a) Explain the role of smart antennas in cognitive radio systems. How do they contribute to efficient spectrum utilization?[2.5 M][CO3]

   (b) Differentiate between licensed and unlicensed spectrum sharing. Provide examples of technologies using each. [2.5 M] [CO3]

2. (a) What is NC-OFDM? Explain its significance in dynamic spectrum access in cognitive radios. [2.5 M] [CO4]

   (b) Describe the key components of a Software Defined Radio (SDR) architecture. Highlight how it differs from traditional radio design. [2.5 M] [CO2]

3. (a) Discuss the fundamental trade-offs between sensing accuracy and spectrum access in cognitive radio. [2.5 M] [CO3]

   (b) Explain the challenges and solutions associated with transmitter design in SDR. [2.5 M] [CO4]

4. (a) Write short notes on: (i) Secondary Spectrum Access, (ii) Real-Time SSA. [2.5 M] [CO1]

   (b) What is a cognitive adaptation engine? How does it operate within a cognitive radio network? [2.5 M] [CO4]

5. (a) Briefly explain how cooperative communication enhances cognitive radio performance. What is a relay channel? [2.5 M] [CO2]

   (b) What is the Publish-Subscribe architecture in CRNs? How does it differ from Topology-Aware CRN Architectures? [2.5 M] [CO5]

6. (a) Explain the concept of spectrum holes. How can cognitive radios detect and exploit them? [2.5 M] [CO4]

   (b) Discuss the policy and regulatory challenges associated with cognitive radios. [2.5 M] [CO5]

7. (a) Describe the function of the adaptation engine in a cognitive radio. What parameters are typically adjusted? [2.5 M] [CO5]

   (b) Illustrate with an example the trade-off between performance and constraints in spectrum sensing. [2.5 M] [CO3]

8. (a) What are the key steps involved in spectrum sensing using energy detection techniques? [2.5 M] [CO2]

   (b) Define spectral footprint minimization. Why is it crucial in NC-OFDM-based cognitive radios? [2.5 M] [CO5]

9. (a) Describe the architecture and advantages of cross-layer optimization in multi-hop CRNs. [2.5 M] [CO5]

(b) Explain the concept of link rendezvous in distributed sensing cognitive radio networks. What challenges arise? [2.5 M] [CO5]

10. (a) Describe a case study involving throughput maximization in a cognitive radio network. Mention key mathematical models used. [2.5 M] [CO5]

(b) Why is dynamic spectrum access a concern for regulators? Compare and contrast traditional radios with software-defined radios in terms of flexibility and functionality. [2.5 M] [CO5]

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Total no. of Pages:02 *Roll no.....*

6th SEMESTER

B.Tech. (Evening)

END TERM EXAMINATION ***May-2025***

COURSE CODE CEC-330

COURSE TITLE Digital Image Processing

Time: 03:00 Hours ***Max. Marks: 40***

Note : All questions carry equal marks.
Attempt any ten questions
Assume suitable missing data, if any.

Q.1 [4M][CO2][BTL2]
Explain with examples how grey level slicing and bit plane slicing differ in terms of technique and applications.

Q.2 [4M][CO2][BTL3]
Given a grayscale image with low contrast, how would you apply histogram equalization to enhance it? Illustrate with a hypothetical histogram.

Q.3 [4M][CO2][BTL2]
Describe and compare logarithmic and exponential transformations. In what type of images are these transformations most useful?

Q.4 [4M][CO3][BTL4]
Differentiate between ideal, Butterworth, and Gaussian low pass filters in the frequency domain. Use frequency response graphs for comparison.

Q.5 [4M][CO3][BTL2]
Explain homomorphic filtering and describe its advantages over standard spatial domain enhancement techniques.

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Q.6 [4M][CO3][BTL4]
Given a degraded image with periodic noise, explain the step-by-step process of removing the noise using notch filters in the frequency domain.

Q.7 [4M][CO4][BTL4]
Compare inverse filtering and Wiener filtering in the context of restoring images degraded by motion blur and noise. Which is more robust and why?

Q.8 [4M][CO4][BTL3]
Using a binary image example, explain the effect of applying thinning and pruning operations. How do they contribute to skeletonization?

Q.9 [4M][CO4][BTL2]
Describe how morphological operations can be used to extract connected components from a binary image. Include a basic example.

Q.10 [4M][CO5][BTL4]
Convert the RGB value (120, 65, 210) into its equivalent HSV and YCbCr values. Briefly explain the significance of each model.

Q.11 [4M][CO5][BTL2]
Explain the difference between lossless and lossy image compression techniques. Provide examples of each and describe one advantage of each method.

Q.12 [4M][CO5][BTL3]
Compare thresholding-based segmentation with region growing techniques. What are the limitations of each method in complex images?

Total No. of Pages: One

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8TH SEMESTER

B.Tech.

END TERM EXAMINATION

May-2025

COURSE CODE: CEC402

COURSE TITLE: RADAR & SATELLITE COMMUNICATION

Time: 3 Hours *Max. Marks: 40*

Note: Attempt any TEN questions. All questions carry equal marks.
Assume suitable missing data, if any.

1. What do you mean by radar range prediction? Write an expression for it with complete mention of all the parameters involved. [4] [CO1] [2]
2. What is integration of pulses in radar systems? Why it is required? How it is done? What are its various types? [4] [CO1] [2]
3. Define transmitter power for a radar system. Drive an expression for the same. [4] [CO1] [1]
4. Explain different types of systems losses in case of radar systems. [4] [CO1] [2]
5. Draw the block diagram for Moving Target Indicator [MTI] radar? Describe its working. [4] [CO2] [2]
6. A satellite is in an elliptical orbit with eccentricity of 0.6 and perigee altitude 1000 Km. Define payload and transponder? Determine: a) The semi major axis b) The period of revolution. [4] [CO3] [5]
7. An antenna has a noise temperature of 35K and it is matched into a receiver which has a noise temperature of 100°K. Calculate the noise power density and the noise power for a BW of 36 MHz. [4] [CO2] [5]
8. State Kepler three Laws of Planetary motion. Illustrate in each case their relevance to artificial satellites orbiting the earth. [4] [CO3] [1]
9. What are the factors that affect the uplink and down link design in geostationary satellite system? Discuss in detail. [4] [CO4] [2]
10. Distinguish centrally controlled random access for satellite access from distributed controlled random access. [4] [CO5] [4]
11. Distinguish between LEO system and GEO system. [4] [CO4] [4]
12. Write short notes on: [4] [CO1] [1]
    A. Radar cross section of the target [4] [CO1] [1]
    B. Ionospheric effects on space link. [4] [CO5] [1]
    C. DTH and GPS

Total No. of Pages: 1

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Roll no.....

B.Tech. [Evening]

End TERM EXAMINATION

May-2025

COURSE CODE: CEC 410 **COURSE TITLE: Advance Coding Theory**

Time: 3:00 Hours ***Max. Marks : 40***

Note: All questions are compulsory.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1(a) Consider a message ensemble S = {s1, s2, s3, s4, s5, s6, s7} with probabilities P = {0.45, 0.15, 0.12, 0.08, 0.08, 0.08, 0.04}. Construct a binary code and determine its efficiency using Shannon – Fano coding procedure. **[4][CO1][L3]**

(b) A zero-memory source has a source alphabet, S = {s1, s2, s3} with P = {0.5, 0.3, 0.2}. Find the entropy of the source. **[4][CO1][L3]**

Q.2 The parity matrix for a (6,3) systematic linear block code is given by

$$P = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

(i) Find all code words. (ii) Find generator and parity check matrix. (iii) Draw encoding circuit. (iv) Draw syndrome circuit. **[8][CO2][L4]**

Q. 3 A communication system employs a continuous source. The channel noise is white-Gaussian. The bandwidth of the source output is 10 MHz and signal to noise power ratio at the receiver is 100.

(i) Determine the channel capacity.

(ii) If the signal to noise ratio drops to 10, how much bandwidth is needed to achieve the same channel capacity as in (i).

(iii) If the bandwidth is decreased to 1 MHz, what S/N ratio is required to maintain the same channel capacity as in (i). **[8][CO2][L4]**

Q.4 (a) Explain the working of Adaptive Huffman Coding. Illustrate the algorithm with an example and discuss its advantages over static Huffman coding. **[4][CO3][L2]**

(b) Explain the MPEG Audio Layers I, II, and III. Compare their features, applications, and improvements across the layers. **[4][CO3][L2]**

Q. 5 What are I-frames, P-frames, and B-frames? Explain their role in video compression with examples and how they contribute to reducing data redundancy. **[8][CO4][L2]**

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Total no. of Pages: 02 Roll no.....

8th SEMESTER

B.Tech. Evening (EC)

END TERM EXAMINATION ***MAY-2025***

COURSE CODE: CEC412 COURSE TITLE: Machine Learning

Time: 3:00 Hours ***Max. Marks: 40***

Note : Attempt any FIVE questions .
Assume suitable missing data, if any.

Q.1 a) Mention the real world problems where supervised, unsupervised and reinforcement learning could be relevant (2 for each). How is reinforcement learning different from the other two learning approaches? [4][CO3][L2]

b) A breast cancer screening AI model is tested on 1,000 mammograms. It detects 95 of 100 actual cancer cases and flags 50 additional non-cancerous cases as cancer. Calculate precision and recall. In this application, which is more important: minimizing false positives or false negatives? Why? [4][CO5][L5]

Q.2 a) For the data given in Table 1, Predict whether a student will pass or fail an exam based on her study hours and sleep hours as 5.5 and 6.5 respectively using KNN with k = 3. Use Euclidean distance.[4][CO2]L[5]

Table 1

Study Hours	Sleep Hours	Result
5	6	Pass
3	5	Fail
6	7	Pass
4	5	Fail
7	6	Pass

b) Derive the expression of simple linear discriminant function. [4][CO2][L2]

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Q.3 a) Consider the data in Table 2, where the target variable 'Play' indicates whether a child wants to play outside. Calculate the Information Gain for each binary attribute (Sunny, HasBall) and decide which attribute should be used for the first split in a decision tree. [4][CO2][L5]

Table 2

Sunny	HasBall	Play
Yes	Yes	Yes
Yes	No	Yes
No	Yes	Yes
No	No	No
Yes	Yes	Yes
No	No	No
Yes	No	No
No	Yes	Yes

b) What is agglomerative clustering? How agglomerative clustering is different from divisive clustering? [2][CO3][L4]

c) Discuss the importance of elbow method. [2][CO1][L2]

Q.4 a) Describe the role of kernels in SVMs and provide examples of different types of kernels? Also compare the difference between soft and hard margin. [3][CO5][L4]

b) What is the goal of Fisher's Linear Discriminant Analysis (LDA)? How is the Fisher criterion formulated in LDA? Also explain how it is different from PCA. [5][CO3][L4]

Q.5 a) Describe briefly about the CNN architecture with the significance of each layer. [4][CO4][L2]

b) What is the difference between machine learning and deep learning? What are the roles of an activation function? Also discuss different activation functions. [4][CO 4][L4]

Q.6 a) Define the following terms: (i) Reward (ii) Action Value (iii) Value and (iv) Policy [2][CO1][L2]

b) Derive the expression of value of optimal policy in reinforcement learning for a simple K-armed Bandit problem. [6][CO5][L3]

Total No. of Pages: 03 Roll No.....

IInd Semester **B-Tech (Eve.)**

END-SEMESTER EXAMINATION **(MAY-2025)**

CEE-102n: Electromechanical Energy Conversion and Transformer

Time: 03hrs ***Max. Marks: 40***

Note: Q.1 to Q.5 are compulsory. Attempt any 3 questions out of remaining 7 questions (Q.6-Q.12). Assume any data if missing and clearly mention the assumption.

Q.1 **Justify** the given statements with proper reasoning in not more than 100 words. [5]

(a) The rheostat in armature circuit is set to maximum value while starting a DC motor. [CO2]

(b) Armature MMF in a DC machine is always directed along brush axis. [CO2]

(c) Efficiency calculated by Swinburne test is always found to be more than the actual efficiency of the machine. [CO1]

(d) For performing open circuit test on a single-phase transformer, rated voltage is supplied to the transformer windings. [CO3]

(e) Transformer working with frequency higher than the rated is having less operating efficiency [CO3]

Q.2 A **500 kVA** transformer has **250W** core losses and **1200W** copper losses at full load. Find the efficiency of the transformer at: [5] [CO4]

(a) Full load and 0.8 power factor lagging.

(b) Full load and unity power factor.

(c) Half load and 0.8 power factor lagging.

(d) For what load, the transformer will have maximum efficiency

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(e) What is the value of maximum efficiency at unity power factor and 0.8 power factor lagging.

Q.3 Explain in detail different phasor groups in transformers? Why are phasor groups mentioned in the name plate of a transformer? [5] [CO4]

Q.4 Hysteresis and Eddy current losses in a transformer can be separated. Comment on this statement with proper justification [5] [CO3]

The core loss of a single-phase **230/115V,50Hz** transformer is **1050W** measured at its high voltage side with its low voltage being kept open. When the voltage and frequency are changed to **138V** and **30Hz**, respectively, the core loss becomes 500W.Find values of Hysteresis and Eddy current loss of the transformer for **230V,50Hz** input.

Q.5 Draw the equivalent circuit of a transformer and define voltage regulation in transformers. Derive the condition for zero voltage regulation and maximum voltage regulation. [5] [CO3]

Q.6 A **75kVA, 3000/300V** single phase transformer has impedance drop of **9%** and resistance drop of **3%**. Determine the regulation of the transformer at full-load and **0.6 pf lagging**. Also determine at what power factor the regulation will be zero. [5] [CO3]

Q.7 Explain different types of three phase transformers in detail. [5] [CO4]

In a three-phase transformer compare between a single three phase unit and a bank of three single phase units. Which one is more preferred?

Q.8 Differentiate all day efficiency with the normal efficiency in transformers. [5] [CO3]

Calculate the **all-day efficiency** of a **100 kVA** transformer installed at your college, for whom the maximum efficiency occurs at **40%** of rated load. Core loss of the transformer is **200W**. Its loading over the day is given as:

(i) Full load at 0.8 power factor lag for 4hrs.
(ii) $3/4^{th}$ full load at 0.9 power factor lag for 6hrs.
(iii) 50 kW at 0.85 power factor lag for 4hrs.
(iv) $1/4^{th}$ full load at 0.6 power factor lag for 4hrs.
(v) No load for 6hrs.

Q.9 Explain the Swinburne test and Hopkinson test in DC machines [5] [CO1]

A **10 kW, 200V** DC shunt motor takes a no-load current of **6A** while running at a speed of **1200 rpm**. Its armature resistance is **0.18Ω** and a files resistance of **100 Ω**. Calculate the efficiency of the motor at full load.

Q.10 Explain in detail various speed control methods for DC motor. [5] [CO2]

Q.11. A **220 V,22A, 1000 rpm** DC shunt motor has armature circuit resistance of **0.1 Ω** and field resistance of **100 Ω**. Calculate the value of additional resistance to be inserted in the armature circuit in order to reduce the speed to **800 rpm**. Assume the load torque to be (i) proportional to the speed and (ii) proportional to square of the speed. [5] [CO2]

Q.12 Write short notes (Any two) [5]

(a) Harmonics in single phase and three phase transformers [CO4]
(b) Interpoles and Compensating coils in DC machines [CO1]
(c) Scott Connection [CO3]
(d) Auto-Transformer [CO3]

Total no. of Pages: 2

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Roll no.....

II SEMESTER

B.Tech(PT)

END TERM EXAMINATION

May-2025

COURSE CODE CEE-104 **TITLE: ELECTROMAGNETIC FIELD THEORY**

Time: 03:00 Hours *Max. Marks: 50*

Note : Answer any five questions carrying equal marks.
Assume suitable missing data, if any.

Q.1 (a)The volume element of the cylinder is $v = 1/3\pi r^2 h$. Find the (i) Differential volume (ii) the vectorial area of the face (iii) differential arc length [5M][CO1][BTL-2]

(b)Determine by integration the area S of the surface defined in spherical coordinate of r=2m and $\pi/4 < \varphi < \pi/3$ and $0 < z < 0.5$m [5M][CO2][BTL1]

Q.2 (a)Two positive charges 2Q and 4Q are separated by distance d in air. The third charge is also placed so the entire system is in equilibrium. Determine the location , magnitude and sign of the third charge [5M][CO3][BTL6]

(b)The electrical charge density within sphere of radius r is given by $\rho = kr^2/a^3$ where k is the constant. Determine the resultant electrical field around the sphere with r > a [5M][CO3][BTL6]

Q.3 (a) Three-point charges Q1 Q2 , and Q3 are initially at infinity are brought at respective location P1 P2and P3 and all other charges are absent. Find the total potential energy of the three-charge container [5M][CO4][BTL4]

(b)If the electron beam of radius b

$$J = J_0 \left((1 - \frac{r}{b}\right) a_z \quad (r < b)$$ [5M][CO3][BTL2]

Find the H field at the surface of the beam

Q.4 (a)A composite magnetic circuit of varying cross section is shown in the figure . The iron portion has standard B-H curve. Given N =100 turns $l_1 = 4\, l_2 = 40$ cms. $A_1 = 2A_2 = 20$ cm^2 $l_g = 2$ mm. leakage flux $\psi = 0.01$ mWb . Calculate I required to establish flux density of 0.6 T [5M][CO5][BTL2]

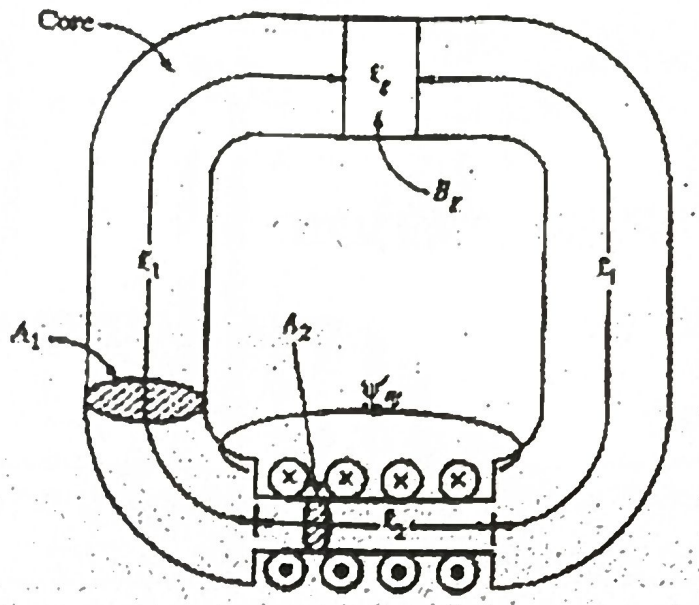

Fig 1

(b) A conductor carrying current I having cross section of R . As per the ampere law $H = H\varphi = Ir/ 2\pi R^2$. What will be magnetic energy in length L of the conductor and value of inductance

[5M][CO4][BTL3]

Q. 5 (a) A system of three coils on ideal core as shown in the fig 2 where $N_1=2N_2=N_3 =500$ turns and $g_1 = 2\ g_2 = 2\ g_3 = 4$mm and A = 1000 mm^2 Calculate the self inductance of the coil

[5M][CO4][BTL3]

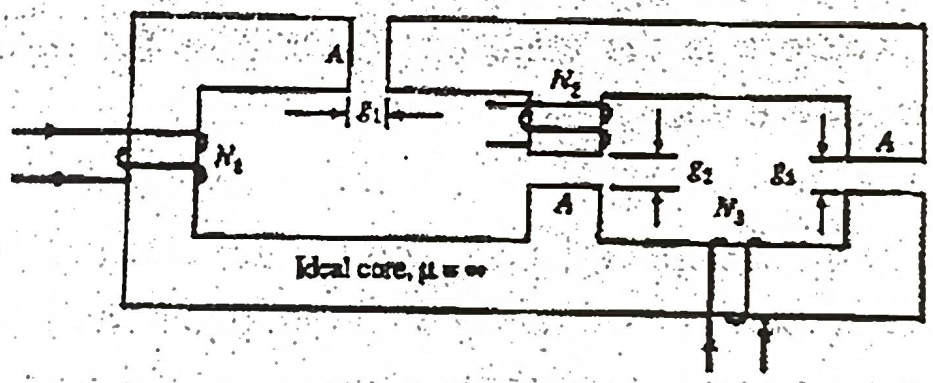

Fig 2

(b) A thin metal sheet of conductivity σ is fixed in x z plane in time varying magnetic field of $B = (B_m \cos\beta x \cos h\, \beta y \cos \omega t)\, a_y$. Determine the electrical field strength at x-z plane of the sheet

Q.6 Write any two short notes

[5MX 2][CO4][BTL3]

(a) Maxwell's equations

(b) Boi Savart's law

(c) Coulomb's law of forces

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Total no. of Pages: 02 Roll no.....

IV SEMESTER

B.Tech. (Eve), EE

END TERM EXAMINATION *May-2025*

CEE-202: POWER TRANSMISSION & DISTRIBUTION

Time: 03:00 Hours *Max. Marks: 40*

Note : Attempt any **Five** questions
All questions carry equal marks.
Assume suitable missing data, if any.

[1] A 3-wire DC system is converted to a 4-wire 3-ϕ AC system by the addition of another wire equal in section to one of the outers. For the some effective voltage between outers and neutral at the consumer's terminals and same percentage loss, find the percentage additional load that can be supplied. Assume balanced load and in the AC system a power factor of 0.9 (lag) **[CO1] [BTL1]**

[2] Determine the best current density in A/mm^2 for a 3-ϕ overhead line. The line is in use for 2600 hours per year and if the conductor costs Rs. 3.0 /Kg. It has a specific resistance of $1.73\times10^{-8}\Omega m$ and weighs 6200 Kg/m^3 and cost of energy is 10 paise/unit. Interest and depreciation is 12% of conductor costs **[CO2] [BTL2]**

[3] Calculate the horizontal component of tension and maximum sag for a span of 300 m if the maximum tension in the conductor is 700 kg/km. Determine also the location of the points on the conductor at which the sag will be half of the above value. **[CO3] [BTL3]**

[4] A certain 3-ϕ equilateral transmission line has a total corona loss of 53 kW at 106 kV and a loss of 98 kW at 110.9 kV. What is the disruptive critical voltage between lines and what the corona loss at 113 kV is. **[CO4] [BTL2]**

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[5] Six conductors of a double-circuit transmission line are arranged as shown in Fig. 1. The diameter of each conductor is 2.5 cm. Find the capacitive reactance to neutral and the charging current per km per phase at 132 kV and 50 Hz, assuming that the line is regularly transposed. Neglect the effect of earth. [CO2] [BTL2]

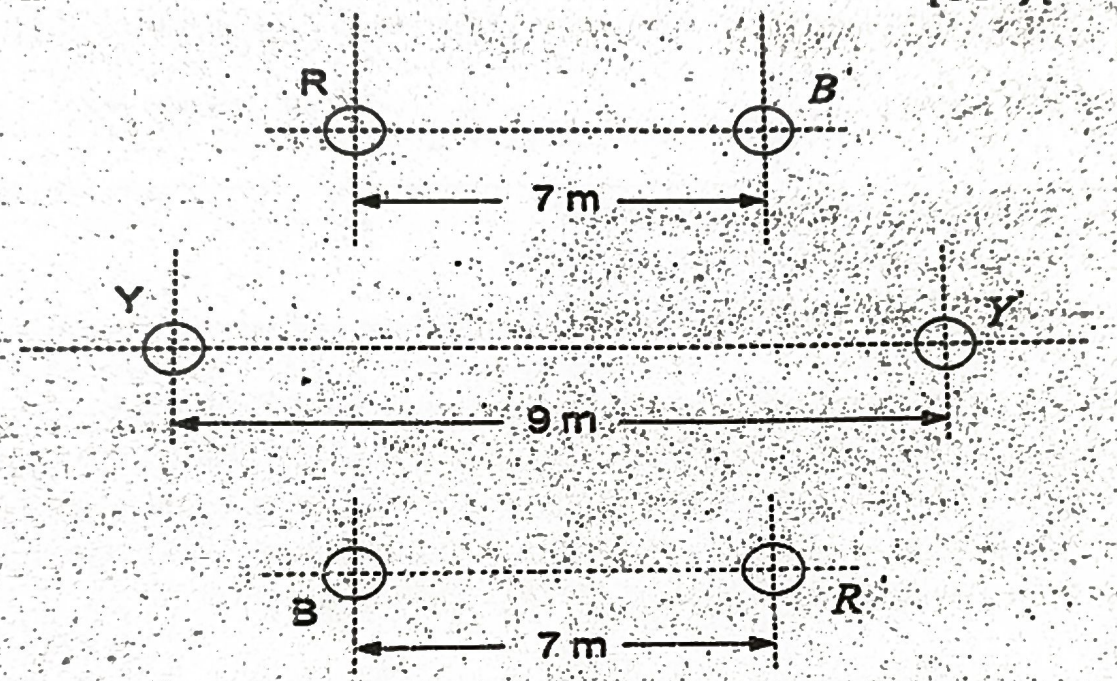

Fig. 1

[6] A 3-ϕ transmission line 50 km long consists of three hard drawn copper conductors in a 1.2 m delta. Load conditions at receiving end are: 10,000 kVA at 0.8 pf lagging, 33 kV, 50 Hz line is designed so that transmission loss is approximately 10%. Find (i) sending end voltage and power factor (ii) efficiency (iii) regulation [CO4] [BTL2]

[7] A single- core cable for use on 11 kV, 50 Hz system has conductor area of 0.645 cm^2 and internal diameter of sheath is 2.18 cm. The permittivity of dielectric used in the cable is 3.5. Find the maximum and minimum electrostatic stresses in the cable. Show also the curve of stress distribution in the cable V/s distance from the centre of the conductor. Find capacitance of the above cable per km length and also find the charging current [CO5] [BTL4]

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Total no. of Pages: 02

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IV Semester

B.Tech (Part-time)

End Term Examination **May 2025**

CEE-204, COURSE TITLE -- Instrumentation & Measurement

Time: 3:00 Hours Max. Marks – 40

Note: Attempt any five questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 (a) 0.0035 μH/degree is the rate of change of inductance in a 25 A electrodynamic meter. What should be the full scale angle of deflection, if spring constant is 10^(-6) Nm/degree? [4][CO1][L5]

(b) A resistance of 20+/-0.2% ohms is experiencing a 1+/-0.5% ampere of current flowing through it. What should be limiting error in the calculation of:

(i) Power [2][CO1][L4]

(ii) Voltage [2][CO1][L4]

Q.2 (a) Draw neat and clean diagram of attraction type Moving Iron Instrument. Explain its working. Derive the equation for deflection angle in moving iron instruments? [4][CO3][L2]

(b) Draw the full waveform formation, with procedure, in the following connections on a CRO.

(i) Same sinusoidal voltage at both X & Y inputs [2][CO4][L6]

(ii) A sinusoidal signal at X and no signal at Y. [2][CO4][L6]

Q.3 (a) Draw neat and clean diagram of a PMMC Instrument. Derive the equation for deflection angle and deflection torque. Explain its working, show if the scale is linear or non-linear? [4][CO2][L1]

(b) Draw neat and clean diagram of a CRT. Which principal does it works on? Draw and explain about the kind of Lissajious pattern be observed on a CRO, if the phase difference between two waveforms in non-sweep mode is 270 degrees? [4][CO4][L1]

Q.4 (a) Draw neat and clean diagram of Maxwell Inductance Capacitance Bridge. Derive the equation for Quality factor of this bridge? [2+2][CO2][L2]

(b) DC supply of 35 volts is connected across 600 Ω resistance in series with an unknown resistance. A voltmeter having 1.2 kΩ resistance is used to calculate the voltage drop across 600 Ω resistance. The voltmeter reads 5 volts. What will be the value of unknown resistance? [4][CO2][L5]

Q.5 Solve any 4 out of the following 5 questions: [1+1+1+1]

(i) A (0-10A) ammeter has an accuracy class of 98% and we are supposed to measure a current of 2.5 amp. What would be the % LE? [CO1][L4]
(ii) A (0-10V) voltmeter has the sensitivity of 1000 ohm/volt. Find the current through the meter at half of full-scale reading? [CO1][L4]

If frequency of sinusoidal waveform given at x deflection plate is 50 Hz and following Lissajious patterns are observed on CRO, then what should be the frequency at y deflection plate?

(iii) Capital "C" [CO4][L6]
(iv) Sign of "INFINITY" [CO4][L6]
(v) Sleeping "Eight" [CO4][L6]

Q.6 Write Short notes on any two of the following: [4+4]

(i) Kelvin's Double Bridge [CO4][L1]
(ii) Anderson's Bridge [CO2][L1]
(iii) Schring's Bridge [CO2][L2]

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4th SEMESTER

B.Tech. [Continuing Education]

END TERM EXAMINATION *May-2025*

COURSE CODE: CEE-206

COURSE TITLE: Microprocessors & Microcontrollers

Time: 3:00 Hours *Max. Marks: 40*

Note:
1. If necessary, make appropriate assumptions and approximations and state them.
2. Attempt **any FIVE** questions!!

1. **QUESTION 1** **[8] [CO 1,2][L1]**

What are **data transfer** and **logical instructions** in the 8085 microprocessors? Explain their significance with examples.

2. **QUESTION 2** **[4 + 4] [CO 2,3][L2]**

A. Draw the timing diagram for INR M?

B. Differentiate between memory mapped I/O and I/O mapped I/O

3. **QUESTION 3** **[2 + 2 + 2 + 2] [CO 2,3][L3,4]**

Explain the following instructions in terms of the tasks it performs, length of the instructions and its addressing modes:

A. ACI 48H B. DAD H C. RAL D. STA 3000H

4. **QUESTION 4** **[3 + 5] [CO 4][L2,4]**

A. Distinguish between fixed-point and floating-point number representations.

B. Represent the decimal number "-19.375_{10}" in IEEE 754 Single-Precision (32-bit) Floating Point Format. Show all the steps involved, including:
   (i) Conversion of the number to binary,
   (ii) Normalization,
   (iii) Calculation of the biased exponent,

(iv) Construction of the 32-bit IEEE 754 format (with sign, exponent, and mantissa),
(v) Write the final answer in hexadecimal format.

5. QUESTION 5

[5 + 3] [CO 4,5][L3,6]

A. Describe the step-by-step execution of Booth's Algorithm for multiplying (-6) and (+7) using 5-bit binary numbers. Show all intermediate values of the Accumulator (A), Multiplier (Q), Multiplicand (M), and Q-1 (Q minus one) at each iteration of the algorithm.

B. Write a program in Assembly Language of 8085 to only complement the upper nibble (D_7 D_6 D_5 D_4) of the accumulator?

6. QUESTION 6

[8] [CO 5][L4,5]

Consider the following 8085 program:

```
MVI C, 0AH
DELAY: DCR C
JNZ DELAY
```

A. How many times is the DCR C instruction executed?
B. If the clock frequency is 1 MHz, calculate the approximate time delay generated.

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B. Tech. (EE) Continuing Education SIXTH SEMESTER

END SEMESTER EXAMINATION (MAY-2025)

CEE 302 RENEWABLE ENERGY SYSTEMS

Time: 3.00 Hours *Max. Marks: 40*

Note: Answer four questions in total. Question 1 is compulsory. Each question carry equal marks. Assume the missing data suitably (if any).

1. **Answer the following questions in brief.** [5×2=10]
   a. What are the various renewable and sustainable energy resources? [CO1][L2]
   b. Briefly explain the significance of MPPT. [CO2][L2]
   c. Draw the block diagram of stand-alone solar PV system. [CO2][L3]
   d. What are different biomass conversion technologies? [CO4][L2]
   e. Why hydrogen is considered as future source of energy? [CO5][2]

2. a. A solar cell having fill factor of 60% gives 2.5 A current at maximum power point at STC. The cell gives 3.0 A short circuit current and 0.5 V open circuit voltage. What is the voltage at maximum power point of the solar cell? [CO2][L4][5]
   b. With the help of pie-chart describe the contribution of various renewable energy sources in power sector. Also discuss the limitations in the exploitation of wind and hydro energy sources for power generation. [CO1][L3][5]

3. a. What are the basic components of a wind energy conversion system, and how do they work together to generate electricity from wind energy? [CO3][L3][5]
   b. What are the main sources of biomass energy? Discuss the effect of ash and moisture on energy contents of biomass. [CO3][L2][5]

4. a. What are the key components of a small hydro power plant? Explain the working principle with help of neat diagram. [CO4][L3][5]

b. A hydro-electric power station has a reservoir of area 2·4 square kilometres and capacity 5×10^6 m^3. The effective head of water is 100 metres. The penstock, turbine and generation efficiencies are respectively 95%, 90% and 85%. [CO4][L5][5]

i. Calculate the total electrical energy that can be generated from the power station.

ii. If a load of 15,000 kW has been supplied for 3 hours, find the fall in reservoir level.

5. Write short notes on any two of the following. [2×5 =10]

a. Tidal power plant [CO5][L3]

b. OTEC [CO5] [L3]

c. Biogas plant [CO4][L3]

d. Geothermal energy [CO4][L3]

****

(c) Derive the expression of "Swing Equation" (not from fundamentals, but from expression of accelerating Power (Pa)? What is the physical significance of this equation? Briefly explain the concept of "Equal Area Criterion" for determining the transient stability for a case of sudden load rejection. (2- Mark).

Q.7: Answer the following questions; [8][CO#5][BTL#L1, L2, L5]

(a) What is understood by the terms "Voltage Control" and "Reactive Power Control". Why is it important to control these variables and how not controlling them might led to instability in the power system? Derive the expression for voltage drop across two terminals (sending end-V1 and receiving end-V2) of a transmission line having an impedance Z = R + j.X and receiving end powers, P2 and Q2. Show both the direct and quadrature axis components of the voltage drop ΔVx and ΔVy and the final expression of ΔV. Using this expression suggest three ways how the voltage drop can be reduced to acceptable limits. (4- Marks).

(b) A transmission line has variables and parameters as follows; V2 ≒ 1 pu; P2 = 0.8 pu; Q2 = 0.6. pu; R= 0.05 pu; X = 1.0 pu. Determine the voltage drop in pu. (2-Marks)

(c) It is desired that shunt capacitors only to be used to reduce voltage drop to within ±10%. Whether this is possible? Prove by calculation. (2- Marks).

Total no. of Pages: 5 *Roll no.....*

__II__SEMESTER **B.Tech. (Eve)**

END TERM EXAMINATION ***May-2025***

CEE-304 : POWER SYSTEM OPERATION AND CONTROL (PSOC)

Time: 03:00 Hours ***Max. Marks: 40***

Note: Attempt any 5 questions out of 7 questions. All questions carry equal marks. Assume suitable missing data, if any.

Q.1: Answer the following questions; [8][CO#1,2][BTL#L1, L2, L5]

(a) Draw the s- domain block diagram of a two area system with supplementary control action implemented on both the areas each with its own "Load Frequency Control System"? Briefly explain the major elements of the block diagram; clearly demarcating the primary LFC control, secondary control and tie line power flow integrated into both the control areas? (3- Marks).

(b) What is the purpose of implementing "Area Control Error (ACE)" in a multi-area interconnected power system? Briefly explain "ACE" and its constituents. What is the significance of "frequency bias (β)" term? Is the "ACE" configured on all the interconnected units? If yes, how? If no, why? (3- Marks).

(c) Recently, on 28/04/2025 around mid- noon, there was a major disturbance on an important power corridor between Spanish-Portuguese interconnect in Europe. This led a massive blackout on both the Spanish and the Portuguese power grids, plunging both the countries into darkness for many hours; disrupting all economic activities and causing distress to industries, commercial establishments and people. Briefly explain this incident. What in your opinion led to this black out and its plausible causes? What mitigating measures/advice would you recommend to the grid authorities to prevent or reduce the impact of such disturbances in the future? (2- Marks).

Q.2 Answer the following questions: [8][CO#2][BTL#L2, L4]

(a) Derive the full expressions (covering both dynamic and steady state parts) for change in frequency (Δw) and change in tie-line power flow (ΔP_tie) in a two area system when the power is flowing from control area-2 to control area-1. Both areas experience simultaneous load changes (ΔP_L1, ΔP_L2) in their respective control areas. (3-marks)

(b) Would the expressions for change in frequency and change in the tie-line power remain identical if the same magnitude of tie power was to flow from control area-1 to control area-2? What changes in the expressions would you observe? (2- Marks).

(c) A two –area system has the following parameters and load changes;
Area-1: D1 = 0.8; H1 = 3; R1 = 2%; ΔPL1 = 0.02 pu (+ve impulse load change)
Area-2: D2 = 1.2; H2 = 6; R2 = 4%; ΔPL2 = - 0.1 pu (-ve step load change)

Derive the dynamic response of individual changes in frequency components (Δω1, Δω2) for two area loads. And then find the complete composite dynamic and steady state frequency response (Δω) of the system. What shall be the final grid frequency (in Hz) after steady state condition is achieved. Assume the initial grid frequency as nominal 50 Hz. (3-Marks)

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Q.3: Answer the following questions; [8][CO#5][BTL#L2, L3]

(a) What is an excitation system? What is the primary purpose of an excitation system and where is it installed in a power plant? What is its role under varying load conditions? Enumerate various types of excitation systems you are taught about? (2- Marks).

(b) Draw schematic diagram of a generic excitation system and briefly explain its major components. What are the three major auxiliary functions added to an excitation system? Briefly explain any one of them. (4- Marks).

(c) What is meant by the exciter response? What is typically the response time of a modern excitation system? Are they helpful during large grid disturbances? If yes, how? If no, why? What is the typical response time of latest high response exciters? (2- Marks).

Q.4: Answer the following questions; [8][CO#5][BTL#L1, L2]

(a) Derive the expressions for active (P) and reactive (Q) power flows at sending end and receiving ends for a lossless transmission line with a high X/R ratio. Designate the sending end variables with suffix-1 and receiving end variables with suffix-2. What is the significance of the "X/R" ratio and how it impacts the analysis and performance of a transmission line? (5- Marks).

(b) Determine the expressions for active and reactive power losses (P_loss, Q_loss) in a transmission line, in terms of sending end and receiving power flows. What are the active and reactive power sources and sinks in a power system, right from generation point and up to the consumption point? (3- Marks).

Q.5: Answer the following questions; [8][CO#5][BTL#L2, L4, L5]

(a) What is meant by the term "Flexible Alternating Current Transmission System (FACTS)"? How it differs from a normal AC Transmission Line? Enumerate various types of FACTs controllers. How their implementation has evolved over the past 3 decades from their inception during 1990s to the present times? Touch upon various technologies shaping the evolution FACTs controllers. What are the merits & demerits of modern VSC based controllers? Draw a block diagram capturing all technologies at one place. (4- Marks).

(b) What is meant by "simultaneous P-Q control" and "independent P-Q control" modes? Which one is the preferred mode of in the modern times and why? (4-Marks)

Case-1: A power system having a lossless transmission line has impedance of 1 pu, sending end and receiving end voltages of 1 pu each. It is desired to transmit 0.5 pu active power (P). Determine the load angle (δ in degrees) and the receiving end reactive power (Q) in pu.

Case-2: It is desired to operate the system with the same P = 0.5 pu but to restrict reactive power flow Q = 0.1 pu only. The receiving ending voltage and reactance remain at previous values of 1 pu each. Determine the new sending end voltage (in pu) and the load angle (δ in degrees).

Compare the results in both the cases above and draw your conclusions.

Q.6: Answer the following questions; [8][CO#3,4][BTL#L2,L3, L4]

(a) Explain the terms "Stability" and "Synchronism". How are these terms related to each other in the power system context? Briefly explain the physics of stability with your understanding and /or using a suitable mathematical expression. (3- Marks).

(b) How would you base and classify different types of power system stabilities? Briefly explain your understanding of each type. Enumerate two ways by which you can enhance the transient stability of power system. (3- Marks).

Total no. of Pages: 530 Roll no.....

6th SEMESTER **B.Tech. (Evening)**

END TERM EXAMINATION *May-2025*

COURSE CODE: CEE-308

COURSE TITLE: Power Electronic Applications to Power Systems

Time: 3 Hours *Max. Marks: 50*

Note : Answer any five questions. All questions carry equal marks. Assume suitable missing data, if any.

Q.1 (a) Define 'FACTS'. Elaborate on the classification of FACTS controllers / FACTS devices. [1+2] [CO1] [BTL 1]

(b) Draw a neat diagram of a TCSC. Explain the function of the MOV in a TCSC. Also plot the variation of the TCSC reactance 'X_{TCSC}' as a function of the firing angle alpha. [2+2+3] [CO2] [BTL 2]

Q.2 (a) Draw a neat diagram of a SVC. How is a SVC better than a TCR ? Draw the V-I characteristics of a TCR and a SVC. [1+1+1] [CO2] [BTL 1]

(b) Draw a neat diagram depicting the physical connection of a UPFC to a transmission line, showing all three phases. [7] [CO4] [BTL 2]

Q.3 (a) Draw (i) the schematic diagram and (ii) the V-I characteristics of a STATCOM. [1.5+1.5][CO2+CO3] [BTL 2]

(b) A TCR with $X_L = 20\ \Omega$ at 50 Hz is connected to a single phase, 230 V bus. Compute the TCR current (fundamental) magnitude for firing angles of 90, 120, 150 and 180 electrical degrees. [7] [CO2] [BTL 4]

Q.4 (a) Draw the schematic diagram of a UPFC. What is the advantage of using a UPFC in power transmission systems ? [3] [CO2] [BTL 3]

(b) Draw the physical connection diagram of a STATCOM. [7] [CO3] [BTL 4]

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Q.5 (a) Explain briefly, the function of the smoothing reactors in a typical HVDC transmission system. How much is the value of a typical smoothing reactor ?

[3] [CO4] [BT 2

(b) With neat diagrams, show that for the same real power transfer, the transmission losses with HVDC transmission are lower than that with AC transmission. Make suitable assumptions. [7] [CO4] [BT

Q.6 (a) How would you (i) reduce and (ii) reverse the real power transfer in a HVDC transmission system ? [3] [CO5] [BT

(b) Draw the schematic diagram of a typical bipolar HVDC transmission system, showing all main components. [7] [CO4] [BT

Q.7 (a) Explain briefly, with neat diagrams, the effect of commutation on the average DC voltage. [3] [CO5] [BT

(b) For a single-phase bridge rectifier (with two thyristors), draw waveforms of the AC voltage, the AC side current and the DC voltage for $\alpha < 90^o$ and $\alpha > 90^o$. [7] [CO5] [BT

Q.8 Write short notes on (any two): 2 x 5

(a) Equivalent commutating reactance [5] [CO5] [BT

(b) Physical connection diagram of a UPFC [5] [CO4] [BT

(c) Physical connections of a SSSC [5] [CO3] [BT

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SIXTH SEMESTER

B.Tech.(even.)[EE]

END-SEMESTER EXAMINATION (MAY-2025)

CEE-322 DESIGN OF ELECTRICAL MACHINES

Time: 03 Hour *Max. Marks:40*

Note: Attempt All Questions.

Assume any data if missing and clearly mention the assumption

Q1. a) In order to design the window area of a transformer, the voltage regulation of the transformer is to be kept in mind. Why is it so? Also derive the expression of approximate regulation of a transformer. **05**

b) For the following conditions determine expression for change in secondary terminal voltage expressed as a fraction of full load rated voltage **05**

i. Minimum value
ii. Maximum value
iii. Zero

Q2. A 1000KVA ON type transformer has a ratio of full load copper loss to core loss of 2.5:1. On rated full load its winding resistance indicates an average temperature rise of 24^0C after 1hr and 38.5^0C after 2hr. **05**

a) estimate the final temperature rise and heating time constant.

b) what continuous overload can be sustained when average permissible rise is 75^0C.

Q3. A motor has a heating time constant of 90min. the temperature rise of the motor is 100^0C when it is continuously loaded with its rated load. If the temperature after 3 hour reaches the max. permissible temp. after it is overloaded, determine the permissible overloading. Assume constant losses is 2 times variable losses. **05**

Q4. Derive the below expression for a transformer **05**

$$S = 2.22 f A_c A_w B_m K_w J \text{ volt amper}$$

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Q5.	For a 200KVA, 4000/1000V single phase transformer draw the equivalent circuit referred to LV side and insert all the values. It is given that η at unity p.f is 97% both at full load and at 60% of full load. A no load p.f is 0.25 and full load regulation at lagging p.f of 0.8 is 5%.	05
Q6.	The ratio of full load mmf in a 400KVA, 50Hz, single phase core type transformer is 2.4×10^{-5}. Calculate the net iron area and the window are of the transformer. Maximum flux density in the core is $1.3 Wb/m^2$, current density is $2.7 A/mm^2$ and window space factor is 0.26. also calculate the full load mmf.	05
Q7	Determine the condition for minimum loss and maximum efficiency in a transformer while designing.	05
Q8	What are the limitations in design of Electrical machines.	05

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EIGHT SEMESTER B. TECH (CEEE)

END SEMESTER EXAMINATION MAY 2025

CEE-402 SWITCHGEAR AND PROTECTION

TIME: 3HRS MAX. MARKS: 40

NOTE: *ATTEMPT ANY FIVE QUESTIONS. ASSUME MISSING DATA IF ANY.*

1. (a) What is a protective relay? [2][CO1] [BT1]
   (b) Differentiate between the terms overreach and underreach. [2][CO1] [BT4]
   (c) Explain what you understand by the pick-up value of the actuating quantity. [2][CO1] [BT2]
   (d) What is meant by the term arc quenching? [2][CO3] [BT1]
2. (a) Explain what you understand about primary and backup protection. What are the various methods of providing backup protection? [4][CO1] [BT2]
   (b) What are the different types of comparators? Discuss the operating principle of the rectifier bridge amplitude comparator. [4][CO1] [BT2]
3. (a) What are the different types of distance relays? Describe the principle of reactance relay with its characteristics on R-X planes. [4][CO1] [BT2]
   (b) Describe the construction, principle of operation, and application of the Buchholz relay. [4][CO2] [BT2]
4. (a) A circuit breaker interrupts the magnetising current of a 100 MVA transformer at 220 kV. The magnetising current of the transformer is 5% of the full load current. Determine the maximum voltage which may appear across the gap of the [4][CO3] [BT3]

breaker when the magnetising current is interrupted at 53% of its peak value. The stray capacitance is 2500 mF. The inductance is 30 H.

(b) Discuss the recovery rate theory and energy balance theory of arc interruption in a circuit breaker. [4][CO3] [BT2]

5. (a) In a 220 kV system, the reactance and capacitance up to the location of circuit breaker is 8 W and 0.025 m F, respectively. A resistance of 600 ohms is connected across the contacts of the circuit breaker. Determine the following: [4][CO3] [BT3]

(i) Natural frequency of oscillation.

(ii) Damped frequency of oscillation.

(iii) Critical value of resistance which will give no transient oscillation.

(iv) The value of resistance which will give damped frequency of oscillation, one-fourth of the natural frequency of oscillation.

(b) With a neat sketch, discuss the differential scheme for bus-zone protection. [4][CO2] [BT2]

6. (a) Explain the working of a microprocessor-based current relay with a suitable diagram. [4][CO1] [BT2]

(b) What are the principal purposes of grounding? Differentiate between neutral grounding and equipment grounding. [4][CO4] [BT4]

7. (a) Discuss the operating principle of the vacuum circuit breaker. What are its advantages over other circuit breakers? [4][CO3] [BT4]

(b) Define the following terms: [4][CO4] [BT1]

Step Voltage, Touch Voltage, Arching Ground, and an effectively grounded system.

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EIGHTH SEMESTER

B. TECH (CEEE)

END SEMESTER EXAMINATION **MAY-2025**

CEE-412 HIGH VOLTAGE ENGINEERING

TIME: 3:00 Hours **MAX. MARKS:40**

NOTE: ***Attempt any FIVE QUESTIONS. Assume suitable missing data, if any.***

1. (a) Explain with neat diagrams two different theories of charge generation and separation in a thunder cloud. [4][CO1][L2]
   (b) Show that a traveling wave moves with a velocity of light on the overhead lines. An inductance of 800 μH connects two sections of a transmission line each having a surge impedance of 350 ohms. A 500 kV 2 μs rectangular surge travels along the line towards the inductance. Determine the maximum value of the transmitted wave. [4][CO4][L4]

2. (a) Explain the use of sphere-gaps in HV measurement. [4[CO2][L2]
   (b) Derive the expression of the refracted voltage wave when a transmission line is terminated through a capacitance. [4[CO2][L3]

3. (a) A surge of 100 kV travelling in a line of natural impedance 600 Ω arrives at a junction with two lines of impedances 800 Ω and 200 Ω respectively. Find the surge voltages and currents into each branch line. [4][CO4][L5]
   (b) A surge of 15 kV magnitude travels along a cable towards its junction with an overhead line. The impedance and capacitance of the cable and overhead line are respectively 0.3 mH, 0.4 μF and 1.5 mH, 0.012 μF per km. Find the voltage rise at the junction due to the surge. [4][CO4][L5]

4. (a) Explain the variation of refracted and reflected waves of voltage and current both in open-ended and short- circuited [4][CO2][L2]

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transmission line. At the other end a source of constant emf V is switched in.

(b) Explain briefly the Impulse generator. [4][CO1][L2]

5. (a) What is tower-footing resistance? What are methods to reduce this resistance? [4][CO1][L1]

(b) Find out the coefficients of reflection and refraction for current and voltage waves when a transmission line terminated through a resistance. [4][CO3][L5]

6. (a)For a model of HVAC long transmission line how you obtain A, B, C, D parameters in the laboratory. [4][CO3][L1]

(b) Discuss Townsend's criterion for breakdown of gases. [4][CO1][L2]

7. Write short notes on any two of the following: - [4 +4] [CO1] [L1]

(i) Cascaded-Transformer method, (ii) Ground wires, (iii) volt-time curves for insulation coordination, (iv) Vacuum breakdown, (v) Testing of HVAC cables.

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VIII SEMESTER **B.Tech. (Eve)**

END TERM EXAMINATION *May-2025*

CEE420: POWER QUALITY

Time: 03:00 Hours *Max. Marks: 50*

Note : All questions carry equal marks.
Assume suitable missing data, if any.
Attempt any *five* questions.

Q.1 Define Electric Power Quality, and how can the different power quality issues be categorized along with their respective causes? [10 M][CO1][BTL1,L2]

Q.2 (a) Explain the working principle of a Distribution Static Compensator (DSTATCOM), and discuss its role in enhancing power quality in distribution systems. Support your answer with relevant examples of practical applications. [5M][CO4][BTL3,4]

(b) A DSTATCOM is connected to a 11 kV feeder and provides reactive power compensation to maintain the voltage at 1 pu. If the feeder supplies a load of 7 MW at 0.85 power factor lagging, determine the reactive power supplied by the DSTATCOM. [5M][CO4][BTL2,3,5]

Q.3 (a) Derive the mathematical model of a Dynamic Voltage Restorer (DVR) and explain its working principle with the circuit diagram. Discuss how the DVR mitigates voltage sags and swells to protect sensitive loads. [7 M][CO3][BTL4,5]

(b) A Dynamic Voltage Restorer (DVR) is connected to a distribution system to protect a sensitive load from voltage sags. The nominal system voltage is 230 V (rms). Due to a fault, the supply voltage drops to 160 V (rms) for a short duration. (i) Calculate the percentage voltage sag. (ii) Determine the voltage that the DVR must inject to maintain the load voltage at 230 V (rms). [3 M][CO3][BTL4,6]

Q.4 (a) Explain the operating principle of a Unified Power Quality Conditioner (UPQC) with the detailed block diagram. Also derive the governing equations for its compensation of voltage sags. [5M][CO3][BTL2,3]

(b) Compare the UPQC with a Dynamic Voltage Restorer (DVR). Discuss the impact of UPQC on the Total Harmonic Distortion (THD) of the system. [5M][CO4][BTL5,6]

Q.5 (a) What are the causes of voltage unbalance in three-phase power systems, explain its impact on motors and transformers, and the standardization of voltage quality parameters. [5M][CO2][BTL4,5]

(b) Discuss the effects of voltage fluctuations and impulses on industrial and commercial loads, providing examples of disturbances caused by these issues. [5M][CO2][BTL4,5]

Q.6 (a) Define the Synchronous Detection Method and discuss its application in the detection of harmonics within power systems. [5M][CO3][BTL1,2,3]

(b) What the different methods used for measuring electrical energy in an AC circuit. Also, distinguish between instantaneous real power and instantaneous reactive power with appropriate mathematical expressions for a three-phase system. [5M][CO3][BTL1,4,5]

Q.7 Write short notes on any of two of the following:

(a) Power quality Indices

(b) Phasor Measurement Units (PMUs)

(c) Active & Passive Harmonic filters

[10M][CO2,3][BTL1,2]

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5.40

Total no. of Pages: 02 Roll no.....

2nd SEMESTER

B.Tech. [Evening](Civil Engg.)

END TERM EXAMINATION May-2025

CCE102 Engineering Mechanics

Time: 3:00 Hours Max. Marks: 40

Note: *Attempt **any five** questions.

- Marks of the questions are mentioned opposite to them.
- Assume suitable missing data, if any.

1. A circular roller weighing 500 N having radius of 200 mm hangs by a string AC 200 mm long as shown in Fig. 1. Find the tension in the string and reaction of the wall. (4+4) [CO1][L1,3,4]

2. An electric lamp weighing 60 N is supported by perfectly flexible strings as shown in Fig. 2. Find the tensions T_1 and T_2 in the strings AC and BC. (4+4) [CO2][L1,4]

3. Determine the forces in various members of the structure as shown in Fig. 3. (8) [CO3][L1,3,5]

4. In a wheel and axle, the diameter of the wheel is 500 mm and that of axle is 200 mm. The rope wound around the wheel is 5mm thick, while the rope wound around the axle is 8 mm thick. What is the velocity ratio of the machine? If the efficiency of the machine, while lifting a load of 200 N is 80%, what is the effort required? If the load is lifted with a velocity of 20 metres per minute, calculate the energy supplied to the machine per minute. (8/3+8/3+8/3) [CO4 & CO6][L1,3,5]

5. A steel ball of diameter 150 mm rests centrally over a concrete cube of 150 mm. Determine the centre of gravity of the system, taking weights of concrete and steel as 25 kN/m^3 and 80 kN/m^3 respectively. (8) [CO5][L1,5]

6. A fire brigade man wants to extinguish a fire at a height of 6 m above the nozzle standing at a distance of 5m away from the fire. Find (i) the minimum velocity of the nozzle discharge required and (ii) velocity of discharge, if he could extinguish with angle of projection at 60^0. (4+4) [CO6][L1,2,4]

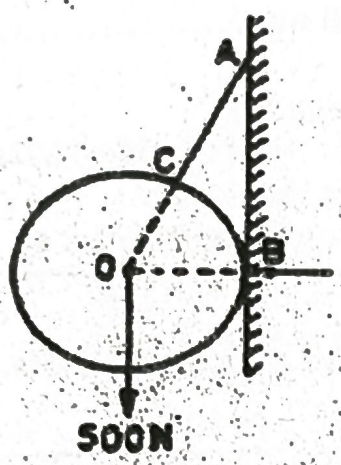


Fig. 1

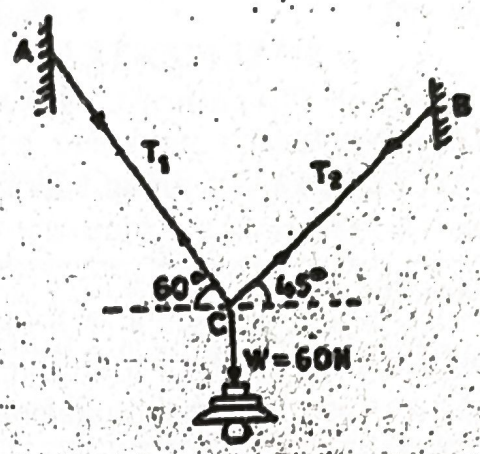


Fig. 2

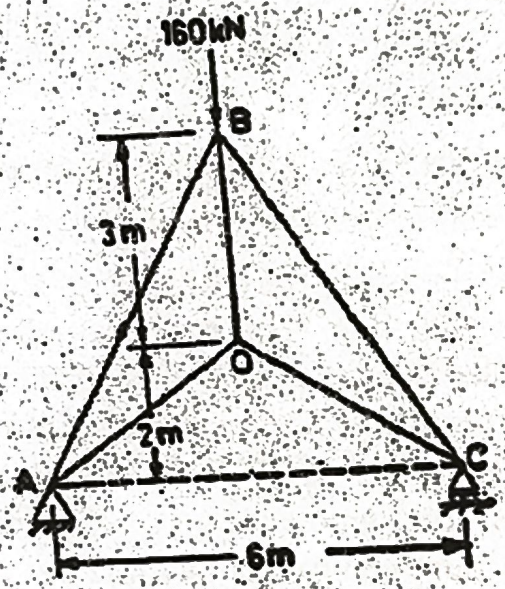


Fig. 3

Calculate

(a)The size of a pipe of length 125 m and f= 0.020, equivalent to the pipe line ABC.

(b) The length of an 8 cm diameter (f = 0.015) pipe equivalent to the pipe line ABC. 8 marks (CO 5) (BTL 4)

Total No. of Pages 04 *Roll No. .....*

SECOND SEMESTER **B.Tech. (Civil)**

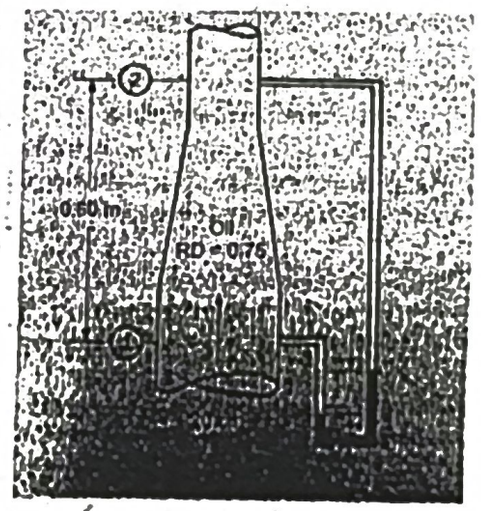
END SEMESTER EXAMINATION May-2025

CCE-104 Fluid Mechanics

Time:3 hours *Max. Marks: 40*

Note :	**Answer any five questions**
	All questions carry equal marks
	Assume suitable missing data, if any.

Q1. (a) For the flow situation shown in figure, calculate the discharge of oil (S = 0.75) when the oil-mercury differential manometer reading h = 10 cm. Neglect all losses in the flow system.



(6 Marks) (CO 3) (BTL 2)

(b) What is meant by stability of a floating body? Explain the stability of a floating body with reference to its metacentric height. (2 Marks) (CO 2) (BTL 2)

2. (a) A horizontal pipe of 100 mm diameter is joined by sudden enlargement to a 150 mm diameter pipe. Water is flowing though it at the rate of 2 m³/min. Find :

(i) Loss of head due to abrupt expansion,
(ii) Pressure difference in two pipes, and
(iii) Change in pressure if the change of section is gradual, without any loss. 6 Marks (CO 5) (BTL 4)

(b) State and explain Newton's law of viscosity? 2 Marks (CO 1) (BTL 2)

3(a) A compound pipeline 1650 m long made up of pipes 450 mm diameter for 900 m, 375 mm for 450 m and 300 mm for 300 m, is required to be replaced by a pipe of uniform diameter. Find the diameter of the new pipe, assuming the length to remain the same.

6 Marks (CO 5) (BTL 4)

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(b) Define the following (i) Absolute Pressure (b) Gauge Pressure
2 Marks (CO 1) (BTL 2)

4 (a) A pipeline of 0-6 diameter is 1.5 km long. To augment the discharge, another pipeline of the same diameter is introduced parallel to the first in the second half of its length. Find the increase in discharge if the friction factor is 0-04 and head at the inlet is 30 m.

6 Marks (CO 4) (BTL 3)

(b) Define Metacentre and Metacentric height
2 Marks (CO 2) (BTL 2)

2

5(a) A 6 m deep tank contains 4 m of water and 2 m of oil of relative density 0.88. Determine the pressure at bottom of the tank .
6 Marks (CO 6) (BTL 3)

(b) Define and explain briefly the following (i) Velocity Potential (ii) Stream function 2 Marks (CO 3) (BTL 2)

6 (a)A triangular plate of 1 m base and 1.5 m altitude is immersed in water. The plane of the plate is inclined at 30° with water surface while the base is parallel to and at a depth of 2 m from the water surface. Calculate:

(i) The total pressure on the plate, and
(ii) The position of the centre of pressure 6 Marks (CO 2) (BTL 3)

(b) Name and explain briefly the hydraulic coefficients
2 Marks (CO 3) (BTL 2)

Q7. Three pipes A, B and C with details as given in the following list are connected in series.

Pipe	length	diameter	f
A	60 m	10 cm	0.018
B	80 m	8 cm	0.020
C	100 m	6 cm	0.020

3

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Total no. of Pages: 02

Roll no.....

IV SEMESTER

B.Tech (Eve)

END TERM EXAMINATION *May-2025*

CCE-202 HYDRAULIC AND HYDRAULICS M1ACHINES

Time: 03:00 Hours *Max. Marks: 40*

Note : Answer any FIVE Questions
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1(a) Describe the phenomenon of energy dissipation in hydraulic jumps. How does this help in channel design and erosion control?

(b) Water flows at 10 m^3/s through a sluice gate into a rectangular channel with an initial depth of 2.2 m. If a hydraulic jump forms downstream, calculate the energy loss in the jump. [8][CO3][L6]

Q.2 (a) Discuss the advantages and disadvantages of operating pumps in parallel and in series. Under what conditions each configuration should be used?

(b) A single-acting reciprocating pump has a cylinder diameter of 0.5 m and a stroke length of 0.3 m. If the pump runs at 100 RPM, determine the theoretical discharge per cycle. [8][CO6][L2]

Q.3 (a) Explain the different types of flow in open channels with suitable examples. Differentiate between uniform flow and non-uniform flow,

(b) Explain Manning's equation and Chezy's equation for uniform flow in open channels. How do roughness coefficients affect the flow characteristics? [8][CO1][L1]

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Q.4 (a) Explain the importance of sluice gates and flumes in controlling flow in open channels. Provide practical examples of their applications.

(b) A sluice gate controls flow in a rectangular channel. If the upstream depth is 2.5 m and the velocity of approach is 3 m/s, determine the depth after the sluice gate, assuming a free-flowing condition. [8][CO4][L3]

Q.5 (a) Explain the working principle of a Pelton wheel turbine with a neat diagram. Discuss the function of the nozzle, buckets, and casing in the turbine's operation.

(b) The efficiency of a Francis turbine is 88%. If the turbine operates under a water head of 40 m with a discharge of 10 m^3/s, determine the shaft power output. [8][CO5][L4]

Q.6 (a) Differentiate between impulse and reaction turbines based on their working principle, components, energy conversion process, and typical applications.

(b) Define cavitation in hydraulic turbines. What are its causes, effects, and methods to minimize cavitation in Pelton, Francis, and Kaplan turbines? [8][CO5][L4]

Total No. of Pages:03

Roll No.....

IVSEMESTER

B.Tech. (Eve.)

END SEMESTER EXAMINATION

May 2025

CCE-204: Analysis of Determinate Structures

Time: 3.00 Hours

Max. Marks: 40

Note: Attempt Any **Five** questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1(a) A Beam 6 m long, simply supported at its ends, is carrying a point load of 50 kN at its centre. The moment of inertia (i.e. I) is given as equal to $78x10^6$ mm^4. If E for the material of = $2.1x10^5$ N/mm^2, calculate (i) deflection at the centre of the beam and (ii) slope at the supports. [CO3][BTL2][4]

(b) Determine the strain energy of a cantilever with uniformly distributed load. Also find the deflection at the free end of a cantilever. [CO4][BTL4][4]

Q.2 (a) Determine the slope and deflection of the free end of a cantilever of length 3 m which is carrying a uniformly distributed load of 10kN/m over a length of 2m from the fixed end. [CO2][BTL5][4]

(b)Find the deflection at the centre of simply supported beam of length carrying UDL w per unit length over the whole span using Castigliano's theorem. [CO3][BTL3][4]

Q.3(a) What is determinacy structure? [CO1][BTL1][2]

(b) Determine the forces in the truss shown in Fig. 1. It carries a horizontal load of 16 kN and vertical load of 24 kN. [CO3][BTL4][6]

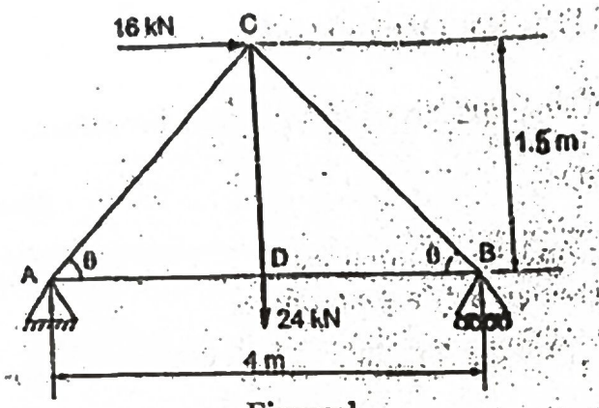

Figure:1

Q. 4 (a) Differentiate between two hinged and three hinged arches. [CO5][BTL1][3]

(b) A symmetrical three hinged parabolic arch of span 40m and rise 8m carries a UDL of 30KN/m, over the left half of the span. The hinges are provide at the support and at the centre of the arch. Calculate the reaction at the support, the bending moment, radial shear and normal thrust a distance of 10m from the left support. [CO5][BTL4][5]

Q.5 (a) What is moment area method? What are the two theorems of moment-area method? [CO3][BTL3][3]

(b) Determine the slope and deflection at points B and C of the beam shown in the Figure 2. Take E=200 GPa and I= 250X10^6. [CO3][BTL6][5]

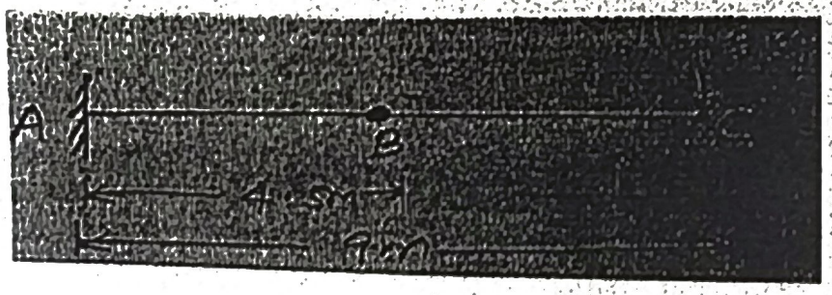

Figure:2

Q.6 Write short notes on [2x4=8]

(i) Maxwell reciprocal deflection theorem [CO1][BTL1]

(i) Castigliano's First Theorem [CO2] [BTL1]

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END TERM EXAMINATION MAY 2025 Roll no.....

IV SEM B.Tech. (Evening) Civil Engineering

COURSE CODE: CCE206 COURSE TITLE: Design of RCC Structures

TIME: 3 Hours Max. Marks: 40

Note: Attempt any Five questions. All questions carry equal marks. Use of IS456-2000 code is NOT permitted.

1(a) Describe stress strain relationship of Mild steel, used in concrete as reinforcement, with a labelled sketch. M4/CO1

(b) What are various types of cement which are permitted by the code for use. Discuss properties of any one cement. M4/CO1

2(a) What do you understand by an under-reinforced beam? How do you check it? Explain with a sketch. M4/CO2

(b) Write details of slump test conducted on concrete. M4/CO2

3(a) Explain various exposure conditions given in the code for RCC structures. M4/CO3

(b) What do you understand by curing of concrete? Describe a method of curing for RCC structures. M4/CO3

4(a) Explain why compaction of concrete is needed. Describe a method of compaction of concrete. M4/CO4

(b) Discuss why mix design of concrete is important. M4/CO4

5(a) Discuss design steps of RCC rectangular beams. M4/CO5

(b) Discuss how reinforcement is provided in an RCC column. Provide a neat sketch of it. M4/CO5

6 Write notes on any two of the following topics. M8/CO6

(a) Importance of quality control in construction

(b) Use of admixtures in concrete

(c) Use of pozzolanic materials in concrete

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Total no. of Pages: 02

6th SEMESTER

Roll no……

B.Tech.

END TERM EXAMINATION

May-2025

CCE302 Transportation Engineering

Time: 3:00 Hours

Max. Marks: 40

Note : Answer any FIVE. All questions carry equal marks. Assume suitable missing data, if any.

Q.1 a) List the limitations of Transportation Engineering. [4][CO1][L1]

b) Discuss the role of transportation in the economic and social development of a society? [4][CO2][L2]

Q.2 a) Discuss briefly the importance of Highway maintenance? [4][CO3][L2]

b) Differentiate between flexible and rigid pavement? [4][CO3][L3]

Q.3 a) Explain briefly the various stages of work with a flow diagram for a new highway project? [4][CO4][L3]

b) What is transport planning? What are the steps involved in transport planning process? [4][CO4][L4]

Q.4 a) What are the objects of highway geometric designs? List the various geometric element to be considered in highway design. [4][CO5][L4]

b) What are the various tests for judging the suitability of road aggregate? Discuss the objects of carrying out each of these tests and their advantages and limitations. [4][CO5][L5]

Q.5 The design speed of a highway is 80 kmph. There is a horizontal curve of radius 200m on a certain locality. Calculate the super elevation needed to maintain this speed. If the maximum super elevation of 0.07 is not to be exceeded, calculate the maximum allowable speed on this horizontal curve as it is not possible to increase the radius. Safe limit of transverse coefficient of friction is 0.15. [8][CO6][L6]

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Q.6 Write short note (any two): [4x2][CO2-CO6][L2-5]

a) Traffic separator
b) Road margins
c) Traffic separator
d) Major faults occurring in flexible pavements

Total no. of Pages: 03

Roll no....

6TH SEMESTER

B.TECH(EVENING) CIVIL ENGINEERING

END SEMESTER EXAMINATION MAY-2025

CCE- 314 GEOTECHNICAL PROCESSES

TIME:3.0 Hr

MAX MARKS: 50

NOTE: ATTEMPT ALL QUESTIONS. ASSUME THE DATA SUITABLY IF ANY.

1. Check the validity of following statements with reasons-

a. If the degree of consolidation in vertical and radial directions is 60% and 70% respectively, the overall degree of consolidation will be 65%. CO-1(2)(L5)

b. The cement grout is a solution grout with high groutability ratio. CO-2 (2)(L2)

c. Electro-osmosis process is used as ground improvement technique in case of coarser soils. CO-3(2)(L3)

d. In order to design composite clay liners geomembranes are used. CO-4(2)(L3)

e. The swelling potential of montmorillonite mineral is minimum. CO-5(2)(L2)

2. Attempt any Two parts.

a. What is the effect of compaction on following geotechnical properties of the soil-

- Unconfined compressive strength
- Swelling characteristics
- Permeability

CO-1(5)(L3)

b. What are the steps involved in vibro-flotation technique? How the effectiveness of the technique is evaluated? CO-1(5)(L3)

c. A 6 m thick clay layer is consolidated by sand drain of diameter 30 cm with spacing of 3 m centre to centre. What will be the increase in the average degree of consolidation when the degree of consolidation in the clay without sand drain would be 25%. The sand drains may be assumed to be arranged in a square pattern. Assume coefficient of permeability and coefficient of consolidation are same in radial and vertical directions. CO-2 (5)(L6)

3.Attempt any Two parts-

a. Explain the mechanism of soil, lime and flyash stablisation. What are the factors affecting this type of stablisation? CO-2 (5)(L4)

b. A clay deposit of depth 10 m is followed by a very stiff stratum. A stone column system of diameter 450 mm and length 8m with centre to centre spacing of 1.2 m is installed in the clay. The water table is at a depth of 1.5m from the ground level. The undrained cohesion is 20kN/m^2. The saturated unit weight of soil is 19kN/m^3. Assume m_v=0.0005 m^2/kN, Φ_c =40° and k_o =0.6. Determine

i) The load carrying capacity of the stone column its tributary soil.

ii) The number of stone column required for a column carrying a load of 650 kN.

iii) settlement of the stone column system CO-2 (5)(L6)

c. What is the principle of electro-osmosis method? What are the precautions to be taken in the field application of electro-osmosis? CO-3 (5)(L2)

4.Attempt any Two parts-

a. Discuss how a grouting project is planned with respect to followings-

- Investigation
- Spacing of grout holes
- Pattern of grout holes CO-3 (5)(L5)

b. With the neat sketches explain the merits, demerits and applications of following types of geosynthetics -

- Geomembrane
- Geocell
- Geogrid CO-4 (5)(L4)

c. How a reinforced retaining wall is checked for stability against

- Sliding
- Overturning
- Bearing failure CO-4 (5)(L5)

5.Attempt any Two parts-

a. Explain the mechanism of reinforced soil. What are the factors governing the effectiveness of reinforcing elements embedded in the soil. CO-4 (5)(L3)

b.(i). The 10 c.c. dry soil passing through 425 micron sieve is poured into a graduated cylinder of 100 ml filled with distilled water. After 24 hr, the volume of settled soil is measures as 150 c.c. Determine the free swell index. Comment on its swelling potential. CO-5 (2.5)(L5)

(ii) A soil has liquid, plastic and shrinkage limits 65%, 25% and12% respectively. Find its swelling potential as per Seed et al. Also comment on its degree of plasticity/ compressibility. CO-5 (2.5)(L5)

d. Discuss with neat sketches any three methods to prevent the swelling potential of expansive soils. CO-5 (5)(L4)

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Total No. of Pages:2 *Roll Number*.....

B.TECH.[Eve](CIVIL) VI SEMESTER

END TERM EXAMINATION MAY-2025

CCE326: TRAFFIC AND TRANSPORTATION PLANNING

Duration: 3 Hours *Max. Marks: 50*

Note: Attempt all questions. All questions carry equal marks. Assume suitable missing data, if any.

Q.1 (a) Describe the concept of level of service. **[CO3][5]**

(b) Based on saturation system, work out the order of priority for phasing the three road projects whose details are as given in the following table:

Road	Length (km)	Population-wise Number of villages			Productivity in Thousand Tonnes	
		<2000	2000-5000	>5000	Agricultural	Industrial
R	12	15	12	6	16	1.6
S	10	21	7	3	15	0.6
T	15	26	16	4	19	1.4

Utility units are given as 1.0 each for population range 2000-5000, 1000 tonne of agricultural product and 100 tonne of industrial product; 0.5 for population less than 2000 and 2.0 for population more than 5000. **[CO3][5]**

Q.2 The total trips produced and attracted to the three zones A, B and C of a study area in the design year are given in the following table:

Zone	Trips produced	Trips attracted
A	1400	2800
B	2600	3200
C	3400	1800

It is known that the trips between two ends are inversely proportional to the second power of travel time between zones, which is uniformly 20 minutes. If the trip interchange between zones B and C is known to be 540, develop the trip distribution matrix. **[CO4][10]**

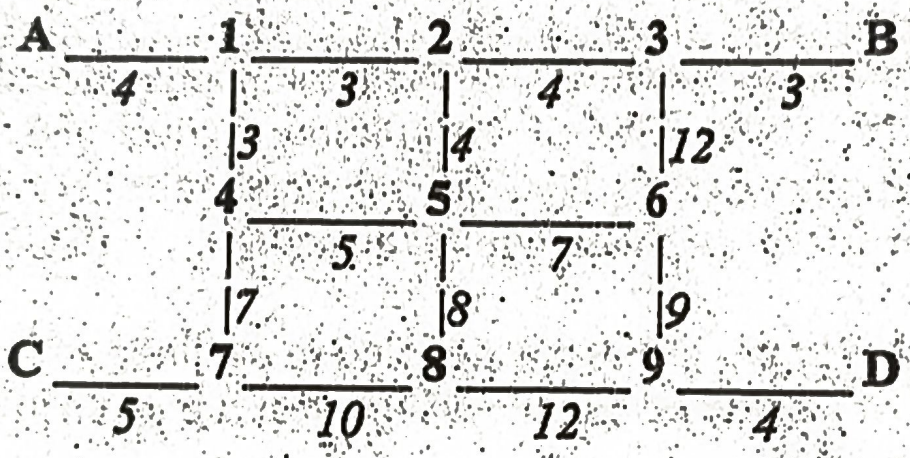
P.T.O.

Q.3 Show the modal split stage in transportation planning process. Explain the various factors that affect modal split? **[CO1][10]**

Q.4 Assign the trips given in the following table: **[CO4][10]**

FROM \ TO →	A	B	C	D
A		900	400	700
B	200		700	300
C	600	800		400
D	100	200	500	

The network connecting the zone centroids A, B, C and D is as shown below:



Figures in italics on network links indicate cost of travel.

Q.5 Write short notes on **ANY FIVE** of the following:

a) Desire line diagram
b) Inter-relationship of traffic flow parameters
c) Interdependence of land use and transport
d) Shortcomings of growth factor methods
e) Impedance factor in trip distribution
f) Capacity restrained assignment technique

[CO2][2×5 = 10]

Total no. of Pages:2 555 Roll no.....

8th SEMESTER

B.Tech. (Eve)

END TERM EXAMINATION May-2025

COURSE CODE: CCE402 COURSE TITLE: CTM

Time: 03:00 Hours Max. Marks:50

Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Describe various types of earthmoving equipment used in construction. Explain any four in detail.[5] [CO1] [BTL1]

Q.2 What are the four common types of compactions equipment?[5] [CO2] [BTL2]

Q.3 What are the five major difference between PERT and CPM. Explain with short examples. [5] [CO3] [BTL3]

Q.4 What is Quality Control (QC) in construction? What are different types of Quality Control in construction project management. Explain any four in detail. [5] [CO1] [BTL4]

Q.5 The cost of equipment is Rs 3 lakhs and scrap value is Rs.20,000, life of equipment 20 years, and age of equipment 8 year. Calculate depreciated value of equipment. [5] [CO4] [BTL3]

Q.6 Determine the gradability of a Crawler tractor pulling a high-pressure rubber tyred self-loading scraper & its load for following condition:

Tractor HP=300, Weight of tractor =20 tonne, Weight of loaded scraper=31 tonne, rated drawbar pull=15 tonne, RR for tractor=90kg/tonne, RR for scraper=105 kg/tonne.[5] [CO3] [BTL5]

Q.7 Determine the probable cost per hour for owing and operating a power shovel (Crawler Tractor Mounted) for the following: Engine,160HP diesel, Crank Capacity=30 lit. Time between oil changes=100Hr. Operating factor=0.6 Useful Life=5 Year, Hours used per Year=2000 Hr. Total initial Cost=800000Rs. Estimated Salvage Value=90000 Rs.

[10] [CO4] [BTL6]

Q.8 The following table shows the jobs of a network along with their time estimates.

Activity	Estimated Duration (Weeks)		
	Optimistic	Most Likely	Pessimistic
1 - 2	1	7	13
1 - 6	2	5	14
2 - 3	2	14	26
2 - 4	2	5	8
3 - 5	7	10	19
4 - 5	5	5	17
6 - 7	5	8	29
5 - 8	3	3	9
7 - 8	8	17	32

Calculate the

a) Draw the Project Network.

b) Find the expected duration and Variance of each Activities.

c) Calculate the earliest and latest occurrence for each event.

d) Calculate expected project length.

e) Calculate the variance and standard deviations of project length. [10] [CO3] [BTL3]

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Total Number of Pages: 01

Roll No._____

CCE-410- Construction and Design aspect in Transportation Engineering

END SEM – MAY, 2025

Time: 3 Hours

8th Semester Civil Engineering

MAX Mark -50

All Questions are compulsory. Assume Suitable Missing Data if any

Q.1: Create and Evaluate case study of super multilevel parking, using AI application

CO5-10 Marks

Q.2: Analyses Case study of international airport Mass terminal facilities deep seek application.

CO4- 10 Marks

Q. 3: Apply case study of subway design of Metro Line and Mono rails –using chart GPT Application.

CO3-10 Marks

Q.4: Understand case study of international traffic solar signals using Robotics applications

CO2-10 Marks

Q.5: Remember case study of super elevation and curse for accidental advance intelligence transport system – using chart bot applications.

CO1-10 Marks

End

Q.5 a) Describe flood hazard assessment and mapping. Discuss benefits and the barriers related to it? [5][CO6][L4]

b) How we can liquefaction hazard evaluation and what are the remedial measures? [5][CO6][L5]

Q.6 Write short note (any two): [5x2][CO2-CO6][L2-6]

a) Natural occurring contamination
b) Ground heave
c) Erosion
d) Rock bolting

Total no. of Pages: 02 *Roll no.....*

8th SEMESTER **B.Tech.**

END TERM EXAMINATION ***May-2025***

CCE-414 Geoenvironmental and Geohazards Engineering

Time: 3:00 Hours ***Max. Marks: 50***

Note : Answer any FIVE.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 a) What are the key challenges faced in implementing geo environmental and geo hazard monitoring systems in remote or difficult to access areas? [5][CO1][L1]

b) What is surface contamination? List the sources of sub- surface contamination? [5][CO2][L1]

Q.2 a) What is leachate? What are the different ways of monitoring and control of leachate? [5][CO3][L2]

b) What is landfill? Explain any one of landfill with neat diagram? [5][CO3][L2]

Q.3 a) What would be the type of subsurface contamination:

i) if household waste dumped on ground surface in a low- lying area.

ii) sludge from effluent treatment plant of a chrome- planting unit.

[5][CO4][L5]

b) What are the effects of rainfall on slope stability? [5][CO4][L4]

Q.4 a) What is land subsidence? Explain recent Josimath land subsidence? [5][CO5][L3]

b) What is landslide? List the type of landslide and explain any one of them with neat diagram? [5][CO5][L4]

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Total no. of Pages: *Roll no.....*

8th SEMESTER **B.Tech. (Eve)**

END TERM EXAMINATION *May-2025*

COURSE CODE CME 402 COURSE TITLE: Total Quality Management

Time: 03:00 Hours *Max. Marks: 40*

Note : Answer any Five Questions.
All questions carry equal marks.
Assume suitable missing data, if any.
Use of Statistical Table is allowed.

Q.1 (a) A quality improvement program has been instituted in an organization to reduce total quality costs. Discuss the impact of such a program on prevention, appraisal, and failure costs. [4][CO2][BTL2]

(b) Classify each of the following into the cost categories of prevention, appraisal, internal failure, and external failure:

I. Vendor selection
II. Administrative salaries
III. Downgraded product
IV. Setup for inspection
V. Supplier control
VI. External certification
VII. Gage calibration
VIII. Process audit

Q.2 (a) Discuss the five dimensions of service quality proposed by Parshuraman, Zeithmal, and Berry. [4][CO2][BTL2]

(b) Discuss seven basic tools for quality control. [4][CO1][BTL1]

Q.3 (a) A machine drills hole in a pipe with a mean diameter of 0.532 cm and a standard deviation of 0.002 cm. Calculate the control limits for mean of samples 5. [4][CO1][BTL1]

[4][CO3][BTL3]

(b) In an auto manufacturing organization, the number of defectives in the 20 lots of spark plug manufactured is given below. Each Lot has 100 spark plugs. Determine the centre line and final control limits.

Lot No.	No. of Defectives	Lot No.	No. of Defectives
1	5	11	4
2	10	12	7
3	12	13	8
4	8	14	3
5	6	15	3
6	4	16	4
7	6	17	5
8	3	18	8
9	3	19	6
10	5	20	10

[4][CO3][BTL3]

Q.4 (a) Find the probability of acceptance for a double sampling plan given as N = 1000, n_1 = 200, c_1 = 2, r_1 = 5, n_2 = 200, c_2 = 5, r_2 =6.

[4][CO4][BTL5]

(b) Find the Average Total Inspection for Single sampling plan N = 1000, n_1 = 300, c_1 = 3, r_1 = 4.

[4][CO3[BTL5]

Q.5 (a) Discuss the Eight Management Principles Used for ISO 9000.

[4][CO4][BTL1]

(b) Discuss the concepts of Six-Sigma in quality management. How does it differ from TQM?

[4][CO5][BTL2]

Q. 6 Write short Notes on **[4×2.0][CO1][BTL1]**

(a) Deming's 14 Principles

(b) Characteristics of O.C. Curve.

(c) Design of Sampling Plans

(d) Difference between control charts for variables and attributes.

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Total No. of Pages _2__ 8th SEMESTER

B.Tech. (Evening)

(Dept. of Mechanical Engg)

END TERM EXAMINATION ***May-2025***

CME406 Robotics and Automation

Time: 3:00 Hours ***Max. Marks : 50***

Note : Answer ***any FIVE*** full question.
Assume suitably missing data, if any.

Q.1. a. Define d.o.f. of robot. Explain with neat figure, six d.o.f. of a robot [06][CO1,2] [L1,L2]

b. With neat diagrams explain the construction and working of two end effectors as tools [04][CO1,2][L3]

Q.2.a. Explain step by step procedure for deriving homogeneous transformation matrix of Denavit-Hartenberg Method (D-H convention). [08][CO2,4][L4]

b. Differentiate between Forward Kinematics and Inverse Kinematics. [02][CO2][L1]

Q.3.a.A point $P[5, 2, 8]^T$ is attached to the moving frame is subjected to the combined transformations as follows:

i. Rotation of 30^0 about Z-axis ii. Followed by rotation of 60^0 about X-axis iii. Followed by translation of [4, 8,6]. Determine the coordinates of the point P relative to the fixed reference frame at the conclusion of the above transformations [08][CO2,3][L5]

Cont..Page 2

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b. Define work volume. Specify the work volume of i. Cartesian coordinate robot ii. Cylindrical coordinate robot iii. Polar coordinate robot. Iv. Articulated joint robot configurations. [02][CO1][L2]

Q.4 a. Explain with neat diagram the construction and working of Inductance sensor and Ultrasonic sensor. [06][CO4][L3,L4]

b. What do you mean by Tactile sensing? Explain with diagram various touch and tactile sensors. [04][CO4][L2]

Q.5 a. Explain with neat diagrams, the concept of Joint-space movements of two d.o.f robot. [03][CO5][L2]

b.It is desired to have the first joint of a six-axis robot go from initial angle of 30° to final angle of 90° in 5 secs. Using cubic polynomial, calculate joint angles at 1,2,3,4, and 5 secs. [07][CO5][L4,L5]

Q.6.a. Explain Lagrangian Mechanics for determining Force and Torque equations, while dealing with dynamic behaviour of the robot. [05][CO6][L3,L4]

b. With neat diagram explain the construction of Force and Torque Sensor. [05][CO6][L2]

Q.7. Write short notes on:

a. Classification of robots

b. Fifth order polynomial trajectory planning

c. Polar coordinate robot

d. Pure translation transformation matrix [10][CO1,3,4,6][L1,L2,L3]

Total no. of pages: 2 563

EIGHTH SEMESTER *Roll No.*_____

END SEMESTER EXAMINATION B. Tech (ME)

CME-412 MATERIALS MANAGEMENT MAY- 2025

Time: 3 Hours Max. Marks: 50

Note: Attempt all questions.
Each question carries equal marks.
Assume missing data , if any

1 (a) What do you understand by materials management? Briefly discuss its primary and secondary objectives. [CO1] [BTL1]

(b) Describe integrated materials management with the help of organization chart. Also discuss the importance of materials department. [CO2] [BTL2]

2 (a) What is the need for classification and identification of materials. Describe the classification of materials according to condition of materials. [CO2] [BTL2]

(b) What is meant by codification of materials? Describe process of codification and merit & demerit of codification. [CO2] [BTL2]

3 (a) Briefly discuss about inventory models. Describe EOQ model with shortage permitted [CO3] [BTL2]

(b) The following data are given for an item:

Annual demand=6000 unit

Cost of an item= Rs 20

Ordering cost = Rs 400

Inventory carrying cost = 30% of item cost

Shortage cost = Rs 10 per item

Calculate (i) Optimum order quantity (Maximum inventory (iii) Total annual cost [CO5] [BTL4]

4 (a) Briefly discuss about inventory control techniques. Describe ABC analysis with neat diagram [CO3] [BTL3]

(b) A firm stores 10 items whose annual consumption in units and price per unit is given in the table 1. Classify the items in A, B and C categories. [CO5] [BTL4]

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Table 1: Annual consumption and price of the items

Item code	Annual usage (units)	Cost/piece
G1	40000	0.07
G2	195000	0.11
G3	4000	0.10
M1	100000	0.05
M2	2000	0.14
M3	240000	0.07
M4	16000	0.08
P1	80000	0.06
P2	10000	0.07
P3	5000	0.09

5 (a) Define purchasing. Describe purchasing procedure. Explain limited and unlimited tender. [CO2] [BTL2]

(b) Name different methods of purchasing. Describe centralized and decentralized method of purchasing. [CO2] [BTL2]

6. Write short notes on any four of the following: [CO1] [BTL1]

(a) Inventory and store

(b) Surplus, obsolete and scrap materials

(c) Subcontracting

(d) Materials safety and security

(e) Out sourcing

(f) Stores accounting

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Total No. of Pages 2 Roll no.....

IV SEMESTER

BTech Evening

END-TERM EXAMINATION *May 2025*

COURSE CODE: CHU-202 **COURSE TITLE: Engineering Economics**

Time: 3:00 Hours *Max. Marks: 50*

Note: Attempt any ten questions.
Assume suitable missing data, if any.
All questions carry equal marks.

Q.1 How do land, labour, capital and entrepreneurship contribute differently to the production process? [5 Marks] [CO1] [BTL2]

Q.2 In what ways do tariffs contribute to the protection of domestic industries? [5 Marks] [CO 4] [BTL3]

Q.3 Highlight the key characteristics that define the Indian economy. [5 Marks] [CO 3] [BTL1]

Q.4 Discuss the importance of inclusive growth in context of India's development. [5 Marks] [CO 1] [BTL5]

Q.5 When did India open up its economy, under which policies and what were the outcomes? [5 Marks] [CO 5] [BTL1]

Q.6 Explain the concept of GDP along with its major methods of measurement. [5 Marks] [CO 2] [BTL4]

Q 7. Explain the contribution of Green Revolution to India's food security. [5 Marks] [CO 4] [BTL5]

Q.8 Define:
a) Average Cost
b) Marginal Cost
[5 Marks] [CO 2] [BTL2]

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Q.9 Differentiate between monetary and fiscal policy. [5 Marks] [CO 3] [BTL4]

Q.10 A local grocery store selling goods in an area faces lot of competition and is unable to charge the prices as per his will. Identify the type of market and briefly explain its characteristics. [5 Marks] [CO 2] [BTL5]

Q.11 How knowledge of engineering and technology may be used to improve life at slums. Explain briefly. [5 Marks] [CO 1] [BTL5]

Q.12 An investment requires an initial outlay of Rs. 20,000 today and is expected to generate the following cash inflows:

- Rs. 5000 at the end of year 1
- Rs. 7000 at the end of year 2
- Rs. 10,000 at the end of year 3.

If the discount rate is 8% annually, what is the net present value (NPV) of this investment? [5 Marks] [CO 3] [BTL3]

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Total no. of Pages: 02 Roll no.....

2nd Semester

B.Tech (Civil)

End Semester Examination **May-2025**

CEN102 ENVIRONMENTAL ENGINEERING

Time 3 Hours **Max Marks 40**

Note : Attempt any five questions. Draw neat and labeled diagrams wherever needed. Assume suitable missing data.

Q.1(a) Discuss the two general methods adopted for sewage disposal; and discuss their merits and demerits explaining the conditions favorable for their adoption. [4] [CO1, CO2][L2]

Q.1(b) What do you understand by self purification of polluted streams? Discuss the factors affecting self purification of polluted streams. [4] [CO1, CO2][L2,3]

Q.2(a) Discuss the construction and functioning of Trickling Filter unit. [4] [CO2][L2]

Q.2(b) Calculate the diameter of circular trickling filter for 250 users. Dry weather flow is 140 lcpd. Rate of filtration of trickling filter units may be assumed as 10 Million Litres/hectare/m. [4] [CO4][L5]

Q.3(a) Explain clearly the purpose of providing a grit chamber in sewage treatment plant scheme, when a primary sedimentation tank in any case is provided ahead of it. [4][CO2,CO3][L2]

Q.3(b) A rectangular grit chamber is designed to remove particles of diameter 0.2 mm and specific gravity 2.65. settling velocity for these particles has been found to range from 0.016 to 0.022 m/sec, depending upon their shape factor. A flow through velocity of 0.3 m/sec will be maintained by proportionate weir. Determine the channel dimensions for a maximum wastewater flow of 10000 m^3/day. [4][CO4][L5,6]

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Q.4(a) Discuss construction and functioning of Activated Sludge process along with its merits and demerits [4][CO1,CO2][L2]

Q.4(b) Average operating data for an activated sludge process is as follows

Wastewater flow 30000 m^3/day, volume of aeration tank 10500 m^3, influent BOD 250 mg/L, effluent BOD 20 mg/L, Mixed Liquor Suspended solids (MLSS) 2500 mg/L, Effluent suspended solids 30 mg/L, waste sludge suspended solids 9700 mg/L, quantity of waste sludge 220 m3/day, based on this information, determine (i)aeration period (hrs) (ii) Food to microorganisms ratio (F/M) (kg BOD per day/ Kg MLSS) (iii) percentage efficiency of BOD removal (iv) Sludge age. [4][CO4][L4]

Q.5(a) Discuss anaerobic digestion of sludge under heads (i) definition and composition of sludge (ii) Fundamental mechanisms of anaerobic digestion (iii) End products and their disposal. [4] [CO1][L2]

Q.5(b) A sedimentation tank is treating 4.5 Million Litres of sewage per day containing 275 mg/L of suspended solids. The tank removes 50% of suspended solids. Calculate the quantity of sludge produced per day in bulk and weight if (i) moisture content of sludge is 98 % (ii) moisture content of sludge is 96 %. Assume specific gravity of sludge as 1.02.

Q.6(a) Explain construction and functioning of Septic Tank. [4] [CO2][L2]

Q.6(b) Design a septic tank for 100 users. Water allowance is 120 lcpd. Detention period may be assumed as 8 hours. [4] [CO4][L4]

Q.7(a) Write short notes on (i)oxygen sag curve (ii) Broad irrigation and effluent irrigation (iii) Sewage sickness (iv) sewage treatment required v/s available dilution ratio for disposal (v) dilution method v/s land disposal method for sewage disposal. [4] [CO1, CO2, CO3][L2]

Q.7(b) Design a suitable rectangular sedimentation tank for treating the sewage from a city provided with assured water supply with a maximum daily demand of 12 Million Litres per day. Assume flow velocity as 0.3 m/sec, water depth 3 m. [4][CO4][L4]

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Total No. of Pages - 1

Roll No.....

IInd Semester
B.Tech.[Evening]

End Term Examination **May 2025**

CMG - 102n Fundamentals of Management

Time - 3.00 hrs **Marks -50**

Note: 1. Answer any five questions
2. All questions carry equal marks

1. Explain the concepts below: [10] [CO#1][L1]
A) E-Governance
B) 4 P'S of marketing
C) Customer lifetime value
D) Primary and secondary market

2. A) Difference between selling and marketing. [5] [CO#2][L2]
B) Difference between traditional and mordern approach of financial management. Also explain the functions of finance. [5] [CO#2][L2]

3. A) Discuss the SWOT analysis of Cloth Industry. [5] [CO#3][L6]
B) Discuss the components affecting the external/macro environment of a business. [5] [CO#4][L4]

4. A) Specify the roles of a manager. [5] [CO#2][L4]
B) Discuss any two motivation theories. [5] [CO#3][L4]

5. A) What is Knowledge management? Explain with suitable examples. [5] [CO#2][L2]
B) Discuss the importance of organising. [5] [CO#2][L]

6. A) Discuss the theories of corporate Governance. [5] [CO#3]
B) Discuss the Principles of Management by Taylor. [5] [CO#1]

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Total No. of Pages:02

Roll No. .....

Second Semester

Int B.Sc. and M.Sc.

IMSAC108 Basic Chemistry-II

END TERM EXAMINATION *May-2025*

Time: 3 Hours *Max. Marks: 50*

Note: Question no. 1 is compulsory. Attempt any 9 Questions in total. Assume suitable missing data, if any

Q1. Draw the phase diagram for water system. Discuss each area, curve and triple point using Degree of freedom. [10 Marks] [CO3]

Q2. Explain the following terms with example:

a) Phase
b) Component
c) Degree of freedom
d) Eutetic point
e) metastable equilibirium [5 Marks] [CO3]

Q3. State Gibbs phase rule. Derive equation for Gibbs phase rule. [5 Marks] [CO3]

Q4. State and explain the three laws of crystallography. [5 Marks] [CO1]

Q5. List and define the seven crystal system along with fourteen bravais lattice. [5 Marks] [CO1]

Q6. a) Draw the plane for the following miller indices:

i. 100 [3 Marks] [CO1]

ii. 120 [2 Marks] [CO1]

b) Write short note on X-ray diffraction.

Q7. What is polarization in dielectrics? Name different types of polarization and discuss them in brief. [5 Marks][CO5]

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Q8. What is Langmuir adsorption isotherm? List the assumption of Langmu adsorption model and derive the equation. [5 Marks][CO

Q9. What are colloids? On what basis are colloids classified. Classify them o the basis of different classification criteria.

[5 Marks][CO

Q10. Discuss five different types of thermodynamic processes with example [5 Marks][CO2]

-----End-----

Total No. of Printed Pages: 03 *Roll No.....*

IInd SEMESTER **Integrated B.Sc.-M.Sc. (Chemistry)**

END TERM EXAMINATION **May 2025**

Course Code: IMSAC 104

Course Title: Organic Chemistry 2

[Time: 3H] [Max. Marks: 40]

Instructions: *Attempt any 5 questions.*

Q1 a) Write down the Haworth synthesis of Anthracene.

b) Account for α-isomer in nitration and halogenation of naphthalene.

[4,4][CO5][L1,3]

Q2 a) Which out of *cis* and *trans* decalin is more stable and why? Illustrate your answer drawing conformations.

b) On the basis of Baeyer's Strain theory explain why cyclobutane is less stable than cyclohexane? [4,4][CO2][L4,5]

Q3. a) Draw the possible chair conformational structures for the following pairs of dimethylcyclohexanes: *cis* and *trans*-1,2 and *cis* and *trans*-1,3. Compare the stabilities of the more stable conformers for each pair of geometric isomers.

b) In terms of eclipsing interactions explain why the chair conformation is more stable than the boat conformation and the twist boat conformation is more stable than the boat conformation.

[4,4][CO1][L6,4,5]

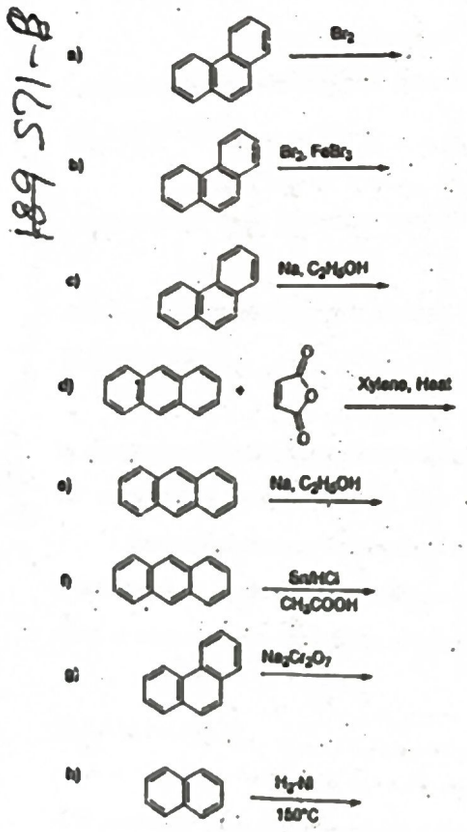
Q4. a) Oxidation of 1-nitronaphthalene yields 3-nitrophthalic acid. However, if 1-nitronaphthalene is reduced to α-naphthylamine and if this amine is oxidized, the

product is phthalic acid. How do these reactions establish the gross structure of naphthalene. Write down all the reactions.

b) Describe in detail the structure of anthracene and explain its preferential position of electrophilic substitution reaction.

[4,4][CO5][L2,L1]

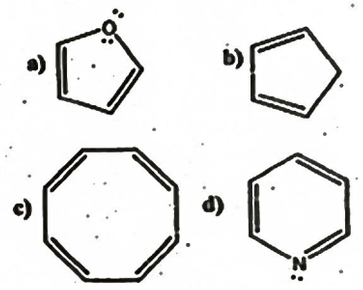
Q5. Complete the following reactions:



[1*8][CO5][L1,2]

Q6. a) Give the mechanism for nitration of benzene. Discuss the rate determining step of the reaction.

b) Classify the following compounds as aromatic, anti-aromatic and non-aromatic. Justify your answer with suitable reason.



[4,4][CO3,CO4][L1,2,3]

Q7. Write short notes on the following:

a) Friedel-Craft alkylation

b) Huckel's Rule with examples.

[4,4][CO3,CO4][L1,2]

Roll No. .....

Total No. of Pages:03
Second Semester

B.Sc. and M.Sc. (Integrated)

May-2025

END TERM EXAMINATION
IMSAC- 106: Physical Chemistry-II
(Gaseous and Liquid States)

Max. Marks: 40

Time: 3 Hours

Note: Attempt six Questions in all. Question 1 is compulsory.
Assume suitable missing data, if any

Useful Physical constants: $R = 8.314\ J\ K^{-1}\ mol^{-1}$; $R = 0.08206\ dm^3\ atm\ K^{-1}\ mol^{-1}$; $1\ J = 1\ kg\ m^2\ s^{-2}$, $\pi = 3.14$; $N = 6.022 \times 10^{23}\ mol^{-1}$; $k_b = 1.3806 \times 10^{-23}\ J\ K^{-1}$; $g = 9.807\ m\ s^{-2}$.

Q1a. Explain the deviation in the values of compressibility factor (Z) of CH_4 gas at low and high pressures as compared to the ideal gas.
[3 Marks] [CO2, CO3, L_2, L_3]

b. Calculate the most probable speed, the mean speed, and the root-mean-square speed of methane molecules at 0 °C.)
[4 Marks] [CO5, L_5]

c. How does the addition of detergent(s) affect the surface tension of water? Explain. Discuss the mechanism of cleansing action of detergent(s) on the fabric.
[3 Marks] [CO2, L_2]

Q2a. Derive the kinetic gas equation based on the postulates of kinetic theory of gases.
[3 Marks] [CO1, L_1]

b. Calculate the relative number densities of water molecule using barometric formula at 300 K at a typical cruising altitude of 8 km, generally kept for the commercial flight. Given, molar mass of water is 18.0 g/mol. Comment on your result.
[3 Marks] [CO5, L_2, L_5]

P.T.O

Q3a. Work out the average kinetic energy of ideal gas molecules using the Maxwell distribution of molecular speeds in 3-D. [3 Marks] [CO2, L_2]

b. Define the critical constants (P_c, V_c and T_c) for a real gas. Work out the following expression for critical temperature (T_c) of a real gas in terms of its van der Waals constants a and b:

$$T_c = 8a / 27 Rb$$ [3 Marks] [CO2, L_2]

Q4a. A 5.0 L cylinder contains 8 mol of Cl_2 gas. Calculate its pressure at 27°C using: (i). ideal gas law; (ii). van der Waals gas equation. Comment on the difference in values of pressure in two cases. Given, the van der Waals constants (a and b) for Cl_2 gas are 6.26 dm^6 atm mol^{-2} and 0.0542 dm^3 mol^{-1}, respectively. [3 Marks] [CO5, L_5]

b. Draw the isotherm for CO_2 qualitatively at different temperatures. In this diagram show the following: two-phase (liquid-gas) coexistence region, the supercritical fluid region and the critical isotherm.

[3 Marks] [CO1, CO2, L_1, L_2]

Q5a. Calculate the reduced pressure (P_r), reduced volume (V_r) and reduced temperature (T_r) of one 1 mole of methane gas confined to a volume of 5 dm^3 container under a pressure of 5 atm. Also calculate the temperature of the gas.
Given the critical constants of methane: P_c, V_c and T_c are 54.6 atm, 0.0988 dm^3 mol^{-1} and 190.2 K respectively. [3 Marks] [CO2, CO5, L_2, L_5]

b. In what ways the structure of liquid(s) differ to that of a solid(s) and gas(es)? Explain. [3 Marks] [CO2]

Q6a. Point out the physical significance of second and third virial coefficients in virial equation of state. [3 Marks] [CO2, L_2]

P.T.O

b. Arrange the following liquids in order of increasing boiling point based on their vapour pressure and intermolecular forces:
ethyl alcohol, ethylene glycol, diethyl ether and water.
Justify your answer. [3 Marks] [CO2, CO3, L_2, L_3]

Q7a. A capillary tube of internal diameter 0.3 x 10^{-3} m is dipped into a liquid whose density is 790 kg m^{-3}. The liquid rises in this capillary to a height of 0.9 m. Calculate the surface tension of the liquid in N m^{-1}. (Given, g = 9.806 m s^{-2}). [3 Marks] [CO5, L_5]

b. How would the addition of the water soluble polymer to water influence the viscosity of water? Justify your answer by taking an example. [3 Marks] [CO2, L_2]

----End----

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Total No. of Pages: 02 *Roll no.....*

Integrated B.Sc.-M.Sc. I SEMESTER

END TERM EXAMINATION **May- 2025**

IMSBT102 - Introduction to Computational Biology

Time: 3:00 Hours ***Max. Marks: 40***

Note: Attempt any 5 questions.
All questions carry equal marks.
Assume suitable missing data, if any

1) (a) Outline the key features of the NCBI database. How does it serve as a central resource in biological research?

(b) Describe the basic working principle of BLAST and explain how it identifies sequence similarities.

[4+4] [CO# IMSBT-102.1] [BTL#2]

2) (a) Discuss specific tools or features within PDB that enhance researchers' ability to analyze and interpret complex molecular data?

(b) Discuss the significance of visualization tools like PyMOL in understanding protein structures and interactions.

[4+4] [CO# IMSBT-102.1] [BTL#6]

3) (a) Explain the role of loops in programming for bioinformatics. How do they help in handling and analyzing biological data easily?

(b) What are arrays in programming? Explain their structure and purpose in storing data.

[4+4] [CO# IMSBT-102.3] [BTL#4]

4) (a) Compare the key differences between PAM and BLOSUM scoring matrices in sequence alignment.

(b) Describe the working principle of the Smith-Waterman algorithm for sequence alignment.

[4+4] [CO# IMSBT-102.4] [BTL#3]

5) (a) Describe the detailed procedure for conducting multiple sequence alignment (MSA). Outline the key steps involved, including sequence preparation, parameter selection, and result interpretation.

(b) Explain the difference between pairwise sequence alignment and multiple sequence alignment, highlighting the specific tools or algorithms used for each approach.

[4+4] [CO# IMSBT-102.5] [BTL#1]

6) (a) Explain how the Human Genome Project has contributed to advancements in genomics and personalized medicine.

(b) Describe how pathway enrichment analysis using databases like KEGG or Reactome can help identify key biological processes affected in a disease condition.

[4+4] [CO# IMSBT-102.2] [BTL#5]

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II Semester
B.Sc./M.Sc. Integrated

ND TERM EXAMINATION **May 2025**

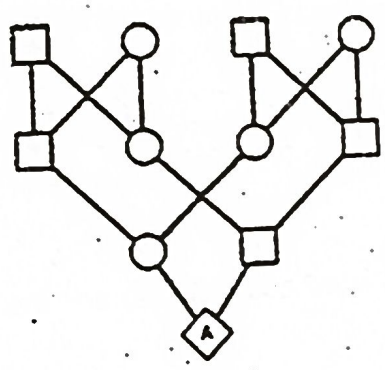
IMSBT-104: Genetics/Molecular Genetics

ime- 3:00 hours **Maximum marks- 40**

e: Answer *SIX* questions. Question No.1, 2 and 3 are compulsory

Write the characteristic features of each stage of Prophase I (Meiosis I). [CO1; L1][5]

Calculate the Inbreeding coefficient (F) of individual "A". Assume common ıcestors are not inbred. [CO2; L4][5]



Answer the following: [CO1,CO2; L2][2+2+2]
Two examples of X-linked recessive disorder.
Explain Base substitution mutations
Define mFISH

a) Explain different types of chromosomal structural variation. [CO3; L3][4]

Describe site-specific recombination between the circular DNA of a acteriophage and that of a bacterium, with the help of an illustration. [CO3; L3][4]

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5. a) Describe any two DNA repair mechanisms. [CO4; L3][4]

b) Explain the positive and negative regulation of Lac operon. [CO4; L3][4

6. a) Describe different chromosome banding techniques using Giemsa stain. [CO5; L3][4

b) Briefly explain the steps involved in Fluorescence In Situ Hybridization. [CO5; L4][4

7. a) Calculate the recombination frequency, average number of crossovers a genetic distance between points A and B on a chromosome from followi information:

i) Individuals with no crossover = 70
ii) Individuals with single crossover = 20
iii) Individuals with double crossover = 8
iv) Individuals with triple crossover = 2

[CO3; L4][3

b) Differentiate between Type I and Type II transposons. [CO4; L1][3

c) Differentiate between Dominant and Codominant markers. [CO5; L5][2

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II SEMESTER

B.SC M.SC Integrated

END TERM EXAMINATION *MAY-2025*

COURSE CODE IMSBT106

COURSE TITLE : Cell Biology

Time: 01:30 Hours *Max. Marks: 50*

Note : Paper is divided into 3 sections.
Assume suitable missing data, if any.

Section A – Short Answer Questions (Any 5 out of 6) [5 × 3 = 15 Marks]

1. Define the cytoskeleton. Mention two major cytoskeletal elements and their functions. [CO1] [BTL1]

2. Differentiate between prokaryotic and eukaryotic cells with one example each. [CO1] [BTL2]

3. What are the differences between apoptosis and necrosis? [CO6][BTL2]

4. What is the role of the p53 gene in controlling the cell cycle? [CO2] [BTL2]

5. Explain the function of tight junctions in epithelial cells. [CO3][BTL2]

6. Describe the mechanism of receptor-mediated endocytosis with an example. [CO4][BTL3]

Section B – Medium Answer Questions (Any 3 out of 5) [3 × 5 = 15 Marks]

8. Explain the molecular components and structural organisation of the cytoskeleton. [CO1][BTL2]

9. Discuss the mechanisms through which tumour suppressor genes like pRb prevent cancer progression. [CO5][BTL3]

10. Analyse the role of Bcl-2 family proteins and cytochrome c in apoptosis. [CO2][BTL4]

11. Describe the role of intracellular signalling proteins in transmitting signals from receptors to the nucleus. [CO3][BTL2]

12. Explain the importance of the extracellular matrix in regulating cell-cell interactions and signalling. [CO1][BTL3]

Section C – Long Answer Questions (Any 2 out of 3)
[2 × 10 = 20 Marks]

13. Describe and differentiate the major types of cell signalling (autocrine, paracrine, endocrine, and juxtacrine), including examples and biological relevance. [CO3][BTL4]

14. Discuss in detail the process of cancer progression from proto-oncogene activation to metastasis, including targeted therapies. [CO5][BTL4]

15. Design an experimental approach to study apoptosis using caspase assays and mitochondrial markers. [CO2][BTL6]

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II SEMESTER

B.Sc.

END TERM EXAMINATION

May-2025

IMSPH 102 Mathematical Physics II

Time: 03:00 Hours ***Max. Marks: 50***

Note : Answer all Questions.
Assume suitable missing data, if any.

Q.1 Find the gradient and divergence of a complex function $f(z)=x^2y - xy^2$. [5][CO2][BTL2]

Q.2 Write the law of transformation of a covariant and contravariant tensor of order 1.Give an example of a physical quantity of each type. [5][CO2][BTL2]

Q.3 What is the geometrical interpretation of gradient. Find the directional derivative of $f(x,y,z)=x^2yz - 4xyz^2$ at the point (1,3,1) in the direction of the vector $2\mathbf{i}-\mathbf{j}-2\mathbf{k}$. [5][CO3][BTL2]

Q.4 Write the Green's divergence theorem and write the expression of gradient and divergence in cartesian coordinates. [5][CO2][BTL2]

Q.5 What is an analytic function. What is a simply connected and a multiply connected region. Write cauchy-riemann equations. [6][CO3][BTL2]

Q6 Determine the poles of the function $f(z)= z^2/(z-1)^2(z+2)$ the residue at each pole and hence evaluate the integral along a contour C given by $|z|=3$ [6][CO3][BTL4]

Q7. Write the line element for an Euclidean space and the Riemannian space . What is the metric tensor and write the transformation law for $g_{\mu\nu}$. [6][CO3][BTL3]

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Q8 Write the Laurent series theorem and derive it from first principles.

Or

Verify the Stokes theorem for the vector field v=xy i+2yz j +3xz k using a square cross section of unit area in yz plane . [7][CO3][BTL3]

Q9. Find all the roots of the complex equation $z^3 = 1$ [5][CO2][BTL2]

Total No. of Pages: 3

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IInd SEMESTER

Integrated B.Sc-M.Sc (Physics)

END TERM EXAMINATION **MAY 2025**

COURSE CODE & TITLE IMSPH 104 THE PHYSICS OF VIBRATIONS & WAVES

Time:3.0 Hours **Max. Marks:50**

Note: **Q1 is compulsory. Attempt any four questions from Q2-Q6.** Symbols have their usual meaning. Assume suitable missing data, if any.

Q1 (a) Is sound wave a transverse or a longitudinal wave? Why sound waves cannot be polarized? **[2]** [CO: 1, 2] [BTL:2]

(b) Define a wavefront, plane wave and a spherical wave. [1.5] [CO: 1, 2] [BTL:1]

(c) When does a reflected pressure sound wave has the same phase or different phase with respect to an incident wave?**[1.5]** [CO:2] [BTL:2]

(d) Why does the pressure variation is maximum for a sound wave when it's reflected from a rigid boundary? **OR** Why there is no difference between a wave velocity and a group velocity when a light travels in a vacuum? **[2]** [CO:5] [BTL:2]

(e) What is the difference between an echo and reverberation for a sound wave? **[1.5]** [CO:2] [BTL:2]

(f) What are the three conditions for the interference of sound waves? **[1.5]** [CO:3] [BTL: 2]

Attempt any four questions from Q2(a-e):

Q2 (a) Explain Sabine's law of sound reverberation and what are the various assumptions taken for the determination of intensity of sound energy in the enclosure at any time? **[2.5]** [CO:5] [BTL:2]

(b) Derive an expression for the intensity of an acoustic wave and define the specific acoustic impedance. **[2.5]** [CO:5] [BTL:3]

(c) Define the following terms (i) Logarithmic Decrement, (ii) Relaxation Time and (iii) Quality Factor and show the relation between these terms. [2.5] [CO:5] [BTL:1]

(d) A hall has a volume of 2000 m^3. Its total absorption is equivalent to 90 m^2 of open window. What will be the effect on the reverberation time if an audience fills the hall and thereby increases the absorption by another 90 m^2 ? [2.5] [CO:5] [BTL:3]

(e) Calculate the displacement to amplitude ratio for a S.H.M when Kinetic Energy (KE) is 90% of total energy. [2.5] [CO:5] [BTL:3]

Attempt any four questions from Q3(a-e):

Q3 (a) From the general solution of a forced oscillator, deduce the expression of an amplitude resonance for a very low and high driving frequency. [2.5] [CO: 1, 5] [BTL:3]

(b) What is Newton's and Laplace correction factor for propagation of sound waves in a gas? [2.5] [CO:5] [BTL:1]

(c) Define different types of earthquake waves. [2.5] [CO: 1, 5] [BTL:1]

(d) Derive the differential equation of SHM of an electrical oscillator. [2.5] [CO: 1, 5] [BTL:3]

(e) A particle is subjected to two simple harmonic motions: $x_1 = A_1 \sin\omega t$ and $x_2 = A_2 \sin(\omega t + \Pi/3)$. Find (i) the displacement at t=0, (ii) the maximum speed of the particle and (iii) the maximum acceleration of the particle. [2.5] [CO: 1, 5] [BTL:3]

Attempt any two questions from Q4(a-c):

Q4 (a) Derive the differential equation of motion & its general solution for a damped SHM and discuss the case for a critically damped SHM. [5.0] [CO:5] [BTL:3,4]

(b) What are Lissajous's figures? Derive an expression for the resultant motion for two simple harmonic motions at right angles to each other with frequency ratio 1:2 and draw the Lissajous figure for two SHM's having different amplitudes, phases and frequencies in the ratio 1:2. [5.0] [CO:5] [BTL:3,4]

(c) The equation for displacement of a point on a damped oscillator is given by $x = 5\ e^{-0.25t} \sin [\Pi/2]t$ metre. Find the velocity of the oscillating point at t=T/4 and T, where T is the time period of the oscillator. [5.0] [CO:5] [BTL:3]

Attempt any two questions from Q5(a-c):

Q5 (a) What are the main requirements for a good acoustic auditorium? Define an acoustic transducer and name 3 acoustic transducers. [5.0] [CO:5] [BTL:1;2]

(b) Show that for two identical stiffness coupled pendulums, the total energy is constant and transferred between the pendulums at the modulated (beat) frequency. [5.0] [CO:5] [BTL:3,4]

(c) Define the following terms: (i) Normal Co-ordinates, (ii) normal modes of vibration and (iii) degrees of freedom. [5.0] [CO:5] [BTL:1,2]

Q6 (a) The vibrations of a string fixed at both ends are described by the equation $y = (5.00\ mm) \sin[(1.57\ cm^{-1})x] \sin[(314\ s^{-1})t]$

(i) What is the maximum displacement of the particle at x= 5.66 cm ?

(ii) What are the wavelengths and the wave speeds of the two transverse waves that combine to give the above vibration?

(iii) What is the velocity of the particle at x= 5.66 cm at time t= 2s?

(iv) If the length of the string is 10.0 cm, locate the nodes and the antinodes. How many loops are formed in the vibration? [3.0] [CO: 1, 2] [BTL:3]

(b) A sonometer wire has a total length of 1m between the fixed ends. Where should the two bridges be placed below the wire so that the three segments of the wire have their fundamental frequencies in the ratio 1:2:3 ? [2] [CO: 1, 2] [BTL:3]

(c) Define the following terms: (i) Normal Dispersion; (ii) Non-Dispersion and (iii) Anomalous Dispersion [5.0] [CO: 1, 2] [BTL:1,2]

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IInd SEMESTER

Integrated B.Sc-M.Sc (Physics)

END TERM EXAMINATION **MAY 2025**

COURSE CODE IMSPH 108 **COURSE TITLE GEC PHYSICS-2**

Time:3.0 Hours **Max. Marks:40**

Note: **Q1 is compulsory. Attempt any four questions from Q2-Q7.** Symbols have their usual meaning. Assume suitable missing data, if any.

Attempt any ten questions from Q1(a-l): [20]

Q1 (a) What is the main difference between a solar cell and LED? [2] [CO:1,2] [BTL:1,2]

(b) What is the difference between a ballistic transport and a drift velocity of electrons upon application of an electric field? [2] [CO:2,3] [BTL:1,2]

(c) What are the two main essential conditions for a lasing action to occur? [2] [CO:1,2] [BTL:2]

(d) What are the two essential conditions for a total Internal Reflection (TIR) at the optical fiber wall to occur? [2] [CO:1,5] [BTL:2]

(e) What do you understand by the term "Refractive Index Profile" for an optical fiber? [2] [CO:1,2] [BTL:2]

(f) What important conclusions can be drawn from the plot of Binding energy per nucleon as a function of mass number in nuclear physics? [2] [CO:1,5] [BTL:2]

(g) Define the following terms: (i) Isotopes; (ii) Isobars and (iii) Isotones. [2] [CO:1,2] [BTL:1]

(h) State four main differences between the ordinary light and laser beam. [2] [CO:1,2] [BTL:1]

(i) Explain Mass defect formula for the stability of atomic nucleus [2] [CO:1,5] [BTL:2]

(j) If the uncertainty in position of an electron is 4×10^{-10} m, calculate the uncertainty in its momentum. [2] [CO:2] [BTL:2,3]

(k) Explain the nuclear fission and fusion process. State four main differences between the two processes.[2] [CO:3] [BTL:2]

(l) Explain Compton Effect and Compton Shift in Nuclear Physics. [2] [CO:3,5] [BTL:2]

Q2 (a) Explain the features, advantages and limitations of either Liquid Drop Model or Nuclear Shell Model of Nuclear physics [3]. [CO:3,5] [BTL:1,2]

(b) Calculate the binding energy of an alpha particle from the following data: Mass of (1,1)H atom = 1.007825 u; mass of neutron = 1.008665 u and mass of (4,2)He atom = 4.00260 u. Take 1u= 931 MeV c^{-2}. [2] [CO:5] [BTL:3]

Q3 (a) What is the effect of temperature and doping on the mobility of semiconductors and state Matthiessen's rule? **OR** Explain the temperature dependence of carrier concentrations in a semiconductor. [3.0] [CO:5] [BTL:2]

(b) Explain any two of the following terms: (i) Amphoteric Dopants; (ii) Law of Mass Action and (iii) Einstein Relationship and (iv) diffusion current and a drift current. [2.0] [CO:5] [BTL:2]

Q4 (a) In the working of a laser, define the following terms (i) population inversion, (ii) Lifetime and (iii) Metastable state. **OR** What are the three main differences between step- and graded-index fibers? [1.5] [CO:2] [BTL:1,2]

(b) Derive Einstein's A & B coefficients with respect to stimulated absorption, spontaneous emission and stimulated emission **OR** Explain the construction and the working mechanism of either Ruby laser or He-Ne laser. [3.5] [CO:5] [BTL:2,3]

Q5 (a) Define the parameter V-number and explain the modes of propagation of light signal via step- and graded index fibers. **OR** Explain the mechanism of attenuation of signal in optical fibers. [2] [CO:5] [BTL:1,2]

(b) Explain the construction and the working mechanism of an optical fiber along with appropriate diagrams. **OR** For an optical fiber, define and derive the expressions for the following terms: (i) Acceptance angle; (ii) Acceptance cone and (iii) Numerical aperture. [3] [CO:5] [BTL:2,3]

Q6 (a) What is the difference between classical mechanics and quantum mechanics? Explain Black Body radiation via Planck's quantum theory [2.5] [CO:5] [BTL:1,2]

(b) What do you understand by de-broglie's concept of matter waves? Give its diagrammatic representation and derive de-broglie's wave equation. [2.5] [CO:5] [BTL:2,3]

Q7 (a) Define the following terms (i) Electric Potential; (ii) Electric Potential Energy; (iii) Dielectric Loss and (iv) Lenz's Law. [2] [CO:2,5] [BTL:1]

(b) A conducting loop placed near a long straight wire carries a current i as shown in the fig. below. If the current increases continuously, find the direction of the induced current in the loop. [2] [CO:2,5] [BTL:3]



(c) A circular coil of radius 1.5 cm carries a current of 1.5 A. If the coil has 25 turns, find the magnetic field at the centre. [1] [CO:2,5] [BTL:3]

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Integrated B.Sc. and M.Sc. (Mahematics)

II Semester

END TERM EXAMINATION

May 2025

IMSMA102: CALCULUS-II

Time: 3 Hours

Maximum Marks: 50

Note: Attempt any five questions. All questions carry equal marks.

1 (a) Verify Euler's theorem for $u = \log\left(\frac{x^2+y^2}{xy}\right)$. [5]
CO1, BTL5

1 (b) Find the maximum and the minimum distances of the point (3, 4, 12) from the sphere $x^2 + y^2 + z^2 = 1$ using Lagrange's method of multipliers. [5]
CO1, BTL4, BTL5

2 (a) Evaluate the double integration $\int_0^a \int_{\sqrt{ax}}^a \left(\frac{y^2}{\sqrt{y^4-a^2x^2}}\right) dydx$ by changing the order of integration. [5]
CO2, BTL5

2 (b) Find the volume bounded by the xy −plane, the cylinder $x^2 + y^2 = 1$ and the plane $x + y + z = 3$. [5]
CO3, BTL5

3 (a) Evaluate the volume of the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ using triple integration. [5]
CO3, BTL5

3 (b) Find the directional derivative of the function $f(x, y, z) = x^2 + xy + z^2$ at the point $A(1, -1, -1)$ in the direction of the line AB, where B has the coordinates (3, 2, 1) [5]
CO4, BTL2

4 (a) Prove that $\nabla^2 f(r) = f''(r) + \frac{2}{r} f'(r)$. [5]
CO5, BTL1, BTL5

4(b) Find a unit vector normal to the surface $y^3z^2x = 4$ at the point $(-1, -1, 2)$. [5]
CO5, BTL3, BTL5

5 (a) If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, prove that $curl(r^n\vec{r}) = \vec{0}$. [5]
CO4, BTL1

5 (b) Verify Green's theorem for the function $\vec{F} = (xy + y^2)\,\hat{i} + x^2\hat{j}$, where the curve C is the boundary of the region bounded by the curves $y = x$ and $y = x^2$. [5]
CO5, BTL4, BTL5

6 (a) A force field $\vec{F}$ is given by $\vec{F} = (2x - y + 2z)\hat{i} + (x + y - z)\hat{j} + (3x - 2y - 5z)\hat{k}$. Find the work done by $\vec{F}$ in moving a particle once round a circle C in xy-plane, if the circle has its centre at origin and radius 2 units.
CO5, BTL3, BTL5 [5]

6 (b) Evaluate $\int\int_S ((2x + z)\hat{i} + yz\,\hat{j} + z^2\hat{k}).\hat{n}dS$ using Gauss divergence theorem, where S is the surface of the region enclosed by upper half of the sphere $x^2 + y^2 + z^2 = a^2$ and $z = 0$ plane. [5]
CO5, BTL3, BTL5

~End~

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Second Semester **I.M.Sc.**

End Term Examination May, 2025

IMSMA-104, Real Analysis-I

Time: 3 Hours Max. Marks: 50

Note: Attempt any ten questions and assume the missing values.

(1) State the Weierstrass M-test and with the help of M-test show that the series

$$\sum_{n=1}^{\infty} r^n \cos nx \text{ and } \sum_{n=1}^{\infty} r^n \sin nx,\ 0 < r < 1,$$

converge uniformly on $\mathbb{R}$. (CO4)(L1)

(2) Let $\{f_n\}$ be a sequence of functions, which converges uniformly to f on $\mathbf{E}$. If each of the functions $f_n (n = 1, 2, 3, \cdots)$ is continuous at $x_0 \in \mathbf{E}$, then show that f is continuous at x_o. (CO4)(L3)

(3) Explain pointwise convergence and uniform convergence and compare them. (CO4)(L1)

(4) Prove that a sequence of functions $\{f_n\}$ defined on $\mathbf{E}$ converges uniformly on a set $\mathbf{E}$ if and only if for every $\varepsilon > 0$, $x \in \mathbf{E}$ there is an integer n_0 such that (CO4)(L3)

$$|f_n(x) - f_m(x)| < \varepsilon,\ m, n \geq n_0.$$

(5) Sate and prove the mean value theorem and give its geometric interpretation. (CO5)(L2)

(6) Prove that if the series $\sum_{n=1}^{\infty} u_n$ converges, then $u_n \to 0$ as $n \to \infty$, but the converse is not necessarily true. (CO3)(L3)

(7) Test the convergence of the series (CO3)(L2)

$$1 + \frac{2x}{2!} + \frac{3^2x^2}{3!} + \frac{4^3x^3}{4!} + \cdots$$

2

(8) Test the convergence of the series (CO3)(L3)

$$x - \frac{x^2}{2^2} + \frac{x^3}{3^2} - \frac{x^4}{4^2} + \cdots$$

(9) Show that the sequence $\{2nx/(nx+3)\}$ converges pointwise on $E = (0, 2]$ but it does not converge uniformly on E. (CO4)(L2)

(10) Show that $\sqrt{8}$ is not a rational number. (CO1)(L1)

(11) Sate and prove the Rolle's theorem and give its geometric interpretation. (CO5)(L2)

(12) Suppose that $\{s_n\}$ and $\{t_n\}$ are two sequences of real numbers and

$$\lim_{n\to\infty} s_n = L \text{ and } \lim_{n\to\infty} t_n = L.$$

If $s_n \leqslant u_n \leqslant t_n (n = 1, 2, \cdots)$, then show that (CO2)(L1)

$$\lim_{n\to\infty} u_n = L.$$

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SECOND SEMESTER

IMSC[Mathematics]

END SEM EXAMINATION

IMSMA-106 ORDINARY DIFFERENTIAL EQUATIONS **MAY 2025**

Time: 3 Hrs. ***Max. Marks: 50***

Note: Answer **ANY FIVE** questions. Assume suitable missing data, if any.

Q.1 (a) Obtain the differential equations from the solution $\frac{x^2}{a^2+c} + \frac{y^2}{b^2+c} = 1$, where a, b are fixed and c is arbitrary constant. [5M][CO1][L2]

(b) Find particular member of orthogonal trajectories of $x^2 + cy^2 = 1$ passing through the point (2, 1). [5M][CO1][L2]

Q.2 (a) Solve $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 5y = x^2\sin(logx)$. [5M] [CO4][L4]

(b) Let y_1 and y_2 be the solutions of differential equation $y'' + p(t)y' + q(t)y = 0$, where p and q are continuous on [a, b]. Prove that the Wronskian is given by $W' + p(t)W = 0$. [5M][CO2][L3]

Q.3 (a) Write the condition of integrability condition of total differential equation and hence solve $(x+z)^2dy + y^2(dx+dz) = 0$. [5M] [CO2][L1]

(b) Solve $\frac{d^2y}{dx^2} + a^2y = tanax$. [5M][CO4][L2]

Q.4 (a) Find all the eigen values and eigen functions of $y'' + \lambda y = 0$, with $y(0) = y(2l)$, $y'(0) = y'(2l)$. [5M] [CO3][L5]

(b) Solve by method of variation of parameters

$(D^2 + 2D + 1)y = e^{-x} \log x$. [5M][CO4][L2]

Q.5 (a) Find the general solution to the system $x' = Ax$, where

$A = \begin{bmatrix} 1 & -1 \\ 1 & 3 \end{bmatrix}$ and $x = [x_1, x_2]^T$. [5M][CO5][L5]

(b) Find the general solution of the system $y' = Ay + h$, where

$A = \begin{pmatrix} 1 & 1 \\ 4 & -2 \end{pmatrix}, h = \begin{pmatrix} 3t+1 \\ 2t+1 \end{pmatrix}, y = [y_1, y_2]^T$. [5M][CO5][L5]

Q.6 (a) Solve the following simultaneous linear differential equations.

$\frac{dx}{dt} + 4x + 3y = t$ and $\frac{dy}{dt} + 2x + 5y = e^t$. [5M][CO4][L4]

(b) Solve the following equation by changing the independent variable.

$x\frac{d^2y}{dx^2} - \frac{dy}{dx} + 4x^3y = x^5$. [5M][CO2][L3]

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END TERM EXAMINATION *May-2025*

Integrated B.Sc. and M.Sc. (2nd Semester)

COURSE CODE: IMSMA108

COURSE TITLE: MATHEMATICS-II (GEC)

Time: 03:00 Hours **Max. Marks: 50**

Note: All questions carry equal marks.

Assume suitable missing data, if any.

Q.1 Find the inverse of the matrix using elementary row transformation.

$$A = \begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$$

[4][CO1][BTL1,3,5]

Q.2 Determine the eigenvalues and eigenvectors of the matrix

$$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$

[4][CO1][BTL1,5,6]

Q.3 Verify that the given function satisfies the differential equation:

$$y = \sin^{-1} x, \quad y'' = \frac{x}{(1-x^2)^{3/2}}$$

[4][CO2][BTL1,2,3,4]

Q.4 Check the equation for exactness. If it is exact, find the solution:

$$(3x^2 + 2e^y)dx + (2xe^y + 3y^2)dy = 0$$

[4][CO2][BTL1,2,3]

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Q.5 Solve the initial value problem:

$(3xy+y^2)dx+(x^2+xy)dy=0, \quad y(0)=1$ [6][CO3][BTL2,3,4,5]

Q.6 Find the solution of the Bernoulli differential equation:

$3y^2y'+xy^3=x$ [6][CO3][BTL2,3,4,5]

Q.7Write the convolution theorem statement and prove the statement.

[6][CO4][BTL1,4,5]

Q.8 Use Laplace transform to solve the initial value problem:

$y''+6y'+9y=8te^{2t}, \; y(0)=0, \; y'(0)=-1$ [6][CO4][BTL1,2,3,4,5]

Q.9 Define the gradient of a scalar field. Find the normal vector and the equation of the tangent plane to the surface: [5][CO5][BTL1,3,4,5]

$z=\sqrt{x^2+y^2}$ at (3,4,5)

Q.10 Write the statement of Green's Theorem. Verify Green's Theorem in the plane for [5][CO5][BTL1,3,5]

$$\oint_C (3x^2-8y^2)dx+(4y-6xy)dy$$

where C is the boundary of the region defined by:

$$y=\sqrt{x}, \quad y=x^2$$

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II Semester
B.Sc.-M.Sc. Integrated

END TERM EXAMINATION **May, 2025**
COURSE CODE: IMSHU102
COURSE TITLE: INTRODUCTORY MACROECONOMIC

TIME: 3:00 HRS. **MAX. MARKS: 50**

NOTE: Attempt any five questions from the following.

1. a) Explain the circular flow of income and expenditure in a two-sector economy. Illustrate your answer with a neat diagram. **(5Marks)(CO1)(BLT1)**

   b) Given the following information, calculate the Nominal GDP and Real GDP. Assume 2020 as the base year.

Year	Price (₹)	Quantity
2020	50	1000
2021	60	1000

(5Marks)(CO1)(BLT5)

2. a) Define money. Discuss the four major functions of money in an economy. Why is money considered better than the barter system? **(5Marks)(CO2)(BLT4)**

   b) If the money supply (M) is ₹4000 crores and the velocity of money (V) is 5, calculate the Nominal GDP using the Quantity Theory of Money (Fisher's Equation). **(5Marks)(CO2)(BLT3)**

3. a) What is inflation? Explain the social and economic costs of inflation. Also, differentiate between inflation and hyperinflation with examples. **(5Marks)(CO3)(BLT4)**

   b) The following information relates to the consumption pattern of an average household for six commonly used items:

Commodity	Quantity (base year)	Price (Base Year) (₹)	Price (Current Year) (₹)
Wheat (kg)	20	25	30
Sugar (kg)	40	40	50
Tea (kg)	200	200	250
Electricity(unit)	6	6	8
Cooking oil(litres)	90	90	110
Soap(pieces)	20	20	25

Calculate the Consumer Price Index (CPI) and the percentage increase in the cost living. **(5Marks)(CO3)(BLT5)**

4. a) Explain the simple Keynesian model of income determination in a closed economy. How does effective demand influence the level of output and employment? **(5Marks)(CO4)(BLT4)**
   b) In a closed economy, the marginal propensity to consume (MPC) is 0.75. Calculate the value of the multiplier. If government spending increases by ₹200 crores, what will be the total increase in income? **(5Marks)(CO4)(BLT5)**

5. a) What is inflation? Explain the causes of inflation and discuss its impact on different sections of society such as fixed-income earners, businessmen, and borrowers. **(5Marks)(CO3)(BLT2)**
   b) If the price index was 200 last year and it rises to 230 this year, calculate the inflation rate. **(5Marks)(CO3)(BLT3)**

6. a) Explain the IS-LM model for a closed economy. How do the goods market (IS curve) and money market (LM curve) interact to determine equilibrium income and interest rate? **(5Marks)(CO4)(BLT6)**
   b) In a simple Keynesian model, if the marginal propensity to save (MPS) is 0.2, calculate the value of the multiplier. If government expenditure increases by ₹500 crores, calculate the total increase in income. **(5Marks)(CO4)(BLT5)**

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Total no. of Pages: 2 *Roll no.....*

SECOND SEMESTER

Integrated M.Sc. Economics

END TERM EXAMINATION *May-2025*

COURSE CODE: IMSHU104

COURSE TITLE: Mathematical Methods for Economics II

Time: 03:00 Hours *Max. Marks: 50*

Note : All questions carry equal marks.
Assume suitable missing data, if any.

Q.1. Consider the following non-linear programming problem (NLPP):

Maximize cost $C = 5x_1^2 - 80x_1 + x_2^2 - 32x_2$

Subject to $x_1 + x_2 \geq 30$,

(a) Write the Kuhn-tucker conditions for the above NLPP. [4][CO1][BTL1]

(b) Using the conditions obtained in part (a), solve the given NLPP. [6][CO1][BTL2]

Q.2 (a) Prove that any function $x = x(t)$ that satisfies the equation $(t-a)^2 + x^2 = a^2$ is a solution of the following differential equation:

$$2tx\frac{dx}{dt} + t^2 - x^2 = 0$$

[6][CO2][BTL4]

(b) Find the area of region bounded by $y = x^3$, the x-axis and the line $x = 4$ for $x > 0$. [4][CO2][BTL3]

Q.3. (a) Show that dual of the dual is primal. [4][CO3][BTL3]

(b) Use duality to solve the given problem. Also find the solution of its primal

Minimize $Z = 3x_1 + x_2$

Subject to $x_1 + x_2 \geq 1$,

$2x_1 + 3x_2 \geq 2$

$x_1, x_2 \geq 0$

[6][CO3][BTL3]

Q.4. The Cobb-Dougals Production function: $50K^{0.3}L^{0.7} = Q$, where Q is a given level of output, K is the amount of capital, and L is the amount of labor. The isoquant associated with this function reflects the levels of capital and labor that yield a constant level of output.

(a) Use the Implicit Function Theorem to derive an equation for the slope of an isoquant associated with this production function.

[4][CO4][BTL3]

(b) When $K = 6$ and $L = 2$, what is the slope of a line tangent to this isoquant? What is the slope of the line when $K = 3$ and $L = 14$?

[4][CO4][BTL1]

(c) The marginal rate of technical substitution (MRTS) is the rate at which the two production inputs can be substituted if output is held constant. Find the MRTS for both examples in part (b). [2][CO4][BTL1]

Q.5 Let the function g be given by

$$g(x,y) = x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$$

Determine the stationary points of g and examine the nature of the extreme values. [10][CO5][BTL5]

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2nd_SEMESTER **I.M.Sc. (ECO)**

END SEMESTER **MAY 2025**

EXAMINATION

IMSHU – 106 Statistics for Economics II

Time: 180 minutes **Max. Marks: 50**

Note: Attempt any **Five** questions. All are of equal marks. Assume missing data, if any.

1. Explain the following terms. (any five) [2 × 5] [CO.1,2,3 BTL2, L3,L6]
   a) Simple random sampling
   b) Delphi technique
   c) Statistic and Parameter
   d) Central Limit Theorem
   e) Null Hypothesis and Alternate Hypothesis
   f) Type I and Type II errors

2. a) Show that the sample mean is an unbiased estimator of the polpulation mean but sample variance is a biased estimate of the population variance. What is the unbiased estimate of the population variance. [5+5] [CO.2, BTL2, L3,L4]
   b) Consider a study designed to estimate the mean credit card debt for the population of households. A sample of $n = 70$ households provided the credit card balances with sample mean $x = ₹9312$ and the sample standard deviation $s = ₹4007$. Compute an interval estimate of the population mean credit card balance.

3. a) During testing in a sample of 300 chips, 10 have been found to be defective. Can the manufacturer's claim that 2% of the chips are defective may be accepted? [5+5] [CO.3, BTL2, 3,4,5]
   b) The daily collection of milk at a plant has averaged 850 kilolitres for the last several years. An observer wants to know whether the average has changed in recent months. He randomly selects 40 days from the database and finds the average collection as $\bar{x} = 840$ kilolitres with S.D. s = 18 kilolitres. Test the alternate hypothesis at $\alpha = 0.05$.

4. a) The mean heights in two large samples of 1000 and 2000 men are 67.5 inches and 68.0 inches, respectively. Can the two samples be regarded as drawn from the same population of S.D. 2.5 inches? [5+5] [CO.3,4, BTL3, [4,5]

b) Obtain the equation of the line of regression of y on x for the following data. Also estimate y when x=32.

x	23	27	28	28	29	30	31	33	35	36
y	18	20	22	27	21	29	27	29	28	29

5. a) Following data give the 11 measurements of the same object on the same instrument. [5+5] [CO.3, BTL3, 4,5]

2.5	2.3	2.4	2.3	2.5	2.7	2.5	2.6	2.6	2.7	2.5

At 1% level, test the hypothesis that the variance of the instrument is no more than 0.16.

b) There are two different choices to stimulate a certain chemical process. To test whether the variance of the yield is the same no matter which catalyst is used, a sample of 10 batches is produced using the first catalyst, and of 12 using the second catalyst. If the resulting data is $S_1^2 = 0.14$ and $S_2^2 = 0.28$, test the hypothesis of equal variance at 2% level.

6. a) Explain the method of least squares to obtain the line of best fit. [5+5] [CO.4, BTL1, 2,3]

b) Find the line of best fit relating y to x for the following data, plot the line and the data points.

x	2	3	4	5	6	7
y	3	5	5.5	6	8	9.5

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II SEMESTER

BSc-MSc Integrated

END-TERM EXAMINATION

May 2025

COURSE CODE: IMSHU-108 **COURSE TITLE: Basics of Financial Accounting**

Time: 3:00 Hours *Max. Marks: 50*

Note: Attempt any five questions.
Assume suitable missing data, if any.

Q.1 Why is trial balance prepared? Write its main features & limitations. [2+4+4=10 Marks] [CO1] [BTL4]

Q.2 Define:

a) Shareholders' equity
b) Current liabilities
c) Current assets

[4+3+3=10 Marks] [CO 4] [BTL

Q.3 Define the term depreciation. Why is it important to charge depreciation on the assets of a company? What are its causes? [2+3+5=10 Marks] [CO 3] [BTL

Q.4 Briefly define share capital. Also mention various types of share capital. [10 Marks] [CO 1] [BTL3]

Q.5 Elaborate on the objectives and benefits of doing ratio analysis as a part of analysing a company's financial health. [10 Marks] [CO 5] [BTL5]

Q.6 Define Inventory valuation. Why is it important and what are its various types? [10 Marks] [CO 2] [BTL2]

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II SEMESTER
Integrated B.Sc.-M.Sc. (Chemistry)
EXAMINATION **May 2025**

IMSAC102 INORGANIC CHEMISTRY-2

[Time: 3H] **[Max. Marks: 40]**
Instructions*: *Attempt any 5 questions.

Ques1. A) What are essential and non-essential metal ions in the biological system? Draw the Dose-response curve for essential elements and toxic metal ions in a human body.
B) Why does a minute concentration of vanadate inhibit the operation of the ATPase in sodium-potassium pump? (6+2) [CO1, CO2][L2]

Ques2. Define: (2X4) [CO1, CO2][L1]
A) Bohr's effect B) Active transport
C) Cooperativity in haemoglobin D) Metalloenzymes

Ques3. A) Describe the Perutz mechanism of oxygenation of haemoglobin.
B) Explain the role of ferritin in human body. (4+4) [CO3][L4]

Ques4. A) The Heme group in Haemoglobin cannot function as an oxygen carrier in the absence of the globin chain. Explain.
B) Discuss the biological importance of calcium. How is it different from magnesium? (4+4) [CO3][L1,3]

Ques5. A) Draw the oxygenation saturation curves for myoglobin and haemoglobin and justify that myoglobin has greater affinity for oxygen than haemoglobin.
B) How is iron transported in human body? (4+4) [CO4][L2,3]

Ques6. A) Write the name and symptom of disease caused by the toxic effects of Hg and Cd.
B) Write the reasons for the toxicity of Pb(II). How can it be treated?
(4+4) [CO4, CO5][L3,4]

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II SEMESTER
B.DES

END TERM EXAMINATION ***May-2025***

COURSE CODE: DD102

COURSE TITLE: Design Methodology and Methods

Time: 4:00 Hours ***Max. Marks: 40 Marks***

Note : Attempt all the questions Question. Assume suitable missing data, if any.

Q1. You are designing a carry bag for daily vegetable vendors who walk long distances and often have no storage space.
a) How would you apply ethnographic research to understand their needs?
b) Create a user persona for one type of user based on your understanding.

(10 Marks)(BTL6)

Or

A local museum is planning a new exhibit on Indian textiles. They want to ensure the experience is inclusive for visitors of all ages and abilities (e.g., children, elderly, visually impaired, hearing-impaired, wheelchair users). Apply the 7 principles of Universal Design to suggest improvements for exhibit layout, content delivery, and interactive displays. Support your answer with relevant examples or sketches of how you would make the experience universally accessible. (10 Marks)(BTL6)

Q2. Choose any one of the following users:

- A college student attending hybrid classes.
- A first-time user of a digital banking app.

Map their user journey for one specific task and highlight at least 3 major pain points they might face. Suggest one design solution for each pain point.

(10 Marks)(BTL6)

Or

Q3. A municipal corporation wants to redesign public water dispensers in crowded urban areas to make them more usable for all types of users, including children, elderly people, and people with disabilities. Using the Human-Cantered Design process, describe how you would approach this challenge. Outline the steps you would take from user research to prototyping and iteration, ensuring the design addresses real user needs. (10 Marks)(BTL6)

Q3. Using the Double Diamond model or the Design Thinking approach, explain how you would design a solution to improve public transport experience for differently-abled individuals. Highlight each stage (Define, Ideate, Prototype, Deliver) with 1-2 points or examples. (10 Marks)(BTL6)

Or

Q3. You are designing a community kitchen space in a flood-prone rural village where people of different backgrounds and ages will cook, eat, and store food. Apply the Design Thinking process to solve this problem. Use methods like empathy mapping, brainstorming, prototyping, and journey mapping to explain how you will understand user needs, define the problem, generate ideas, and test your solution. (10 Marks)(BTL6)

Q4. You are tasked with designing a reusable water bottle for school children aged 6–10 years. Explain how you would apply the stages of design (Define, Ideate, Prototype, Deliver) to create a final product. Include what tools or methods (like sketching, mock-ups, feedback, etc.) you might use at each stage. (10 Marks)(BTL6)

Or

Q4. You are part of a design team working for a wearable technology company. The company wants to release a fitness tracking wristband for teenagers, but user preferences are constantly evolving due to new trends, tech, and fashion. Explain how the Agile methodology can help manage this dynamic design scenario. Describe how you would apply Agile methods such as sprint planning, iteration, user feedback, and stand-up meetings to develop and deliver a relevant product. (10 Marks)(BTL6)

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1st SEMESTER B.Des

END TERM EXAMINATION

May 2025

DD106 - Communication Studios and Semiotics

Time: 3Hrs

Max. Marks: 40

Note: Make suitable assumptions where necessary. Use of Computers and Internet is NOT allowed. Give Answer sheet + 2 A3 Sheets to each student. Q1, Q2, Q3 are compulsory. Do any one of Q4 or Q5.

Q1. Define the following terms along with an example (do any 5)

[5x1=5 Marks] L1,2, CO1,2,3,4

a) Connotation
b) Semantics
c) Symbol
d) Representation
e) Abstraction
f) Pragmatics

Q2. What is a Sign as explained by Saussure? Explain the different parts of a sign and the relationship between them. Also give an example to illustrate your answer. [5 Marks]L2,3, CO2

Q3. List and explain the three different tendencies through which humans create Signs? Give an example for each and explain why they belong to each. [5 Marks]L2,3 CO2

Q4.

a) Select any **two distinct and powerful emotions** (e.g., fear, joy, calm, urgency etc.). For each emotion, clearly discuss how you would use the following representational strategies to communicate effectively- **Colors, Shapes, Typography, Signs/ Symbols**

[5+5=10 Marks]L3,4, CO1,2,3,4

b) Choose **one emotion** from the two discussed above and create a detailed, well-composed poster illustrating it on A3 sheet. Employ the strategies discussed in part (a). Be mindful of composition, visual impact, appropriate visual elements, originality and neat execution.

[15 Marks]L6,CO1,2,3,4

OR

Q5.

a) Reflect on the life of a design student and identify any two recurring emotional or cognitive states (e.g., excitement, frustration, confusion, curiosity, exhaustion, flow, etc.). Briefly describe how these states could be visually represented using: **Colors, Body Language, Typography,** and other **Signs/Symbolic Elements** in a sequential narrative.

[5+5=10 Marks]L3,4, CO1,2,3,4

b) Based on your reflection in part (a), create a comic strip or visual narrative titled "A Day in the Life of a Design Student." Use 8–12 frames to depict a sequence of events that effectively communicates key emotional shifts and experiences. Be mindful of coherence, creative use of semiotic strategies, visual storytelling, narrative and originality.

[15 Marks]L6,CO1,2,3,4

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2nd SEMESTER

B.Des.

END TERM EXAMINATION ***May-2025***

COURSE CODE: DD108

COURSE TITLE: Materials and Processes for Designers

Time: 04:00 Hours *Max. Marks: 40*

Instructions to Candidates:

- **Attempt any four** questions.
- All questions carry **equal marks (10 marks each).**
- Use **sketches, process diagrams, or examples** to support your answers.
- Focus on **design thinking, material-process understanding,** and **creative articulation.**

Q1. Choose one natural material (wood, bamboo, jute, leather, cloth, or paper). Narrate its journey from raw form to finished product through craft and industrial processes. [10][BTL3]

- Include how the material is sourced, processed, and shaped
- Highlight how its natural properties influence its application (*Use annotated sketches to support your explanation*)

Q2. You are tasked with designing a kitchen tool for a compact urban kitchen. [10][BTL3]

a) Choose an appropriate material and

b) A suitable manufacturing process for casting, moulding, forming, or machining is recommended.

Justify your choices in terms of:

- Material behaviour
- Production efficiency
- User experience

(*Optional: Add a product sketch with labelled material & process choices*)

Q3. Select any one product made from wood, metal, or plastic (e.g., a chair, utensil, or lamp). [10][BTL6]

- Describe two different finishing techniques applicable to that material
- Explain how each finish alters the product's functionality, durability, or user perception

(*Use comparative illustrations or examples to enrich your response*)

Q4. Reflect on a model or mock-up you created during your studio sessions using materials like foam, wire, mount board, or plaster of Paris. [10][BTL2]

a) What were the material-specific challenges you encountered?
b) How would you re-imagine the same form using industrial materials and processes?

(*Include before/after sketches if relevant*)

Q5. Choose a common product (e.g., plastic pen, ceramic mug, metal lamp). Propose a material swap using a more sustainable or unconventional material. [10][BTL6]

Explain:

- Why is the new material a better choice
- What process changes would be needed for manufacturing
- How would it impact form, function, or aesthetic

(*Sketch the redesigned product if possible.*)

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2nd SEMESTER **B.Des**

END TERM EXAMINATION ***May 2025***

DD110 - Computer-aided 3D visualization

Time: 03:00 Hours ***Max. Marks: 40***

Note: i) Students may download reference images from the internet for their work.
ii) Submit both the Blender screenshot and the rendered image on Google Classroom.
iii) A maximum delay of 10 minutes is allowed for uploading the images.
iv) Save your files in .jpeg and .mpeg formats with the filename format: "**StudentName_RollNo_**".
v) Google Classroom Codes — Section A: **3jkafkd**, Section B: **e7gw2qh**
vi) Laptops are allowed during the task.
vii) The Blender project file may be requested later; ensure you save it securely on your system.

Q.1(a) Model a drawing room scene that includes at least two walls, a floor, and a window. The room should be furnished with a sofa set, a centre table, and decorative objects such as a wall hanging. The scene should show lighting coming from the window (natural light) and interior room lights. Render an image of the complete room. *Write the steps involved and mention the tools used for modelling and rendering the scene. (Marking: Modelling 5, Light Setup 5, Material Render 5, Write-up 5).* [CO4] [BT4] [20]

or

Q.1(b) Model a glass perfume bottle that includes a brand name featuring your initials (e.g., Name: Yug Rajput, Initials: YR). Render a photoshoot-style image of the perfume bottle using a three-point lighting setup and a gradient background.
Write the steps involved and mention the tools used for modelling and rendering the scene. (Marking: Modelling 5, Light Setup 5, Material Render 5, Write-up 5) [CO3] [BT3] [20]

Q.2(a) Create a 5 to 10-second animation that first reveals a jewellery box by removing a silk cloth. Then, animate the opening of the velvet jewellery box to display a diamond in gold ring. *Write the steps involved and mention the tools* [CO3] [BT4] [20]

used for modelling, animating, and rendering the scene. (Marking: Modelling 5, Light Setup 5, Material Render 5, Write-up 5)

Or

Q.2(b) Create a 5 to 10-second animation showing the unwrapping of a brown corrugated carton box using armature animation to reveal a coffee mug inside. [CO2] [20] [BT3]

Write the steps involved and mention the tools used for modelling, animating, and rendering the scene. (Marking: Modelling 5, Light Setup 5, Material Render 5, Write-up 5)

——End——

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IV SEMESTER
B.DES

END TERM EXAMINATION May-2025

COURSE CODE: DD 202
COURSE TITLE: Cognitive Ergonomics

Time: 3:00 Hours Max. Marks: 40 Marks

Note :
Attempt all Questions in A3 Sheets.
Assume any missing data.
Please read all questions before attempting the paper.

Q 1. Develop a game for experiencing multiple realities. Assume every Reality has contextual needs and requirements based on the player's mental and emotional situation. Give a diagrammatic representation of various levels.

[10 Marks]

Q 2. Sketch Game characters for living through these realities and describe the different powers that are required in traversing the above mentioned levels.

[10 marks]

Q 3. Show different operational scenarios and their complexities in dealing with multiple realities with context specific ideas.

[10 marks]

Q 4. How can Cognitive Ergonomics be used in decision making for choosing and operating in the various levels mentioned above?

[10 marks]

-END-

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4th SEMESTER B.Des

END TERM EXAMINATION ***May 2025***

DD206 - Colour, Context and Composition

Time: 03:00 Hours *Max. Marks: 40*

Note: All questions carry equal marks.
Assume suitable missing data, if any.

Q.1	What are HEX codes? Explain their structure, use, and advantages in digital design. Give three examples of HEX colour codes and the colours they represent.	[CO1] [BTL2]	[10]
Q.2(a)	Describe the successive contrast (afterimage effect) and explain the science behind how our eyes create complementary illusions	[CO2] [BTL4]	[10]
	or		
Q.2(b)	What is colour relativity as per Albers' theory? Support your explanation with an example or sketch showing how the same colour appears different on different backgrounds.	[CO2] [BTL4]	
Q.3(a)	What is the difference between denotation and connotation according to Roland Barthes' theory of symbols? Explain with relevant design examples?	[CO1] [BTL3]	[10]
	or		
Q.3(b)	Discuss the role of iconic, indexical, and symbolic signs in design using Charles Peirce's model. Support your answer with real-world applications	[CO1] [BTL3]	
Q.4	Differentiate between the principles of "Figure/Ground" and "Multistability." How do these affect perception in graphic and interface design?	[CO1] [BTL2]	[10]

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Total no. of Pages: 1 *Roll no.....*

4th SEMESTER

B.Des

END TERM EXAMINATION *May-2025*

COURSE CODE: DD242a

COURSE TITLE: Ethnographic Studies in Interaction Design

Time: 03:00 Hours *Max. Marks: 40*

Note :
Attempt all questions.
Answer to be written on 2 Nos of A3 sheets.
Internet is allowed for Research.

Q.1 **[10 Marks][CO 1][BTL 02]**

Explain with an infographic how you collected data in various categories pertaining to SDGs that you have chosen.

Q.2 **[10 Marks][CO 2][BTL 03]**

Give details of the data collection methods used and how have you analysed and sorted them in quantitative or qualitative formats.

Q.3 **[20 Marks][CO 3][BTL 04]**

Sketch the network of interviews conducted based on data collection during field visits. The correlation between these interviews and identifying insights is the key highlight that needs to be addressed and shown here. Use your creative freedom in imagining and documenting the same.

-END-

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Total no. of Pages: 1 *Roll no.....*

VI SEMESTER
B.Des

END TERM EXAMINATION **May 2025**

COURSE CODE: DD302

COURSE TITLE: SUSTAINABLE DESIGN

Time: 03:00 Hours *Max. Marks: 40*

Note: Attempt any four questions.
Each Question carry Ten marks.
Assume suitable missing data, if any.

Q 1: Many rural communities face challenges such as limited access to clean drinking water and affordable healthcare. How can frugal design principles be applied to develop low-cost, high-impact solutions for these challenges? Illustrate your answer with relevant examples. **[CO4][BTL5,6]**

Q 2: Kumbh Mela, one of the largest religious gatherings in India, generates enormous amounts of food waste, plastic waste, temporary housing materials, and sanitation waste. Analyze how the current linear economy practices contribute to environmental challenges during mega-events. Propose a circular economy framework to help manage waste, promote resource recovery, and improve sustainability at future Kumbh Melas. **[CO3][BTL4,6]**

Q 3: Discuss the concept of biomimicry. Discuss five examples of biomimicry used in product design and architecture. **[CO2][BTL3,4]**

Q 4: India generates a large amount of e-waste annually, much of which is in landfills. Apply the concept of Cradle-to-Grave lifecycle thinking to explain the challenges caused by improper e-waste disposal. How could a Cradle-to-Cradle model improve the situation? **[CO2][BTL2,3]**

Q 5: What are the future trends in sustainable design? How can designers and engineers stay up-to-date with emerging technologies and practices in sustainable design? **[CO1][BTL2]**

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VI Semester

B.Des

End Semester Exam **May-2025**

DD322 Psychology and Behavior Science

MARKS:40 **Duration: 3hrs**

PHONE IS ALLOWED DURING EXAM

1. Explain how cognitive psychology principles (like attention, memory, and perception) influence user interaction with digital interfaces, with relevant examples. **(10 Marks)(BTL4)**

2. Explain how cognitive load theory and relevant psychological or behavioral science techniques (e.g. cognitive ease, social proof, FOMO, habit loops, nudges, etc.) are applied to enhance user experience, reduce friction, and drive engagement. Take any Brand/Company/Application in examples also map one simple process flow (Login/Buying/password reset etc) for explaining **(20 Marks)(BTL6)**

3. Discuss how users emotions and mental models impact their decision-making and overall experience while using a product, with suitable examples. **(10 Marks)(BTL4)**

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a) what the tool made easy,

b) what it made difficult,

c) and how the tool shaped the kind of visuals you created.

Would you choose the same tool again for a similar project? Which other tools would you explore?

Q.4 **[10 Marks][CO 2] [L3,4]**

Describe a specific design element in a visualisation you created that may have been misunderstood or interpreted differently than you intended—either based on peer feedback or your own reflections. What caused the gap? How would you redesign that part today to reduce misinterpretation?

Q.5 **[10 Marks][CO 3][L5]**

Walk through your workflow: how did you go from raw data to final visualization in your mid-sem or end-sem project? Highlight one step whether data cleaning, transformation, sketching, prototyping, or iteration—that was particularly challenging or rewarding. What did you learn from that process?

Q.6 **[10 Marks][CO 3][L5]**

Pick another student's project (mid-sem or end-sem) that impressed you. Analyze one aspect of it—such as layout, visual hierarchy, interactivity, or storytelling—that you found effective. If you were to borrow an idea from this project, how would you adapt it to your own?

-END-

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Total no. of Pages 01 *Roll No .....*

VI SEMESTER

BSC. DESIGN

END TERM EXAMINATION **MAY: 2025**

DD332 Photography 2

Time: 3 Hour **Max. Marks: 40**

Note: All questions are compulsory.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 What is the role of lighting in photography provide with an example? [5][CO2,3]

Q.2 Scenario: You're photographing a macro subject, such as a flower, & you want to capture its intricate details. Describe your camera settings & techniques for achieving a sharp, well-exposed image with a suitable depth of field? [10] [CO4,5]

Q.3 Explain the different types of photography genres (e.g., portrait, landscape, street, wildlife) and their unique characteristics? [15] [CO1,6]

Q.4 Discuss the importance of understanding the exposure triangle (aperture, shutter speed & ISO) in photography? Please explain with examples. [10][CO6]

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2nd SEMESTER **B.Des**

END TERM EXAMINATION *May-2025*

DD334 - Visual Narratives and Storytelling

Time: 3 Hours *Max. Marks: 40*

Note: Answer sheet + 2-3 A3 sheets to be given. Students can make suitable assumptions where necessary. No Internet Allowed

Read the story below and visually interpret it.

"There was a street where all the houses looked the same — grey walls, black gates, white doors. Except one. House number 17 had a red door.
People walked past it every day. No one ever saw anyone enter or leave. Some said it was abandoned. Others said an artist lived inside. Children made up stories about it — ghosts, witches, treasure.
One morning, a boy named Tom stopped and knocked. No one answered. He knocked again. The door creaked open.
Inside, the walls were covered in drawings. Not paper drawings — drawings on the walls, the ceiling, even the floor. Cities upside-down. A tree growing from a teacup. Eyes that blinked when you looked away.
Tom stayed for hours, just looking. When he left, he didn't say a word. But the next day, he painted his own door red.
And soon, others did too."

Q1. a) Visually narrate the story across **8 to 12 frames.**
You may choose to lay out your frames in sequence (comic-strip style), in a grid, or in a layout of your choice. Focus on key transitions: setting, curiosity, discovery, transformation, and impact. You will be assessed on Visualisation ability, Style and execution, Storytelling and overall Impact
[30 Marks]CO1,2,3,4 L6,5,4

b) Include a short reflective note (150–200 words) on your visual choices and interpretation of the story (In the answersheet)

[5 Marks] CO2, L5,4

c) What do you think could be the central idea of the story. What could be a suitable title for the story. (In the answersheet)

[3+2 Marks]CO1,2 L4,3

Suggestion:** Here's an example of the frame breakdown in 8 frames: **Establishing Shot, Contrast Frame, Curiosity** – Tom pauses, knocks, and the door opens, **Interior Transformation** – The inside of the house with surreal drawings (creative explosion), **Tom's Response, Change Begins, Ripple Effect, Closing Metaphor

This is just an example. You may interpret the frames in your own way—feel free to reinterpret, modify, add, or remove frames as needed to suit your storytelling.

—End—

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Total no. of Pages: *Roll no.....*

06_SEMESTER **B.Des**

END TERM EXAMINATION *May-2025*

DD372 - FILM EDITING AND COMPOSTING

Time: 03:00 Hours *Max. Marks: 40*

Note : Attempt only four questions. All Questions carry equal marks. Assume suitable missing data, if any.

Q.1 What is the main role of production design in a feature film?

[10M] [CO1] [L2]

Q.2 How do visual elements like composition, lighting and colour work together to create a cohesive visual narrative in a film?

[10M] [CO1] [L3]

Q.3 How does visual communication contribute to storytelling in a film and what are some techniques used to convey emotions or themes visually?

[10M] [CO4] [L3]

Q.4 Which type of cut is used to show actions happening at the same time in different locations?

[10M] [CO3pp [L4]

Q.5 In what ways does the timing of cuts influence the pacing and emotional tone of a scene?

[10M] [CO5] [L1, L5]

------End------

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VI SEMESTER B.Des.

END TERM EXAMINATION May2025

DD376 Character Design

Time: 03:00 Hours Max. Marks: 40

Note : Assume suitable missing data, if any.
Use sketches & illustrations to elaborate your answers.
Material: 01 Answer Booklet & 01 A3 Drawing sheet.

Q.1 Discuss in detail about your final submission character design project for the course. Elaborate on your research, storyline, design choices (colours/ storyboard design/ character traits), critical reasoning and execution of your project?

[20 Marks][CO3,4][BTL3,4]

Q.2 Identify examples of anthropomorphic characters in popular culture and explain how their anthropomorphic traits are expressed?

[10 Marks][CO2][BTL2]

Q.3 a) Explain how anthropomorphic traits can be used to develop a character's personality and backstory?

OR

b) Design an old man's/woman's character who is hungry and thirsty with an activity or an incident in one page comic. Elaborate on the backstory and your design choices?

[10 Marks][CO5,6][BTL5,6]