QUESTION PAPERS FOR END TERM THEORY EXAMINATIONS
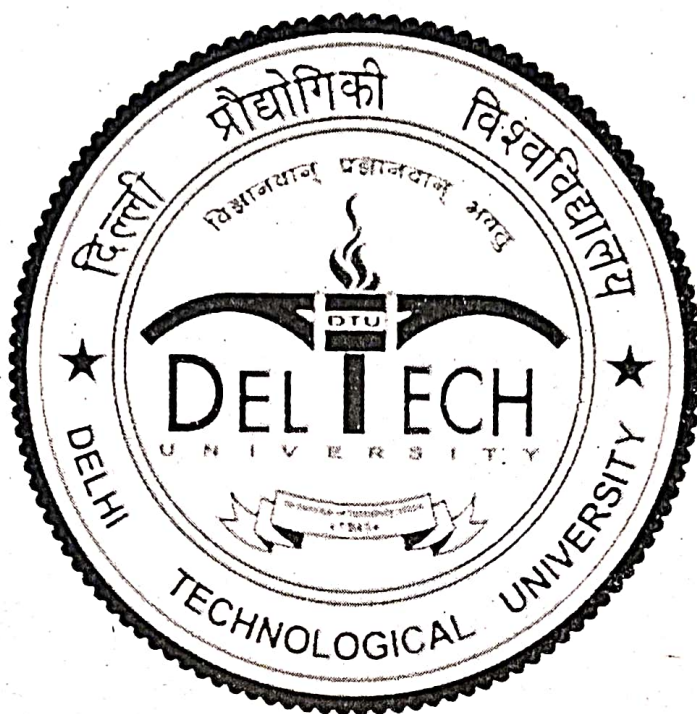# MAY-2023

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

INDEX
B.TECH

IV SEMESTER

B.Tech.

END TERM EXAMINATION   *May-2023*

AE202 Heat & Mass Transfer

Time: 03:00 Hours   Max. Marks: 40

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

Q.1 Derive the expression for critical thickness of Insulation for (i)cylinder and (ii) sphere   [Marks 4+4] [CO#1]

Q. 2 : What are the methods for finding effectiveness of heat exchanger. Also derive the expression of effectiveness of heat exchanger in (i) parallel flow and Counter flow arrangement   [M:1+3+4][CO#5]

Q.3: (a) Define following terms with physical significance
(i) Reynold Number (ii) Stanton Number (iii) Nusselt Number (iv) Prandtl Number (v) Grashof Number   [Marks: 5] [CO#2]

(b) Using Dimensional analysis prove that Nusselt Number is a function of Reynold number and Prandtl number in forced convection heat transfer   [Marks: 3] [CO#3]

Q.4 (a) Derive the expression for the radiation heat exchange and shape factor and prove reciprocal theorm   [Marks: 3] [CO#4]

(b) Define following terms with physical significance
(i) Intensity of Radiation (ii) Emissivity (iii) Reflectivity (iv)Transmissivity (v) Absorptivity   [Marks: 5] [CO#4]

Q.5 (a) Define following terms with physical significance
(i) Shearwood Number (ii) Schmid Number   [Marks:2] [CO#6]

(b) Discuss the various regimes of pool boiling   [Marks:3] [CO#3]

(c) What is the lumped system analysis and when is it applicable. What are the assumptions made in the lumped system analysis . Also derive the expression for temperature distribution and rate of heat transfer   [Marks:3] [CO#2]

IV SEMESTER

B.Tech. - AE

END TERM EXAMINATION   *May-2023*

AE204   THEORY OF MACHINES

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

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

1 A four bar chain ABCD mechanism has different links as shown in
   Fig.1.The link AB=12 mm, BC=26 mm, CD=20 mm, AD=28 mm,
   BE=CE=14 mm, CG=12 mm and DG=15 mm. Draw the velocity and
   acceleration diagram when the crank makes 60° and rotates uniformly
   with 210 rpm counter clockwise. Also determine the velocity and
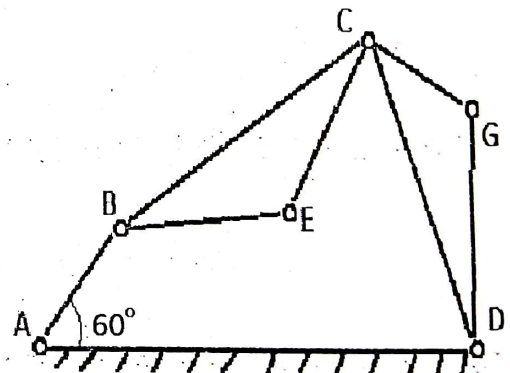   acceleration of point E with respect to point G.   [08] [CO-2]

Fig.1

2 Attempt the following:

[a] Define and describe the law of steering and its importance of turning of the vehicles. [4][CO-1]

[b] Compare the function and properties of knife edge, roller and flat face followers. [4][CO-2]

3 Attempt the following:

[a] Describe underdamped, overdamped and critical damped vibrations with the help of neat sketch and expressions. [4][CO-3]

[b] Derive the expressions and discuss the effect of whirling of the shaft. [4][CO-4]

4 An epicyclic gear train as shown in Fig.2 has gears as annular A, planet B and sun C. Gear wheel A has 80 internal teeth and fixed to the frame. The gear C has 32 external teeth. The gear B meshes with A and C. Gear B is carried on an arm which rotates about the centre A at 150 rpm. Determine the speed of wheel B and C. [08][CO-5]
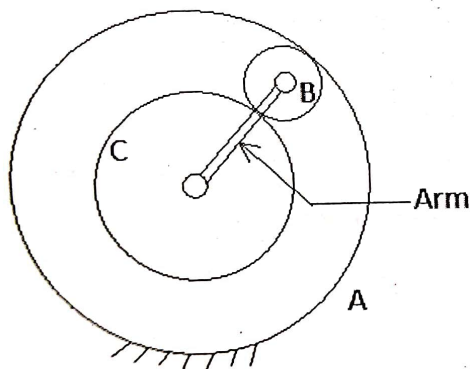

Fig.2

5 [a] With the help of neat sketch describe the turning moment diagram for two stroke and four stroke I C Engine. For the same power output for middle range of I C Engine, compare the requirement of mass moment of inertia for the both two stroke and four stroke I C Engine. [4][CO-5]

[b] Describe Tractive force, swaying couple and hammer blow with all the necessary condition in 2-cylinder, 90° crank, inline, uncoupled locomotive engine. [4][CO-5]

6 [a] Discuss the stabilization of naval ship during rolling, pitching and steering. [4][CO-6]

[b] Describe the hunting of the governor and stage of failure during the process of hunting. [4][CO-6]

7 Attempt any two of the following:

[a] Describe longitudinal, transverse and torsional vibrations. [4][CO-5]

[b] Derive law of gearing. [4][CO-3]

[c] Differentiate between primary and secondary unbalanced force in reciprocating engines. [4][CO-6]

8 Attempt any two of following:

[a] Describe law of belting and its importance in transmission of power through the open belt drive pulleys. [4][CO-4]

[b] Compare the function of flywheel and mechanical governor. [4][CO-5]

[c] Discuss the stabilization of 4-wheel vehicle regarding gyroscopic couple and include the effect of motion of engine also. [4][CO-6]

-END-

6B. A thin cylinder with closed ends has an internal diameter of 50 mm and a wall thickness of 2.5 mm. It is subjected to an axial pull of 10 kN and a torque of 500 Nm while under an internal pressure of 6 MN/m2

(i) Determine the principal stresses in the tube and the maximum shear stress.

(ii) Represent the stress configuration on a square element taken in the load direction with direction and magnitude indicated; (schematic).

04 [CO4]

B.Tech. (Mechanical – Automobile)

END SEMESTER EXAMINATION - *May -2023*

AE206 - MECHANICS OF SOLIDS

*Time: 3 Hours*

Max. Marks : 40

ANSWER ANY 5 QUESTIONS
ASSUME SUITABLE MISSING DATA, IF ANY

1A. Explain the assumptions made in Euler's long column. 04 [CO1]

1B. Find the Euler's crushing load for a hollow cylindrical steel column 30 cm external diameter and 15 cm internal diameter and 6m long and hinged at both the ends. Assuming the young's modulus value as 2.1×10^5 N/mm². If the same column is treated as the Rankine Column with σ_c as 550 N/mm² and Rankine's constant as 1/7500, find the crushing load. 04[CO2]

2A. The diameters of the brass and steel segments of the axially loaded bar shown in figure are 30 mm and 12 mm respectively. The diameter of the hollow section of the brass segment is 20 mm.
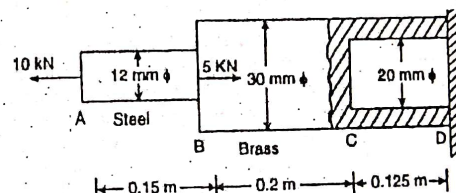
Determine: (i) The maximum normal stress in the steel and brass (ii) The displacement of the free end ; Take Es = 210 GPa and Eb = 105 Gpa. 04[CO4]

2B. A Copper rod 6 cm in diameter is placed within a steel tube, 8 cm external diameter and 6 cm internal diameter, of exactly the same length. The two pieces are rigidly fixed together by two transverse pins 20 mm in diameter, one at each end passing through both rod and the tube.

Calculated the stresses induced in the copper rod, steel tube and the pins if the temperature of the combination is raised by 50^0 C.
[Take E_s=210 GPa, α_s = 0.0000115/^{0}C; E_c=105 GPa, α_c = 0.000017/^{0}C]

04[CO3]

3A. Draw Mohr's circle for a 2-dimensional stress field subjected to

(a) Pure shear (b) Pure biaxial tension (c) Pure uniaxial tension and

(d) Pure uniaxial compression   04[CO2]

3B. Two planes AB and BC which are at right angles are acted upon by tensile stress of 140 N/mm2 and a compressive stress of 70 N/mm2 respectively and also by stress 35 N/mm2. Determine the principal stresses and principal planes. Find also the maximum shear stress and planes on which they act.   04[CO3]

4A. A Simply supported beam AB of span length 4 m supports a uniformly distributed load of intensity q = 4 kN/m spread over the entire span and a concentrated load P = 2 kN placed at a distance of 1.5 m from left end A. The beam is constructed of a rectangular cross-section with width b = 10 cm and depth d = 20 cm. Determine the maximum tensile and compressive stresses developed in the beam to bending.   04[CO4]

4B. A simply supported beam made of rolled steel joist (I-section: 450mm × 200mm) has a span of 5 m and it carries a central concentrated load W. The flanges are strengthened by two 300mm × 20mm plates, one riveted to each flange over the entire length of the flanges. The second moment of area of the joist about the principal bending axis is 35060 cm4. Calculate
04[CO3]
   (i)   The greatest central load the beam will carry if the bending stress in the 300mm/20mm plates is not to exceed 125 MPa.
   (ii)   The minimum length of the 300 mm plates required to restrict the maximum bending stress is the flanges of the joist to 125 MPa.
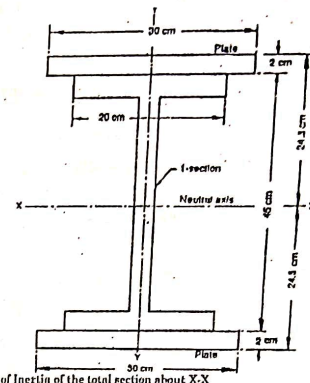
Moment of Inertia of the total section about X-X

5A. In a torsion test, the specimen is a hollow shaft with 50 mm external and 30 mm internal diameter. An applied torque of 1.6 kN-m is found to produce an angular twist of 0.4° measured on a length of 0.2 m of the shaft. The Young's modulus of elasticity obtained from a tensile test has been found to be 200 GPa. Find the values of
(i) Modulus of rigidity.
(ii) Poisson's ratio.   04[CO4]

5B. A hollow shaft of diameter ratio 3/8 required to transmit 600 kW at 110 rpm, the maximum torque being 20% greater than the mean. The shear stress is not to exceed 63 MPa and the twist in a length of 3 m not to exceed 1.4 degrees. Determine the diameter of the shaft. Assume modulus of rigidity for the shaft material as 84 GPa.   04[CO5]

6A. A cylindrical shell has the following dimensions:
   Length = 3 m
   Inside diameter = 1 m
   Thickness of metal = 10 mm
   Internal pressure = 1.5 MPa
   Calculate the change in dimensions of the shell and the maximum intensity of shear stress induced. Take E = 200 GPa and Poisson's ratio v = 0.3
04[CO3]

Total No. of Pages: 02

Roll No. ... .

Fourth Semester

B. Tech. (AE)

End Semester Examination

(May-2023)

AE208 MATERIAL ENGINEERING & METALLURGY

Time: 3 hrs

Max. Marks: 40

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

(1) (a) What are 'Polymers' ? Explain addition and condensation polymerisation mechanism. [1+3] [CO1]

(b) Define atomic packing factor. Sketch the unit cell of a FCC crystal structure. Derive an expression for the atomic packing factor to FCC. [1+1+2] [CO1]

(2) (a) Explain the differences between cold working and hot working of a metals. [4][CO2]

(b) Describe changes in microstructures, with suitable sketches, when cooled slowly from austenite to room temperature, for (i) hypo-eutectoid plain carbon steels and (ii) eutectoid plain carbon steels. [2+2][CO2]

(3) (a) Draw the Iron-Carbon equilibrium diagram for steel and label it. Show and write invariant reactions. [3+1] [CO3]

(b) Explain the steps to construct TTT diagram. Draw a labeled sketch of TTT diagram for an eutectoid steel. [2+2] [CO3]

(4) (a) Explain Griffith's theory of brittle fracture and derive the expression for critical fracture stress in terms of Young's modulus of elasticity, surface energy per unit area and crack length for centre crack. [1+3] [CO4]

(b) Explains three regions of a typical creep curve, showing creep strain against time. [4] [CO4]

7 (5) (a) What is meant by powder metallurgy ? Explain the procedure of manufacturing parts by powder metallurgy.   [1+3] [CO5

(b) Define composite materials. Classify different types of composite materials and write application of composite materials.   [1+2+1][CO5]

(6) Write short notes on any four of the following:
   (a) Imperfections in crystals   [CO1
   (b) Recrystallisation and grain growth   [CO2
   (c) Annealing and Normalizing   [CO3
   (d) Ductile to brittle transition temperature   [CO4
   (e) Classification of fibers and matrix   [CO5][2+2+2+2]

-END-

8

B. Tech.
SIXTH SEMESTER [AE]
END TERM EXAMINATION

May-2023

AE302 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 term 'Endurance limit' of a material. Explain the factors which affect the endurance limit of a material.
[CO#1] [4]

   (b) Explain the different types of fits with the help of neat sketches. [CO#2] [4]

2. Design a quadruple riveted (zigzag type) double strap butt joint with unequal straps for joining 25 mm thick medium carbon steel plates. [CO#3] [8]

3. Design a bushed-pin type flexible coupling for connecting two shafts 75 mm in diameter running at 1500 rpm while transmitting 25 kW. [CO#4] [8]

4. Design a power screw of 60 kN capacity for a maximum lift of 375 mm. The ground clearance should be as small as possible. [CO#5] [8]

5. Design a pair of cast teeth helical gears with 20° full depth system to transmit 75 kW at 1200 rpm of the pinion with a velocity ratio of 2.5. [CO#6] [8]

6. Design a differential band brake having an operating lever 225 m long. The ends of the brake band are attached so that their operating arms are 40 mm and 130 mm long. The brake drum diameter is 0.6 m and the arc of contact is 310°. The coefficient of friction may be taken as 0.2. [CO#7] [8]

Roll no............

VI SEMESTER

B. Tech Automobile Engineering

END Term Examination

May 2023

AE304 : IC Engines

Time: 3:00 Hours

Max. Marks: 40

Note: Answer any five questions. All questions carry equal marks

Assume missing data suitably, if any

Q. 1 (a) Show the variations of pressure with the variation crank [5,3] angle in SI engines operating at full load and explain the [CO- 1,2] various stages of combustion.
Discuss the effect of the following variables on flame propagation in a four-stroke gasoline engine.
   i)   Air-fuel ratio
   ii) Turbulence
   iii) Engine load

(b) Draw ASTM distillation curve of gasoline and discuss its significance in SI engines.

Q. 2 (a) "Factors tending to increase knock in SI engines tend to [5,3] reduce knock in CI engines" - Justify the above statement [CO-2,3] in light of the differences in nature of two phenomena and indicate the methods to reduce knock in SI engines.

(b) "Power of a diesel engine is limited by smoke."
Justify the above statement with reasons

Q. 3 (a) Compare important physico-chemical and combustion [5,3] [CO-3] properties of ethanol and gasoline from point of view of using them in SI engines.
"The fuel "E-85" is more preferable than "E-100" in a spark ignited engine"- Justify with reasons.
Also discuss the modifications required in an existing gasoline engine, if E-85 is to be used.

(b)   What are the advantages and limitations of methyl ester)0
(bio-diesel) as compared to conventional diesel fuel?

Q. 4 (a)   A four stroke diesel engine of 4000 cc capacity develops [5,3]
15kW per m^3 of free air inducted per minute. When [CO-5]
running at 3000 rpm, it has a volumetric efficiency of 80
percent referred to free air-condition of .1.013 bar and
300K. It is proposed to boost the power of the engine by
supercharging by a blower (driven mechanically from the
engine) of pressure ratio 1.7, an isometric efficiency of
75 percent. Assuming that at the end of the induction the
cylinders contain a volume of charge equal to the swept
volume, at the pressure and temperature of the delivery
from the blower, estimate the increase in break power
from the engine. Assume overall mechanical efficiency as
80 percent.

(b)   What is the effect of supercharging on the following
parameters in CI engines?
     i)   Mechanical efficiency
     ii) NO_x emissions
     iii) Fuel consumption

Q. 5 (a)   Discuss basic functions of lubricant in an engine. With [4,4]
the help of a suitable sketch explain wet sump lubrication [CO-5,6]
system in a 6-cylinder compression ignition engine.

(b)   What is multipoint fuel injection (MPFI) system? With a [4,4]
suitable sketch explain the working of MPFI. What are [CO-5,6]
the advantages and disadvantages of MPFI over a
carburettor?

Write short notes on the following
    i)   Design of SI engine combustion chamber
    ii)   Construction and working of a 4-stroke CI
       engine.

VI SEMESTER B TECH AE/Elective E6

END SEMESTER EXAMINATION MAY. 2023

AE-306 ALTERNATIVE FUELS AND ENERGY SYSTEMS

Time: 3 Hours   Max. Marks: 40

Note: 1. Answer ANY FIVE questions.
2. Answer to each question (or its subpart) must start on a fresh page.
3. Draw the properly labelled diagrams wherever required.
4. All questions carry equal marks.

1. a. Explain the formation of engine exhaust emissions with petro fuels and how they affect the human health?   [4] [CO1]

b. What is the concept of Solar powered vehicles? Discuss their feasibility and limitations.   [4] [CO6]

2. a. Compare the various fuel properties of petro diesel and biodiesel, need to be considered for use in IC Engines and list the advantages of biodiesel operation of CI engines? [4] [CO5]

b. Describe the various methods to use alcohol as fuel in IC engines.   [4] [CO2]

3.   a. Discuss the IC engine performance and emissions in dual fuel operation.   [4] [CO3]

b. Explain the process for production of producer gas and discuss its uses, advantages and limitations.   [4] [CO4]

4. a. Explain the modifications required to convert a CI engine for CNG operation. Discuss its advantages and limitations [4] [CO4]

b. Explain the working of a bio gas plant and discuss its production optimization parameters.   [4] [CO4]

5. a. Explain the stages of biodiesel production methods. Discuss the parameters for optimizing the production yield. [4] [CO5]

b. Explain the various types of electric vehicles and compare them for their constraints and advantages.   [4] [CO6]

6. Explain the following in brief: **(ANY FOUR ONLY)**

i) Automotive batteries ii) Hydrogen Combustion
iii) Surface ignition   iv) Fuel flex Vehicles
v) Fuel Additives   vi) Lipase [4x2][CO1-6]

Total no. of pages: 2

SIXTH SEMESTER

END SEMESTER EXAMINATION

12

Roll No._____

B. Tech

MAY- 2023

AE-310 ADVANCED MANUFACTURING TECHNOLOGY

Time: 3 Hours   Max. Marks: 50

Note: Attempt any five questions.

Assume missing data , if any

1 (a) What is magnetostriction effect in Ultrasonic machining (USM) process. Also discuss the effect of amplitude and frequency of vibration, grain size and % of abrasive concentration on material removal rate (MRR).   [CO2]

(b) Explain the function of slurry, horn, transducer and oscillator in USM. Describe the mechanism of material removal in USM.   [CO3]

2 (a) Justify the statement "AFM has high flexibility". Describe the mechanism of material removal in abrasive flow machining (AFM) process Write industrial applications of AFM system.   [CO5]

(b) Describe the mechanism of material removal in electro-chemo centrifugal force assisted AFM process. How material removal rate is enhanced as compared to AFM process.   [CO4]

3 (a) Briefly discuss the mechanism of material removal in vibration assisted magnetic abrasive finishing (MAF). Clearly show lines of magnetic force, magnetic equipotential lines, direction of pressure acting on work-piece and direction of rotary motion.   [CO3]

(b) What is gap filling density in magnetic abrasive finishing (MAF). Describe the mechanism of internal surface finishing of cylindrical work-piece by MAF process with neat sketch.   [CO3]

4 (a) Explain the working principle of electric discharge machining (EDM) process with neat sketch. Discuss the functions of adaptive control system used for EDM. [CO2]

(b) Describe the effect of resistance, current density, pulse energy and capacitance on material removal rate in EDM. [CO3]

5(a) Briefly discuss the mechanics of material removal in electron beam machining (EBM) process with neat sketch. Why is vacuum required in the machining chamber during EBM process. [CO3]

(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 and how it is different from ECM. [CO3]

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

    (a) Laser beam machining

    (b) Plasma arc machining

    (c) Fabrication of micro devices

    (d) Chemical machining

    (e) Biochemical machining

    (f) Microfabrication technology
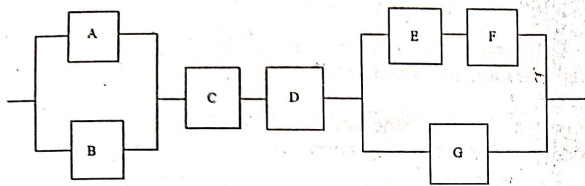
FIGURE 1 System with seven components.

6. Write short notes on the following   [CO5&6][2.5×4=10]
(a) Philosophies of Total Quality Management
(b) Quality Function Deployment
(c) Six Sigma and its applications
(d) Implementation steps for ISO 9000 certification.

END SEMESTER EXAMINATION   MAY-2023
AE-312, Quality Management & Six Sigma Applications
Time: 3:00 Hours   *Max. Marks : 50*

Note: Answer ANY FIVE questions.
      Assume suitable missing data, if any.
      Use of Statistical Table is allowed

1(a) Discuss some service nonconformity and behavioral characteristics in the following areas. Also, discuss the ease or difficulty of measuring service quality. What are some remedial measures?
  (i) Health care
  (ii) Call center
  (iii) Internal Revenue Service
  (iv) Airline industry
(b) Discuss Deming's 14-points of quality management.
                                [CO1&2][5×2=10]

2(a) In a printing company, data from the previous month show the following types of errors, with the unit cost (in dollars) of rectifying each error, in Table 1.
  (i) Construct a Pareto chart and discuss the results.
  (ii) If management has a monthly allocation of $18,000, which areas should they tackle?
  Table 1

Error Categories	Frequency	Unit Costs
Typographical	4000	0.20
Proofreading	3500	0.50
Paper tension	80	50.00
Paper misalignment	100	30.00
Inadequate binding	120	100.00

(b) Consider a single sampling plan with a lot size of 1500, sample size of 200, and acceptance number of 3. Construct the OC curve. If the acceptable quality level is 0.05% nonconforming and the limiting quality level is 6% nonconforming, describe the protection offered by the plan at these quality levels.

[CO1&3][5×2=10]

3. The number of dietary errors is found from a random sample of 100 trays chosen on a daily basis in a health care facility. The data for 25 such samples are shown in Table 2. **(a)** Construct an appropriate control chart and comment on the process. **(b)** How many dietary errors do you predict if no changes are made in the process? [CO2][5×2=10]

Table 2

Sample Number	Number of Dietary Errors	Sample Number	Number of Dietary Errors
1	9	14	8
2	6	15	8
3	4	16	7
4	7	17	6
5	5	18	4
6	6	19	12
7	16	20	7
8	8	21	6
9	7	22	8
10	9	23	6
11	3	24	8
12	6	25	5
13	10		

4. (a) A sample of 20 diodes is chosen for life testing. The time to failure of the diodes is exponentially distributed. The test is terminated after six failures, with no replacement of the failed items. The failure times (in hours) of the six diodes are 530, 590, 670, 700, 720, and 780. (i) Estimate the mean time to failure of the diodes as well as the failure rate. (ii) Find a mean life for 95% reliability.

(b) Using the data shown in Table 3. Draw the suitable control chart and discuss your conclusion.

Table 3.

Observation	Items Inspected	Nonconforming Items	Observation	Items Inspected	Nonconforming Items
1	80	3	14	90	4
2	120	6	15	160	5
3	60	4	16	230	3
4	150	5	17	200	12
5	140	8	18	150	8
6	150	10	19	210	6
7	160	7	20	190	4
8	90	6	21	160	9
9	100	5	22	100	8
10	160	12	23	100	12
11	110	8	24	190	7
12	100	5	25	160	10
13	200	14			

[CO4&2][5×2=10]

5(a). Explain procedures that might improve the reliability of a system. How would you increase the availability of a system? Distinguish between a system with components in parallel and another with standby components.

(b) Consider the seven-component system shown in Figure 1. The reliabilities of the components are as follows: $R_A = 0.96$, $R_B = 0.92$, $R_C = 0.94$, $R_D = 0.89$, $R_E = 0.95$, $R_F = 0.88$, $R_G = 0.90$. Find the reliability of the system. If you had a choice of improving system reliability by modifying any two components, how would you proceed? [CO4][5×2=10]

END SEMESTER EXAMINATION   *May- 2023*

AE 416 RENEWABLE SOURCES OF ENERGY

Time: 3:00 Hours   Max. Marks: 50

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

Q 1. Write Short Notes on ANY TWO of the following:
     a. Oceanic Wave and Tidal Energy
     b. Flex Fuel Policy of India
     c. UN sustainable Development goals
     d. Fuel cell Technology.

                                        (5x2 = 10) [CO 1]

Q 2. Discuss the significance & implications of ANY TWO of the following on the sustainable economic development of India:
     a. Intermittency of Renewable Energy systems.
     b. Promotion of Hydrogen as Green energy source.
     c. Rural Green Energy Technology initiatives.
                                   (5x2 = 10) [CO 2]

Q 3. Perform a Techno -Enviro - Economic analysis on the development of Electric Vehicles (EV) Industry in the Indian context?
                                           (10) [CO 3]

Q.4. Critically discuss the role and impact of reliable energy storage systems in the sustainable development of Renewable Green Energy economy of the world?   (10) [CO 4]

Q.5. Propose, Hypothetically, a self-sustainable and viable model of stand-alone renewable energy source for meeting all the demands of Delhi Technological University main campus, including Academic area, Hostel area and residential area requirements throughout the year without needing Grid power supply? Draw a self-explanatory neat diagram of your proposed model ?
                                           (10) [CO 5]

------------------------xxx----------------------

B.Tech [Auto/Other Branches]

END TERM EXAMINATION   *MAY-2023*

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) List out the passive safety equipment used in a modern car and with the aid of sketches, explain any two of them.	10 marks (5+5)	CO-1
	(b) What are the driving forces for increased vehicle safety throughout the globe?		
Q.2	(a) What are the different tests for checking pneumatic braking systems?	10 marks (5+5)	CO-2
	(b) Explain the construction and working of automatic seat belt tightener systems with neat sketches.		
Q.3	(a) Explain the influence of engine location on vehicle safety, with a neat sketch.	10 marks (5+5)	CO-3
	(b) Explain any four convenience systems present in modern cars with relevant sketches.		
Q.4	(a) Explain the emission test procedure for petrol and diesel engines.	10 marks (5+5)	CO-4
	(b) Explain the pass-by noise test in a vehicle.		

Please Turn Over for remaining four questions

18

Q.5	(a) What is the gradeability of a vehicle, and how is it measured??	10 marks (5+5)	CO-5
	(b) What is G.P.S.? How does this system enhance the safety & convenience of a passenger car?		
Q.6	(a) Describe the main provisions of the Indian Motor Vehicle Act 1988.	10 marks (5+5)	CO-6
	(b) Discuss the amendments in the Indian Motor Vehicle Act in 2019.		
Q.7	(a) Discuss the different safety legislations for vehicle safety in India	10 marks (5+5)	CO-1 CO-2
	(b) Explain the role of ECU in impact detection.		
Q.8	Write short notes on any two of the following: a. Causes of rear collision b. Crumble Zone c. MPFI System	10 marks (5+5)	CO-1 CO-3 CO-5

19

END TERM EXAMINATION

MAY-2023

AE430   Product Design & Development

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)   What are the stages involved in Design of new product and   (4) (CO2)
its introduction in the market.

Q.1 (b)   What do you understand the 3'S in Tools for product   (4) (CO2)
development.

Q.2 (a)   Given the following data:

Sales	10000 units
Price/ Unit	Rs. 10/-
Variable expenses	Rs. 80000/-
Fixed Expenses	Rs. 30000/-
Contribution	Rs. 20000/-

Evaluate: (i) What sale are needed for break-even?
(ii) What will be selling price if the break even
points should be brought down to 15000 units?   (5) (CO5)

Q.2 (b)   Discuss any three design Methods/ techniques for a product.   (3) (CO2)

Q.3 (a)   Draw a Bath tub curve and explain the phases involved.   (4) (CO6)

Q.3 (b)   What is meant by Ergonomics. Define Anthropometrics data.   (4) (CO8)
Plot and Discuss man-machine interface cycle.

Q.4 (a)   Write down the guidelines for Design of Manufacturing and   (5) (CO3)
Design for Assembly.

Q.4 (b)   Prove that $R(t) = e^{-\lambda t}$ (3) (CO6)

Where   R = Reliability
λ = Failure rate
t = time

Q.5 (a) What do you mean by Design communication. How does drawing and visual aids help the design engineer to share his/her ideas. (4) (C

Q.5 (b) The components A and B are connected in parallel, which is further connected to component C in series. Components A and B have an average life of 15 hours, While C has an MTBF of 1200 minutes. Find the reliability of the system for 25 hours. (4) (C

Q.6 (a) During writing a technical report, what point should be kept in mind for easy and impactful communication. (4) (CC

Q.6 (b) A company makes curtain rods of size 2 meters in length. Three materials A, B & C are available. Each material calls for different process and machine for manufacturing and cost data is given as below (4) (CC

Materials	A	B	C
Raw material cost Rs. /meter	2.25	2.75	3.00
Equipment cost Rs. /year	5000	6000	3000
Labour cost Rs. /rod	0.55	0.62	0.25

Plot the total cost v/s yearly production volume. If sales volume of 10,000 rods/year is expected, which material should be used.

FOURTH SEMESTER

B. Tech. [BT]

END SEMESTER EXAMINATION   *May-2023*

BT 202 Molecular Biology

Time: 03.00 Hours   *Max. Marks: 40*

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

Q.1 [A] Attempt <u>any TWO</u> of the following   [2+2] [CO1, CO2]
  (i) Give a descriptive account of the regulation of prokaryotic DNA replication
  (ii) Comment on the fidelity of prokaryotic DNA replication
  (iii) Discuss <u>any two</u> of the following in brief
    (a) Roles of telomeres in solving end replication problem in eukaryotes
    (b) Roles of ribonucleases in the processing of ends of prokaryotic pre-tRNA
    (c) Role and mechanism of action of any one snoRNA in the covalent modification of eukaryotic pre-RNA

[B] Diagrammatically explain the reactions involved in the splicing of GU:AG introns in eukaryotic nuclear pre-mRNA. Enumerate various proteins involved in spliceosomal splicing and clearly explain their roles [4] [CO4]

Q.2 [A] Attempt <u>any TWO</u> of the following   [2+2] [CO2]
  (i) During initiation phase of prokaryotic transcription, abortive initiations may occur. Assign and explain four reasons for it
  (ii) Give a descriptive account of eukaryotic promoter sequences controlling transcription of downstream genes
  (iii) Explain with an example, how deamination plays role in the post-transcriptional editing of eukaryotic nuclear pre-mRNA
  (iv) Explain the roles played by various topological structures of RNA Pol during prokaryotic transcription

P.T.O.

[B] Attempt <u>any TWO</u> of the following   **[2+2] [CO2]**
(i) How do nucleosome modifiers and chromatin remodellors facilitate transcription initiation in eukaryotes?
(ii) Give flowsheet representations of the post-transcriptional processing events in which 'RNA triphosphatase' and 'Sen endonuclease' are involved. Clearly indicate the types of RNAs processed, names of the events and the roles of these enzymes
(iii) Comment on 'Transcription termination in eukaryotes is coordinated with cleavage and polyadenylation'. Mention explaining roles of various proteins / enzymes involved in these steps

Q.3 [A] Attempt <u>any TWO</u> of the following   **[2+2] [CO3]**
(i) Write in brief about degeneracy of codons. How do isoacceptor tRNAs and Wobble hypothesis explain codon degeneracy?
(ii) Ribosome is a ribozyme. Explain the statement giving details of rRNA nucleotides involved in facilitating peptide bond formation in *E. coli*
(iii) tRNA is charged with a specific amino acid. Which enzyme is responsible for charging of tRNA? Discuss the reactions involved in tRNA charging and the accuracy of amino acid attachment on specific tRNA

[B] Attempt <u>any TWO</u> of the following   **[2+2] [CO3]**
(i) During translation, how is ribosome located on the 5' end of mRNA? Explain both in prokaryotes and eukaryotes
(ii) With respect to translation, explain the terms 'tRNA accommodation' and 'Hybrid state model for translocation' in ~60 words each
(iii) Explain the steps of 'stop codon recognition' and 'polypeptide chain cleavage' during prokaryotic translation

Q.4 [A] Attempt <u>any TWO</u> of the following   **[2+2] [CO3, CO4]**
(i) How does Lac repressor (Lac R) control *lac* operon? Explain its structure and binding to DNA to exert its function
(ii) Explain the role of EF-Tu in translation and recycling of EF-Tu

P.T.O.

2

(iii) Explain the step of polyubiquitination of substrate protein and the enzymatic activities associated with 26S proteasome <u>or</u> Discuss the process of mRNA transport mentioning various proteins involved
[B] Attempt <u>any TWO</u> of the following   **[2+2] [CO4]**
(i) Discuss dsRNA mediated DNA methylation and condensation
(ii) Explain the pathway of miRNA-mediated RNA interference
(iii) Explain the structure and catalytic residues of minimal hammerheaded ribozyme for cleavage of endogenous mRNA

Q.5 [A] Attempt <u>any TWO</u> of the following   **[2+2] [CO5]**
(i) Give a flowsheet representation of Sanger's sequencing explaining each step in detail
(ii) Discuss the significance of various components of hybridization buffer used in Southern hybridization
(iii) Discuss the action of *lac* Z' selectable marker gene in the selection of recombinants in a gene cloning experiment using pUC18/19 plasmid vector
[B] Answer the following   **[2+2] [CO5]**
(i) Explain in detail various steps involved in the PCR amplification of DNA using standard PCR. Clearly indicate the roles of thermostable DNA polymerase and primers in the process <u>or</u> Explain the principle and procedure of real time PCR
(ii) Discuss in detail various steps involved in DNA cloning. Highlight various properties of ideal cloning vectors, sticky end cutters and blunt end cutters involved in the process

* END *

3

IVth SEMESTER

B.Tech[BT]

END TERM EXAMINATION   May-2023

BT204   Drug Design & Delivery

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

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

Q.1   Describe briefly the traditional sources of drugs and methods used in traditional drug development   [M=10] [CO#1]

Q.2   Describe the various parameters investigated during preclinical studies on drug development.   [M=10] [CO#2]

Q.3   What do you understand by IPR? Describe the IPR regulations in drug development   [M=10][CO#3]

Q.4   Write short notes on
(a) Peptidomimetics
(b) Epitope mapping
[M=10][CO#4]

Q.5 Describe the various methods used in computational drug designing
[M=10] [CO#5]

Roll No. ....

FOURTH SEMESTER 22 B.tech [BT]

END SEMESTER EXAMINATION   MAY-2023

BT 206: Microbiology

Time: 3:00 Hours   Max. Marks: 40

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

Q.1 [a] What is plant-microbe interactions, Discus it's types with examples? Explain the mechanism of *Agrobacterium* mediated infection in plants.   [2+2=4] [CO5]

[b] Analyse the terms ID and LD50 for infections. Explain the role and mechanism of endotoxic and exotoxin in the bacterial infection?

[2+2=4] [CO5]

Q.2 [a] What are biogeological cycles and the role of microorganism in environment. Discus nitrogen cycle with diagram.

[2+2=4] [CO5]

[b] Write a note on any *two* of the followings: [2+2=4] [CO5]

(i) Normal microflora
(ii) Port of entry of pathogens into a host cell
(iii) Respiratory system infections

Q.3 [a] Explain following terms (*any two*):   [2+2=4][CO4][CO3]

(i) DNA chip
(ii) Prions
(iii) Antibiotics

[b] What is a microbial cell membrane? How the transportation system work across the cell? Explain.

[2+2=4] [CO4]

4. [a] Discuss any four methods of controlling growth of microorganisms.   [4] [CO6]

[b] What is sterilization? Derive the expression of bacterial inactivation kinetics.   [2+2=4] [CO6]

5. [a] Explain the stages involved in infection and disease with the help of curve. What are the symptoms and syndrome.   [3+1=4] [CO5]

[b] What is malaria? Explain the causative agent, symptoms, and treatments with its life cycle.

[4] [CO5]

24

4ᵗʰ SEMESTER

B.Tech. [Biotechnology]

END TERM EXAMINATION   MAY-2023

BT208   Advances in Computational Biology

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   How effective are different tree building methods in determining the
      evolutionary relationships between different species, and how do
      their strengths and weaknesses compare?

                                                          [8][CO# BT-208.4]

Q.2   Evaluate the effectiveness of different machine learning algorithms
      for predicting credit card application approval or denial and propose
      a recommendation for the most appropriate algorithm based on the
      experimental results. Provide a rationale for your recommendation,
      considering factors such as algorithm complexity, interpretability,
      and performance metrics.

                                                          [8][CO# BT-208.5]

Q.3. a) Explain the concept of overfitting in machine learning and how it
      can be avoided.

      b) What is the difference between precision and recall, and how are
      they used to evaluate the performance of machine learning
      algorithms?

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

Q.4. a) Analyze the impact of environmental factors on the expression of genetic variations and their contribution to disease risk.

b) What is the Human Genome Project and how has it impacted our understanding of human genetic variations?

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

Q.5 Evaluate the use of structural databases in drug discovery, including their limitations and ethical considerations.

[8][CO# BT-208.2]

Q.6 Design a hypothetical study to investigate the impact of pharmacogenomics-based drug therapy on patient outcomes, and outline the key components of the study design, such as sample selection criteria and outcome measures.

[8][CO# BT-208.3]

Q.7 How would you apply the knowledge of pharmacogenomics databases and algorithms to devise a personalized drug therapy plan for a patient with a specific genetic profile, taking into consideration potential drug-gene interactions and predicting drug efficacy and toxicity?

[8][CO# BT-208.3]

VIth SEMESTER   B.Tech. Biotechnology

END TERM EXAMINATION *May-2023*

COURSE CODE BT-302   COURSE . Plant Biotechnology

Time: 3 hrs   Max.Marks:40

> Note: All questions carry equal marks.
> Attempt any 5 questions.

Q1a. What is embryo culture? What are the applications of this technique in crop improvement   [4][CO1]

b. What is androgenesis? Explain the different methods of androgenesis. Explain the different factors on which the success of androgenesis is dependent?   [4][CO2]

Q2a. What is protoplast? Give diagrammatic representation of protoplast isolation and fusion. What are the different ways for identifying the hybrid cells? Explain with the help of a schematic diagram.   [4][CO3]

b. How can cell suspension culture be used for isolation of secondary metabolites of commercial importance?   [4][CO3]

Q3a. Define term cryopreservation. What is the role of cryoprotectants? Explain the different steps involved in cryopreservation?   [4][CO4]

b. Explain the role of enzymes used in gene cloning   [4][CO4]

Q4. a. What is vector mediated gene transfer? Give the mechanism of T-DNA transfer in plants using agrobacterium mediated transformation.

                                                            [4][CO5]

b. Explain particle gun bombardment method of gene transfer.. Give advantages and disadvantages of vectorless gene transfer methods.

[4][CO5]

Q5a. What is molecular farming? Give an overview how transgenic can be used as biofactories for the production of lipids, carbohydrates and proteins. [4][CO5]

b. Explain how genetic transformation has resulted in enhancing insect and pathogenic resistance in plants. [4][CO5]

Q6a. Describe various public concerns related to application of transgenic plants [4][CO5]

b. What are plasmid vectors? Give the construction of pBR322 and pUC vector. How can selection of transformed cells done using these vectors. [4][CO5]

SIXTH SEMESTER   B.TECH. (BIOTECHNOLOGY)
END SEMESTER EXAMINATION   MAY-2023
BT 304: ANIMAL BIOTECHNOLOGY

Time: 3.00 Hours   Max. Marks: 40

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

Q1. Answer all questions   [1×6][CO-1,4,5]

(a) _____ can activate the mammalian immune system, used as vaccine adjuvants.

(b) Why male pronucleus is preferred for DNA transfer?

(c) How attenuation and detoxification is done for vaccine production.

(d) "Herman." his offspring contained the correctly arranged gene for _____.

(e) In HAT medium, _____ blocks the de novo pathway.

(f) Chlamydia is caused by.............infection

Q2. Briefly answer all questions   [2×5] [CO-4,5]

(a) What is fever, describe different types of fever.

(b) Write down the principle of WST assay.

(c) What are the major periods of infectious disease?

(d) What are positive and negative selection cassette in knockout development?

(e) With suitable example explain what are conjugate vaccines?

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

(a) Define Transgenic Animals.   [2]

(b) Briefly explain the various modes of gene transfer employed to generate Transgenic Animals.   [3]

(c) What is the significance of Transgenesis, how the Transgenic Animal study could benefit the society, explain with examples.   [3]

P.T.O

Q4. Answer all questions 29 [2+3+3=8] [CO-1, 5]
  (a) What are monoclonal antibodies (mAbs), with suitable example explain different type of mAbs. [2]
  (b) With diagram explain the process of development of mAbs. [3]

  (c) Discus about the mechanism of antitumor effect associated with mAbs [3]

OR

  (a) Briefly describe the distinguished morphological features of cell death. [2]
  (b) What is the major difference between the extrinsic and intrinsic pathway of apoptosis. [3]
  (c) Describe the methods used for apoptosis assay. [3]

Q5. Answer all questions [4+4= 8] [CO-2, 4]
  (a) What is an infection; describe the major classes of infectious agents. Briefly explain the various mode of transmission of infectious agents. [4]
  (b) Briefly describe the molecular diagnostic techniques used in infectious disease. [4]

OR

  (a) Describe gene knockout technology, how does gene knockout animal are produced. [4]
  (b) Discuss about the applications of gene knockout animal models in human genetic disorder. [4]

-END-

2

Roll No. ....

SIXTH SEMESTER

B. Tech. [BT]

END SEMESTER EXAMINATION   *May-2023*
BT 306 Genomics & Proteomics

Time: 03.00 Hours   *Max. Marks: 40*

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

Q.1 [A] Attempt <u>any TWO</u> of the following   [2+2] [CO1]
  (i) Explain any two methods of ssDNA library construction used in different NGS technologies of DNA sequencing
  (ii) Emulsion PCR and Bridge PCR are used for clonal amplification of ssDNA on beads. Compare and contrast these two PCR methods
  (iii) Write any four salient points about Human Genome Project. What is meant by human reference genome? <u>or</u> Discuss 'replication slippage' and 'unequal crossing over' mechanisms of gene duplication

  [B] Attempt <u>any TWO</u> of the following   [2+2] [CO5]
  (i) Describe various capture molecules and the purpose for which each is used in protein microarray. Also describe one method each for oriented and random immobilization on chip
  (ii) Discuss the physicochemical properties of different variants of GFPs for their suitability in protein-protein interaction analysis. Explain with the help of an example
  (iii) Giving an example, explain the application of 'Intein splicing' in determining protein-protein interactions

Q.2 [A] Attempt <u>any TWO</u> of the following   [2+2] [CO2]
  (i) Explain specific features and significance of using deoxyribonucleoside 3'-phosphoramidite in oligonucleotide synthesis for spotting on DNA microarray slide
  (ii) Answer <u>any two</u> of the following in ~60 words each
    (a) Define conserved synteny. Discuss its applications in grass family

P.T.O.

(b) Describe what is meant by sister group, outgroup, ingroup, clade, polytomy with the help of phylogenetic tree diagram(s) or Compare and contrast cladogram and phylogram

(c) Compare and contrast orthologs and paralogs. How are orthologs identified with the help of phylogenetic tree?

(d) Explain the principle of Total Gene Expression Analysis (TOGA)

(iii) Enumerate and briefly explain various methods of sequence alignment. Also discuss the advantages of each

[B] Design a protocol for transposon mutagenesis in *Arabidopsis* for the construction of genome-wide gene knockouts giving details of positive and negative selection systems. Describe in detail any one method for screening of insertional mutants thus created [4] [CO2]

Q.3 [A] Attempt <u>any TWO</u> of the following   [2+2] [CO3]

(i) Explain salient points of any one secondary structure of proteins. Also comment on force(s) involved in secondary structure formation and φ and ψ angles

(ii) Explain the principle and procedure of 'Edman degradation method' of protein sequencing or Describe any two 'specific peptide cleavage reactions' to produce manageable sized fragments for the purpose of protein sequencing

(iii) Explain the principle of 2D gel electrophoresis. How is it more advantageous as compared to electrophoresis in single dimension?

[B] Describe the principle and procedure of MALDI-ToF MS. Enumerate various roles of MALDI matrix. Also explain the significance of protein ion fragmentation and a, b, y ions [4] [CO3]

Q.4 [A] Attempt <u>any TWO</u> of the following   [2+2] [CO4, CO5]

(i) Explain the procedure of 'DNase I footprinting'. Draw the autoradiogram obtained and discuss its interpretation

(ii) Explain the properties of 'TAP tag' and its application in the purification of interacting proteins

(iii) Comment on the robustness and buffering systems of cell that are responsible for maintaining homeostasis indicating genetic interactions

<div align="right">P.T.O.</div>

[B] Attempt <u>any TWO</u> of the following   [2+2] [CO4]

(i) Design a strategy for the immunoprecipitation of target protein and its interacting partner for which qualified antibodies are unavailable

(ii) Give a brief account of 'Luciferase reporter assay'

(iii) Describe the purpose and properties of crosslinkers used in X-ChIP

Q.5 [A] Attempt <u>any TWO</u> of the following   [2+2] [CO5]

(i) How does basic leucine zipper motif facilitate both protein-protein and protein-DNA interactions? Explain its structure in detail

(ii) Explain the vector construction step of 'Yeast two-hybrid system'. How is it based on the modular organization of many eukaryotic proteins?

(iii) What is phage display library? How is it used for the screening of protein-protein interactions?

[B] Design a homologous recombination-based strategy for generation of yeast knock out (YKO) library for ~6,000 yeast genes. How are synthetic lethal genetic interactions determined using microarrays? Give a flowsheet representation of the procedure clearly explaining each step in detail   [4] [CO5]

<div align="center">* END *</div>

SIXTH SEMESTER   B.TECH. (BIOTECHNOLOGY)
END SEMESTER EXAMINATION   MAY-2023
BT 308: STEM CELL AND REGENERATIVE MEDICINES

Time: 3.00 Hours

Max. Marks: 50

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

Q1. Write down the characteristics of following eyes disorders

[1×4=4][CO-1]

    i.   Aniridia
    ii. Telangiectasia
   iii. Lyell's syndrome
   iv. Stevens-Johnson syndrome

Q2. Attempt _all_ of the following questions   [2×8=16][CO-2,3,5]

(a) What is role of TGF-β in cell cycle explain?
(b) Describe the role of growth factors in bone and skin tissue engineering with examples.
(c) Define osteoinduction and osteoconduction?
(d) What are the possible host responses to implant?
(e) What are neurotransmitters, explain their type with role in neurotransmission.
(f) What are mesenchymal stem cells, with example explain their role in developmental biology.
(g) What are iatrogenic disorders, explain with suitable example.
(h) What is transdiffrentiation, explain with suitable example.

Q3. Attempt _all_ of the following questions   [5×2=10][CO-2]

(a) What are the ideal properties of scaffolds, support your statement with reference to bone scaffolds.

(b) Briefly discuss about bone formation and repair, with suitable examples explain bone tissue engineering.

P.T.O

Q4. Attempt all of the following questions [5×2=10][CO-3, 6]

(a) Give the advantages and disadvantages of natural and synthetic scaffolds in regenerative medicine applications.

(b) Describe the treatment methods for neuronal damage using tissue engineering and mention what are alternative strategies and biomaterials applied in treating nerve injuries.

Q5. Attempt all of the following questions [5×2=10][CO-1,3,6]

(a) Bioreactors must provide basic requirements for growth of engineered tissues. Support your statement in relevance with development of cell base tracheal implants.

(b) What is arthritis, what are the tissues engineering methods applied for the treatment of arthritis?

OR

(a) Briefly explain the functioning of Amniotic membrane transplantation and its advantages.

(b) What are Limbal Stem cell disorders, what strategies applied to treat Bilateral limbal stem cell disorders.

-END-

6th and 8th SEMESTER
B.Tech

END TERM EXAMINATION   **May-2023**

BT320   Genomics in Medicine

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

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

Q.1. (a) Write down the characteristics of two principal invertebrate animal models.   [5] [CO1]

(b) How do we use two dimensional gel electrophoresis to separate proteins? Write down the principle, advantage and limitation.   [5] [CO2]

Q.2 (a) What is molecular epidemiology? Write down the methods for typing microorganisms.   [5] [CO3]

(b) Write down the challenges for developing malarial vaccine. Which organelle of protozoan is sequenced to show the susceptibility of parasites to antibiotics ?   [4+1=5] [CO3]

Q.3(a) Explain TaqMan assay method with diagram. Write about the alternative of TaqMan assay.   [3+2=5] [CO4]

(b) What are the different methods to treat single gene disorders? Give the reasons why fully effective therapy is not possible for 80 percent of disorders.   [3.5 +1.5=5] [CO4]

Q.4. (a)What is the molecular-control of cell proliferation?   [5] [CO5]

(b) What are the basic approaches for the treatment of cancer? Write detailed note on chemotherapy.   [1+4=5] [CO5]

Q.5 (a) What are the clinical applications of gene therapy to cardiovascular diseases?   [5] [CO6]

(b) What is zinc finger proteins gene therapy?   [5] [CO6]

Total No. of Pages 02

SIXTH SEMESTER   *3 5*   B.Tech[BT]

END SEMESTER EXAMINATION   *MAY-2023*

BT 322: Protein Engineering

Time: 3:00 Hours   Max. Marks: 50

Roll No. ....

Note: Answer FIVE questions. Question No. 1 is compulsory
Assume suitable missing data if any.

Q.1 [a] What do you mean by salting in and salting out of a protein.
[3X6= 18][CO1]

[b] Write the structural formula of aromatic amino acids along with their symbol.   [CO2]

[c] What happens when a reaction occurs between PITC and polypeptide chain.   [CO3]

[d] Explain the functions of transmembrane proteins.   [CO4]

[e] Which technique is used for 2D analysis of protein.   [CO5]

[f] Write the principle on which FTIR is based. Distinguish between constructive and destructive signals obtained during FTIR.   [CO3]

Q.2 [a] Discuss the different types of bonds present in a protein structure.   [CO1] [4]

[b] Classify proteins based on their composition and tertiary structure.   [CO1] [4]

Q. 3 [a] Illustrate the importance and mechanism of Phosphorylation process occurs during post translational modification of a protein by giving examples.   [CO2] [4]

[b] What are torsional angles. Which amino acid occupies maximum and minimum region of Ramachandran plot and why? [CO2] [2+2=4]

Q.4 [a] Elaborate the working of NMR in determining the tertiary structure of a protein.   [CO3] [4]

[b] Discuss Dansyl Chloride method for N-terminal analysis of primary amino groups during protein sequencing.   [CO3] [4]

Q.5 [a] Explain coupled transport mechanism using Glucose-Na^+ symporter.   [CO4] [4]

[b] Elaborate the structure and function of Zinc finger Motif in gene expression.   [CO4] [2+2=4]

Q.6 [a] Write in detail about ESI using Tandem mass spectrometry.   [CO5] [4]

[b] Define the term MALDI. Estimate k, the first order rate constant, for an enzyme preparation with a Vmax of 4.6 μmoles x liter^{-1} x min^{-1} and Km = 2 x 10^{-6} M.   [CO5] [2+2=4]

Q.7 [a] Discuss how transcription factors regulate the mechanism of transcription in eukaryotes. Write the function of TFIIE during Transcription.   [CO4] [3+1=4]

[b] Explain the principle and working of CD in determining the secondary structure of a protein.   [CO5] [4]

MID TERM EXAMINATION   *May-2023*

BT 328 Bioinformatics Approaches in Complex Disorders

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

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

1. Answer all of the following   [2 x 5][CO5]

A] Name 2 features of proteins that can be derived from the sequence.

B] What conclusions can be derived from protein sequence features?

C] Give two examples of graphs in biology.

D] Name 2 experimental methods of motif discovery.

E] How are conserved motifs identified?

2. Answer any 5 of the following   [2 x 5][CO6]

A] Name any 4 problem statements in biology where machine learning can be applied.

B] Name 4 challenges to applying machine learning in biology.

C] Name 2 categories of ML algorithms based on type of data.

D] Draw a schematic representation of the working of support vector machines.

E] Draw a schematic representation of the working of a perceptron.

F] Name the two methods to determine feature importance in decision trees.

3. Answer any two of the following questions.   [5 x 2][CO5]

A] In context of protein binding site- name

i. three descriptions of the binding pocket

ii. three types of molecular surfaces

iii. two challenges associated with prediction.

B] Describe rigid docking. Name the methods to evaluate protein docking outcomes.

C] What are molecular dynamics simulations. Name the properties of the atoms calculated during MD simulations. Name the mechanism due to which energy conservation law is maintained.

4. Answer any two of the following questions.   [5 x 2][CO6]

A] Draw a schematic of a linear classifier in 1-, 2- and 3-dimensions. How is a good decision boundary determined?

B] Name two types of loss functions. What is a confusion matrix. Name two metrics of classification algorithm performance.

C] What is regression? Name two metrics of regression performance. Name two regression algorithms, mention how they are different from each other.

5. Answer all of the following   [2 x 5][CO5,6]

A] What is metrics and what is loss?

B] What is the difference between bias and variance?

C] What is the difference between overfitting and underfitting?

D] What is the pipeline to be followed when a patient is detected with a possible monogenic disorder.

E] What type of amino acids are found in

i. core of a globular protein

ii. transmembrane region of a membrane-embedded protein

VIth SEMESTER
B.Tech.

END TERM EXAMINATION   May-2023

BT404   ADVANCES IN COMPUTATIONAL BIOLOGY

Time: 3:00 Hours   Max. Marks: 50

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

Q.1 What are the pillars of machine learning in healthcare sector? Explain the working procedure of support vector machine and fuzzy logics with a suitable flowchart   [10][5]

Q.2 Briefly explain the process of phylogenetic tree prediction with a suitable diagram. How phylogenetic tree is involved in human health and disease? [10][4]

Q.3 What are the biological databases? Explain the difference between primary, secondary, and tertiary databases with examples. Discuss briefly the any four of the mutational databases with their working procedure.   [10][2]

Q.4 Explain the working principle and procedure of any four of the following databases

4.1. Database of genomic variants

4.2. Database of genotypes and phenotypes (dbGaP)

4.3. RCSB PDB

4.4. Uniprot

4.5. ClinVar database   [10][1]

Q.5 What is precision medicine initiative? How pharmacogenomics is related to genetic polymorphism, and explain the implementation of pharmacogenomics in drug discovery and development? Discuss the advantages and limitations of personalized medicine.   [10][3]

EIGHTH SEMESTER   B.Tech[BT]

END SEMESTER EXAMINATION   MAY-2023

BT 406: Agriculture Microbiology

Time: 3:00 Hours   Max. Marks: 50

Note: Answer FIVE questions. Question No. 1 is compulsory
Assume suitable missing data if any.

Q.1 [a] Discuss the contribution of John Tyndall in History of Microbiology.   [CO1] [3X6= 18]

[b] Write the differences between Oxidative and Substrate level phosphorylation.   [CO2]

[c] What do you mean by dissimilatory nitrate reduction.   [CO3]

[d] Distinguish between Lyophilization and Cryopreservation. [CO4]

[e] Explain key lock mechanism between Rhizobium and leguminous plant.   [CO5]

[f] Illustrate the effect of osmotically active solute in providing tolerance towards drought and salinity. [CO6]

Q.2 [a] How microbes play an important role in different fermentation processes.   [CO1] [4]

[b] What do you mean by pathogen containment. Discuss the role of PR proteins as a defense mechanism in plants against infection.   [CO1] [1+3=4]

Q.3 [a] Elaborate the different steps involved in TCA cycle along with ATP generation.   [CO2] [4]

[b] Explain the mode of transmission and diseases caused by Viroid.   [CO2] [4]

Q.4 [a] Describe in detail the various steps involved in microbial transformation of sulphur. [CO3] [4]

[b] Explain different phases of composting along with microorganisms involved in it. [CO3] [4]

Q.5 [a] Define the term Radiation Pasteurization. Discuss the factors affecting heat destruction of microorganisms. [CO4] [1+3=4]

[b] Classify the chemical changes caused by microorganisms during spoilage of food. [CO4] [4]

Q.6 [a] Describe the mode of action of viral pesticides along with examples. [CO5] [4]

[b] What is meant by PHA. Discuss the enzymes and pathway involved during PHB biosynthesis by *Ralstonia eutropha*.

[CO5] [1+3=4]

Q.7 [a] Explain the molecular strategy used for producing Glyphosate resistant plant. [CO6] [4]

[b] Name the mechanisms by which plants show responses towards abiotic and biotic stress. Explain the role of salicylic acid in plant development. [CO6] [2+2=4]

VIIIthSEMESTER   **B.Tech. Biotechnology**

END TERM EXAMINATION *May-2023*

COURSE CODE BT-408   **COURSE Bioethics and IPR**

Time: 3 hrs   *Max.Marks:50*

Note : All questions carry equal marks.
All questions are compulsory.

Q1a. What is IPR? Explain the need of IPR in the context of Indian Biotech Industry.   [5][CO1]

b. Explain the term Trade mark and what are the rights associated with its registration.   [5][CO2]

Q2a. What is Biosafety? What are the issues involved in Biosafety? Discuss the different biosafety levels?   [5][CO3]

b. Write in detail about the biosafety guidelines and regulations of Government of INDIA   [5][CO3]

Q3a. What are GMO's? What are the advantages of GMO's for human health and environment?   [5][CO4]

b. Give an overview of Human Genome Project.   [5][CO4]

Q4a. What is Bioethics? Explain its role in healthcare, food and agriculture.   [5][CO5]

b. What is genetic testing? What are the ethical concerns related to genetic testing, explain with example of 'Jesse Gelsinger"   [5][CO5]

Q5a. What is Plant Breeders rights and plant variety protection? Give its advantages and disadvantages.   [5][CO4]

b. What is Biopiracy? What are the effects of biopiracy explain with examples?   [5][CO5]

6th & 8th SEMESTER

B.Tech

END TERM EXAMINATION

May-2023

COURSE CODE BT426

COURSE TITLE ENVIRONMENTAL BIOTECHNOLOGY

Time: 03:00 Hours

Max. Marks: 50

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

Q.1 Define the term xenobiotics? Discuss the process of microbial degradation of xenobiotics. [10] [CO4]

Q.2 (a) Solid waste generation is a big issue nowadays. Explain the process of solid waste management and list its benefits.

OR

(b) Ozone layer depletion causes global environmental problems. Explain its causes and impact on environment. [10] [CO5]

Q.3 (a) Describe waste management through vermicomposting and how is this method better than others in practice?

OR

(b) The future belongs to electric vehicles. Write your opinion and views on the statement. [10] [CO2]

Q.4 Different industries in India emit various effluents in water bodies. How can wastewater emitted from different industries be treated. [10] [CO3]

Q.5 (a) Being considered as the lifeline of Delhi, Yamuna is highly polluted. Explain the causes of its pollution and measures for its management.

(b) Discuss briefly on greenhouse gas emissions with reference to Kyoto Protocol. [5X2=10] [CO1]

END TERM EXAMINATION   MAY 2023

IV SEM B.Tech.   Civil Engineering
COURSE CODE: CE202   COURSE TITLE: Mechanics of solids
TIME: 3 Hours   Max. Marks: 40

> **Note:** Attempt any Five questions. All questions carry equal marks.

1(a) Describe stress strain relationship of Mild steel with the help of a labelled sketch. Discuss how shall you compute Young's modulus of elasticity of Mild steel from this curve.   M4/CO1

(b) A cantilever beam of span 'L' is loaded with a concentrated load 'P' at its free end. The flexural stiffness of the beam is 'EI'. Calculate the slope and deflection at the free end of the beam.
OR
Discuss the Mohr's circle of stress with a neat sketch.   M4/CO1

2(a) What is Modulus of rigidity? Explain with a neat sketch. What is its relation to Young's modulus of elasticity?   M4/CO2

(b) What are statically determinate structures? Discuss in detail. Draw sketches of any two statically determinate structures.   M4/CO2

3(a) What do you understand by 'Degree of freedom' of a structure? Discuss how would you calculate its value for a simply supported beam and a cantilever beam.   M4/CO3

(b) Write a stress matrix (stress tensor) with a neat sketch. Show various stress components in it. Discuss how many stress components are needed to define state of stress at a point.   M4/CO3

4(a) A simply supported beam AB has a span of 6 m. A point load of 10 KN is applied on the middle point C of the beam. Take a section just to the left of the point C and draw free body diagrams of the portions AC and CB.   M4/CO4

(b) What do you understand by 'Principal stresses'? Discuss how the magnitude and direction of these are determined.   M4/CO4

5(a) Discuss the nature and working of fixed, hinged and roller supports. Draw neat sketches of these supports and show likely reactions for these supports.   M4/CO5

(b) Draw shear force and bending moment diagrams for a simply supported beam subjected to a uniformly distributed load of intensity 'w' KN per m length. The UDL is applied to full span 'L' of the beam.   M4/CO5

6 Write notes on any two of the following topics.
(a) Poisson's ratio
(b) Ductility and its use in structural materials
(c) Hooke's law   M8/CO6

IVth SEMESTER

B.Tech.

END TERM EXAMINATION   *May-2023*

CE 204   Engineering Survey

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

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

Q.1. A theodolite has a tacheometric constant of 100 and an addictive constant of zero. The centre reading on a vertical staff held on a point B was 2.292m when sighted from A. If the vertical angle was$+25^0$ and the horizontal distance AB 190.326 m, calculate the other staff readings and thus show that the two intercept interval are not equal. Using these values calculate the level of B if A was 37.95 m and the height of the instruments1.35m.   [5][6]

Q.2. The following bearings were observed with a compass. Calculate the exterior angles.   [5][3]

Line	AB	BC	CD
DE	EA		
Fore Bearing	$60^030'$	$122^00'$	$46^00'$
$205^030'$	$300^00'$		

Q3. A survey line PQ intersects a hillock. In order to extend the line beyond the obstacle, a perpendicular QR, 100m long, is set out at Q. From R two lines RS and RT are set out at angle of $45^0$and 60^0 with RQ respectively. Find the lengths RS and RT such that the points S and T may lie on the prolongation of line PQ and also find the obstructed distance QS.   [5][5]

Q.4. It was required to ascertain the elevations of two points, A and B. A line of level was run from A to B. The levelling was then continued to a B.M of elevation 100.00m, the readings obtained are as shown as below. Obtain the RL of A and B. [5][3]

B.S	IS	FS	RL	Remarks
3.9				A
1.45		3.96		
3.95		2.14		
	2.35			B
3.35		0.85		
3.5		2.95		
3.9		3.1		
		2.5	100	0.B.M

Q.5. Describe the various methods of compass traversing and discuss any method of adjusting it graphically [5][4]

Q.6. How plane table orientation is done at site ? Bring out the difference between resection and intersection methods. [5][6]

Q7. With respect to moving from whole to part explain the triangulation and trilateration. [5][7]

Q8. Explain the terms - [5][6]

    a) Zenith

    b) Nadir

    c) Celestial Horizon

    d) Terrestrial poles and equator.

SIXTH SEMESTER

B.Tech

END TERM EXAMINATION   **May-2023**

CE206   SOIL MECHANICS

Time: 03:00 Hours   Max. Marks: 40

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

Q1. a) What are the types of structures in clay minerals. Describe different types of clay minerals along with the increasing order of their activity.

b) Explain adsorbed and diffused double layer using a neat diagram.

d) Differentiate the index and the engineering properties of soil

e) Derive the following equation from ab-initio:

$$\gamma_t = \frac{Gs + eS}{1+e} \cdot \gamma_w$$
                        [4x2] [CO1]

OR,

a) How many phases of soil correspond to concurrent engineering practices and map well with Indian Knowledge System (IKS)?

b) How the IKS explains the existence of 5-phase system as a scientific discipline?   [4x2] [CO1]

Q2. a) A soil sample has a volume of 50 cm³ and a mass of 100 g. The specific gravity of the solid particles is 2.7, and the water content of the sample is 20%. The sample is then subjected to different levels of compaction, and the void ratio and degree of saturation are measured for each compaction level. The results are shown in the table below:

Compaction level	Void ratio	Degree of saturation
0.50	0.80	30%
0.80	0.65	60%

Assuming the soil is homogeneous and isotropic, determine the dry density, saturated density, and hydraulic conductivity of the soil.

b) A soil profile is shown in Fig. 1. The water table is 6m below the ground level. Calculate the total stress, pore water pressure, and effective stress at A, B, C, and D.
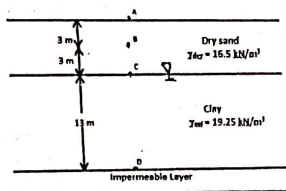

Fig.1   [2x4] [CO2]

Q3. a) How compaction is differentiated with consolidation? Compute the settlement due to compaction using the phase diagram of soil.

b) The flow net around a sheet pile wall is shown in Fig. 2. The properties of the soil are: permeability coefficient = 0.09 m/day (isotropic), specific gravity = 2.70 and void ratio = 0.85. The sheet pile wall and the bottom of the soil are impermeable.

[2x4] [CO3]
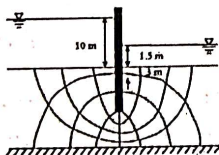
Fig. 2

Q4. a) Examine the validity of the statements;
i) The Mohr's circle for stresses represents the value of normal and shear stress in 2D plane at a point in a body.
ii) Undrained and drained shear test may give different values of cohesion and friction.

b) Construct the Mohr's circle for the state of stresses shown in Fig. 3. Determine the major & minor principle stresses and the maximum in-plane shear stress along with their plane orientation.   [2x4] [CO4]
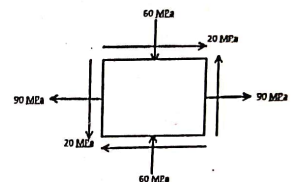

Fig. 3

Q5. a) What are the assumptions of Terzaghi's theory of one dimensional consolidation?

b) A saturated soil stratum 6 metres thick lies above an impervious stratum and below a pervious stratum. It has a compression index of 0.28 and a coefficient of permeability of 35×10^{-4} mm/sec. Its void ratio at a stress of 150kN/m^2 is 1.95.

Determine:
i) change in void ratio due to an increase in stress to 210 kNm^{-2}
ii) settlement of the soil stratum due to the dissipation of excess pore water pressure
iii) time required for 80 percent consolidation. [2, 6] [CO5]

FOURTH SEMESTER   **B. Tech. (Civil)**
END SEMESTER EXAMINATION   May-2023
            CE-208 Hydraulics and Hydraulic Machines
Time: 3:00 Hours   Max. Marks : 40

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

1[a] Derive an expression for the force exerted by a jet of
water on a moving inclined plate in the direction of the jet.
                                        (2 Marks) (CO 5)

[b] A square plate weighing 117.72 N and of uniform
thickness and 300 mm edge is hung so that horizontal jet
20 mm diameter and having a velocity of 15m/s impinges
on the plate. The centre line of the jet is 150 mm below
the upper edge of the plate, and when the plate is vertical
the jet strikes the plate normally and at its centre.
(i) Find what force must be applied at the lower edge of
the plate in order to keep the plate vertical.
(ii) If the plate is allowed to swing freely, find the
inclination to the vertical which the plate will assume
under the action of jet.   (6 Marks) (CO 5)

2[a] Compare impulse and reaction turbine. Also derive an
expression for maximum hydraulic efficiency of a Pelton
wheel   (2 Marks) (CO 6)

[b] A jet of water impinges on a series of curved vanes at an
angle of 30° to the direction of motion of the vanes while
entering and leaves the vanes horizontally. The head
under which the jet issues from the nozzle is 30m, the co-
efficient of velocity for the nozzle is 0.9 and the diameter
of the jet after leaving the nozzle is 50 mm. The speed of
the vanes is 10m/s and the relative velocity of the water at

the outlet is 0.8 times the relative velocity at inlet. Calculate:

(i) The angle of vane tips at inlet
(ii) The power developed by the jet and
(iii) The efficiency of the system   (6 Marks) (CO 6)

3[a] Draw a schematic diagram of a Francis turbine and explain briefly its construction and working. Also write the advantages of Francis turbine over Pelton wheel.
                          (2 Marks) (CO 6)

[b] The inward flow reaction turbine develops 735 kW at 750 rpm under a net head of 100m. The guide vanes make an angle of 15° with the tangent at the inlet. The axial length of the blade at inlet is 0.1 times the outer diameter. The radial velocity of flow through the wheel is constant and the discharge from the wheel is radial. The blade thickness blocks 5 % of the area of flow at inlet. The hydraulic efficiency of the wheel is 88% and overall efficiency is 84%. Determine

(i) The wheel diameter
(ii) The wheel width and
(iii) The blade angle at inlet.   (6 Marks) (CO 6)

4[a] Describe the principle and working of a reciprocating pump. Also define slip and negative slip of a reciprocating pump.   (2 Marks) (CO 7)

[b] A centrifugal pump impeller whose external and internal diameters are 400 mm and 200 mm, respectively is running at 950 rpm. The rate of the flow through the pump is 0.035 m³/s. The suction and delivery heads are 5m and 25 m respectively. The diameters of the suction and delivery pipe are 120mm and 80 mm respectively. If the outlet vane angle is 45°, the flow velocity is constant and equal to 1.8 m/s and power required to drive the pump is 15 kW, determine

(i) Inlet vane angle
(ii) The overall efficiency and
(iii) The manometric efficiency.   (6 Marks) (CO 7)

5[a] At what depth or depths can a discharge of 12 cumec flow in a 3 m wide rectangular channel, if the total energy of channel flow with channel bed as datum is to be 2m? What is the lowest possible energy for this discharge and corresponding depth and velocity of flow?
                          (4 Marks)(CO 2)

[b] A rectangular river has 30 m wide and at a bridge location its width is restricted to 25m by the piers of the bridge. The river bed is horizontal. Describe the flow, which obtains underneath the bridge with minimum upstream depth when a flood of 450 m³/Sec flows in the river. Also determine the upstream depth.   (4 Marks) (CO 3)

6[a] A rectangular channel carrying a supercritical stream is to be provided with a hydraulic jump type of energy dissipater. It is desired to have an energy loss of 5.0 m in the hydraulic jump when the inlet Froude number is 8.5. What are the sequent depths of this jump?
                          (4 Marks) (CO 4)

[b] A trapezoidal channel has side slopes of 1 horizontal to 2 vertical and the slope of the bed is 1 in 2000. The area of the section is 42 m². Find the dimensions of the section if it is most economical. Determine the discharge of the most economical section if C = 60.   (4 Marks) (CO 2)

B. Tech. [Environment Engineering]

End Term Examination   (May-2023)

Course Code CE-252 . Course Title: Structural Analysis

Time: 3.00 Hours   Max. Marks: 50

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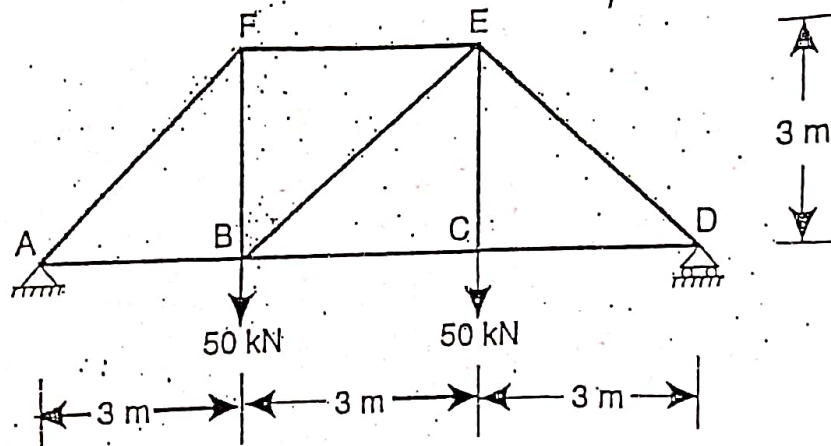   All questions carry equal marks.
       Assume suitable missing data, if any.

1. (a) Explain the principle of virtual work.   [2][CO1]

(b) Determine the vertical displacement of joint C of the steel truss shown in Figure below. The cross sectional area of each member is A = 400 mm^2 and E = 2 x 10^5 N/mm^2.   [8][CO1].

2. (a) State the Castigiliano's Theorem I and II.   [2][CO1]

(b) A single load of 100 kN rolls along a girder of 20m span. Draw the diagrams of maximum bending moment and shear force (positive and negative). What will be the absolute maximum positive shear force and bending moment?   [8][CO2]

3. (a) What is the significance of Influence line diagram.   [2][CO2]

(b) Draw the ILD for shear force and bending moment for a section at 5m from the left hand support of a simply supported beam, 20m long. Hence, calculate the maximum bending moment and shear force at the section, due to an uniformly distributed rolling load of length 8m and intensity 10 kN/m run. [8][CO2]

4. (a) Explain the determinate and indertminate structures. [2][CO3]

(b) Using conjugate beam method, for the beam shown in figure. Find the slopes and deflections at A, B, C, and D. Given: $E = 200 \times 10^6$ kN/m^2 and $I = 300 \times 10^{-4}$ m^4. Neglect the weight of the beam. [8][CO4]

(a) Beam

or
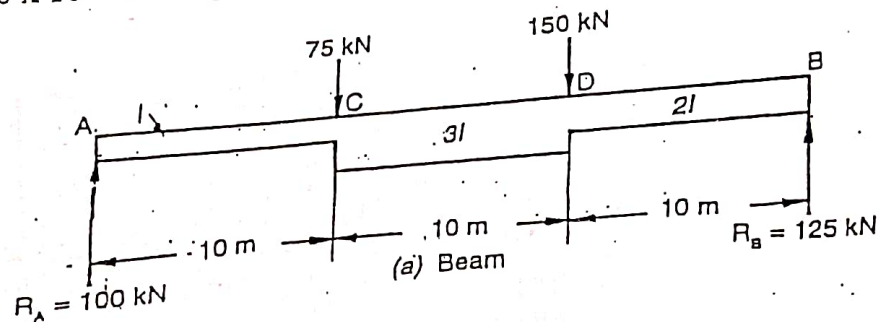
A simply supported beam is carrying a point load W at the centre. Calculate the slopes at the ends and the central deflection, using conjugate beam method. [8][CO4]

5. Explain different types of arches with neat sketch. [10][CO5]

or

A symmetrical three hinged parabolic arch of span 40m and rise 8m carries an udl of 30 kN/m over the left half of the span. The hinges are provided at the supports and at the centre of the arch. Calculate the reactions at the supports. Also calculate the bending moment, radial shear force and normal thrust at a distance of 10m from the left support.

[10][CO5]

Q5[a] Determine the shape factor for the triangular cross-section having base 'b' and height 'h'. [CO 6]

Q5[b] A symmetric suspension cable of 100 m span has a central dip of 10 m. A two-hinged stiffening girder stiffens it. The total dead load is 20 kN/m. Determine the maximum tension in the cable if a point load of 500 kN travels in the girder. Find the maximum +ve and the maximum -ve bending moment in the girder. [CO 5]

Q5[c] Analyse the propped cantilever beam subjected to service loads as shown in Figure 5(c) below using the mechanism method. Taking the collapse load factor $\lambda_c = 2$, determine the plastic moment capacity required for the beam. Apply a statical check and draw the collapse BMD for the true collapse mechanism. [CO 6]
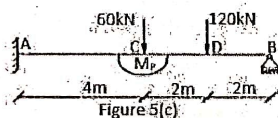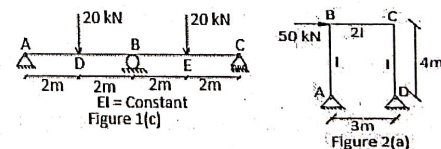

Figure 5(c)

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

Q1[a] Analyse the two-span continuous beam shown in Figure 1(a) below using the method of consistent deformations. Draw BMD and SFD. [CO 1]
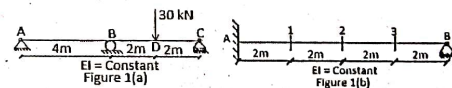

Figure 1(a)   Figure 1(b)

Q1[b] Draw the ILD for bending moment at A for the propped cantilever beam as shown in figure 1(b) above using *Müller Breslaü* Principle. Obtain the influence coefficients at quarter span points. [CO 1]

Q1[c] Analyse the beam shown in Figure 1(c) below using the strain energy method. Draw the BMD and SFD. [CO 1]


Figure 1(c)   Figure 2(a)

Q2[a] Analyse the frame shown in Figure 2(a) above using the moment distribution method taking advantage of symmetry. Draw BMD and SFD. [CO 2]

53

Q2[b] Analyse the frame shown in Figure 2(b) below using the slope deflection method. Draw BMD and SFD. [CO 2]

Figure 2(b)

80 kNm
40 kN   40 kN   40 kN
EI = Constant
Figure 2(c)
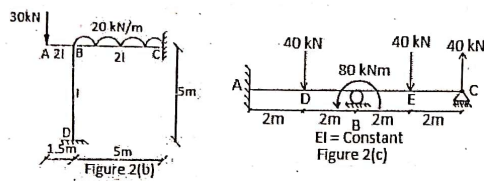
Q2[c] Analyse the continuous beam shown in Figure 2(c) above using the moment distribution or slope deflection methods. Draw BMD and SFD. [CO 2]

Q3[a] Analyse the pin-jointed frame using the force method/flexibility method and determine the forces in all the frame members shown in Figure 3(a) below. [CO 3]


AE = constant
Figure 3(a)

9kN/m
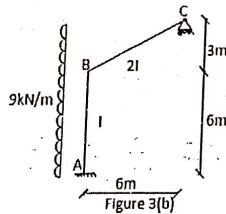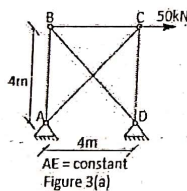
Figure 3(b)

Q3[b] Analyse the frame using the stiffness method shown in Figure 3(b) above. Draw BMD and SFD. [CO 3]

Q3[c] Analyse the frame using the stiffness or force/flexibility methods, as shown in Figure 3(c) below. Draw BMD and SFD. [CO 3]

Figure 3(c)

$I = I_c \sec\phi$; $A = A_c \sec\phi$
Figure 4(a)
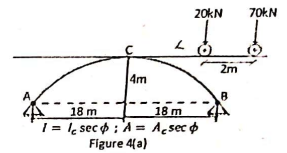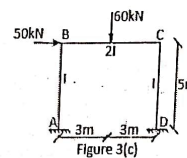
Q4[a] Assume secant variation of the moment of inertia and area of cross-section of the two hinged parabolic arch rib at a section shown in Figure 4(a) above. Draw the ILD for H_A. For the movement of the train load in the arch span, as shown, using ILD, determine the maximum value of H_A. [CO 4]

Q4[b] Analyse the cable with a span 30 m stretch supported at A and B, as shown in Figure 4(b) below. The length of the cable is 33 m. Determine the profile of the cable after loading. Also, determine the tension in different parts of the cable. [CO 5]
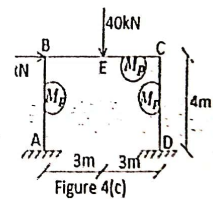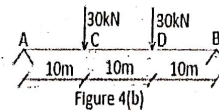
Figure 4(b)

Figure 4(c)

Q4[c] Determine the collapse load factor for the frame subjected to service loads, as shown in Figure 4(c) above, using the mechanism method. Apply the statical check and draw the collapse BMD. [CO 6]

SIXTH SEMESTER
B.Tech
END TERM EXAMINATION　　　　　　　May-2023
CE304 GEOTECHNICAL ENGINEERING

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

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

Q.1　(a) Explain the following with neat sketches with reference to in-situ and laboratory-based soil investigations
　　　(i) Type of soil samplers (split-spoon, bucket etc:)
　　　(ii) Type of soil samples (disturbed, undisturbed, representative, non-representative)　　　　　　　　　　　　　　[4] [CO1]

　　　(b) A 6 m high retaining wall is to support a soil with unit weight γ = 17.4 kN/m³, angle of internal friction ϕ = 26°, and cohesion c =14.36 kN/m². Determine the Rankine active force per unit length of the wall both before and after the tensile crack occurs, and determine the line of action of the resultant in both cases.　　　　[4] [CO2]

Q.2　(a) Using neat sketches compare the following
　　　(i) Terzaghi bearing capacity theory
　　　(ii) Vesic (1973) bearing capacity theory
　　　Explain the reasons for the difference among the mathematical expressions of bearing capacity factors (N_c, N_q and N_γ) from these theories.　　　　　　　　　　　　　　　　　[4] [CO3]

　　　(b) A square foundation is 1.5 m × 1.5 m in plan. The soil supporting the foundation has a friction angle ϕ = 20°, and cohesion c =15.20 kN/m² unit weight γ = 17.8 kN/m³. Determine the allowable gross load on the foundation with a factor of safety (FS) of 2.5.
　　　(i) Assume that the depth of the foundation (D_f) is 1 m and that general shear failure occurs in soil.
　　　(ii) Assuming that local shear failure occurs in soil supporting the foundation.　　　　　　　　　　　　　　　　　[4] [CO3]

Q.3 A rectangular foundation has dimensions of 1m x 2m and is founded on a layer of soil at a depth of 1m. The modulus of elasticity of the soil is 10, 8 and 12 MPa for depth of 1 to 3m, 3 to 4m and 4 to 5m respectively. Its Poisson's ratio is 0.3. The total stresses due to weight of the structure is 150 kNm^{-2}. Calculate the settlement of a 5m deep layer below the foundation, using the influence factor method. For a rectangular foundation on a clayey soil, the influence factor can be calculated using the following formula:

$k = (1 + 0.2d/b) \ln[(2a+b)/b] - (1 + 0.4d/b) \ln[(a+b)/b]$ where a is half the width of the foundation, b is half the length of the foundation, and d is the depth of the foundation. [8] [CO4]
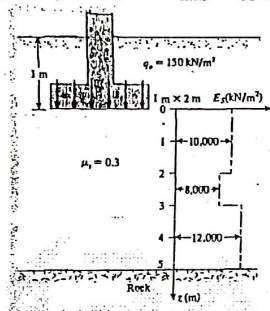

Fig.1

Q.4 (a) Explain the following with neat sketches
    (i) Elements of well foundation
    (ii) Scour depth of well foundation   [4] [CO5]

(b) A concrete pile is 16 m long and 410 mm × 410 mm in cross section. The pile is fully embedded in sand for which $\gamma = 17$ kN/m³ and $\phi = 30°$. Calculate the ultimate point load by Meyerhof's and Janbu's method. Further given K = 1.3 and $\delta = 0.8\phi$, determine the frictional resistance.   [4] [CO4]

Q.5 The stability of slices is to be analysed by method of slices (Fig.2). On a particular trial curved surface through the soil mass shown, the shearing component (i.e., sliding force) and the normal component (i.e., normal to the base of each slice) of each slice's weights are tabulated below:

Slice Number	Shearing Component (kN/mm)	Normal Component (kN/mm)
1	-85.41[a]	485.38
2	-69.14[a]	1965.9
3	116.6	3064.14
4	978.9	4148.80
5	1993.05	4474.19
6	2548.9	4243.71
7	3064.14	3077.70
8	1288.02	123.37

[a] Since the trial surface curves upward near its lower end, the shearing components of the weights of the slice 1 and 2 will act in a direction opposite to those along the reminder of the trial curve, resulting in a negative sign.

The length of the trial curve is 10.97 m. The angle of friction is $\phi = 5°$ and cohesion, c = 20 kN/m². Find the factor of safety of the slope along the trial surface.   [8] [CO3]

Fig.2

57
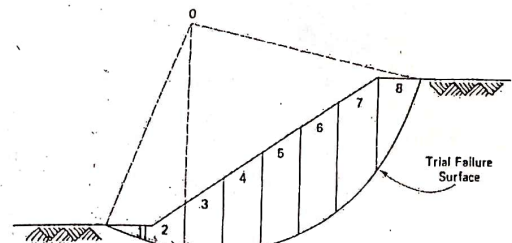
B.TECH. (CIVIL)
END TERM EXAMINATION   MAY-2023
CE306: TRANSPORTATION ENGINEERING
Duration: 3 Hours   Max. Marks: 40

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

Q.1 Compare camber and super elevation in tabular form with respect to their purpose and values as per IRC recommendation. [CO1][5]

Q.2 Calculate the stresses at interior, edge and corner regions of a CC pavement using Westergaard's formulae. Use the following data:
Wheel load, $P = 5100$ kg
Modulus of subgrade reaction, $K = 7$ kg/cm'
Modulus of elasticity of CC, $E = 3.0 \times 10^5$ kg
Poisson's ratio of concrete, $\mu = 0.15$
Pavement thickness, $h = 22$ cm [CO3][5]

Q.3 Describe functions of main components of railway track. Draw a typical cross section of a single line broad gauge railway track on embankment. [CO2][5]

Q.4 Design the super elevation and speed limit on branch line curve which diverges from main line curve in opposite direction in the layout of broad gauge track. Following design data is given:
Degree of curve of main line $= 4°$
Degree of curve of branch line $= 6°$
Permissible speed on main line $= 50$ km/h
Permissible cant deficiency $= 7.6$ cm [CO4][5]

P.T.O.

Q.5 Design all elements of a turnout on a Broad Gauge railway track for the following data:
Heel divergence = 13.5 cm
Angle of switch = 1° 34′ 27″
Angle of Crossing = 6° 42′ 35″   [CO4][5]
Show the results on a neat diagram.

Q.6 Illustrate the method of design best runway orientation with the help of neat labelled diagrams.   [CO3][5]

Q.7 Design runway length for the following data:
Basic runway length =1450 m
Elevation of site = 250 m above mean sea level
Monthly mean of daily maximum temperature of the hottest month = 44.8 °C
Monthly mean of daily average temperature of the hottest month = 26.2 °C
Effective gradient =0.5 %   [CO4][5]

Q.8 Write short notes on any **TWO** of the following:
    i) Sleeper density
    ii) Minimum depth of ballast section
    iii) Visual aids at airport
                                              [CO2][5]

Q.9 Write short notes on any **TWO** of the following:
    i) Purpose of break waters
    ii) Functions of docks
    iii) Shapes of tunnels
                                              [CO2][5]

59

SIXTH SEMESTER

B.Tech (REGULAR)

MID TERM EXAMINATION   MAY 2023

COURSE CODE- CE308   COURSE TITLE- DISASTER MANAGEMENT

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

Note :   Attempt all Questions.

Assume suitable missing data, if any.

Q.1 What are the phases of Disaster Management? Explain all with the help of examples.

[10][CO1]

Q.2 Explain the evolution of Disaster Management in India.

[5][CO2]

Q.3 What are the issues of Rehabilitation and Resettlement among the Disaster Survivors?

[05][CO3]

Q.4 What are the Components of Disaster Relief? Explain all.

[10][CO4]

Q.5 Briefly explain any two.
    (a) National Disaster Management Act 2005.
    (b) National Policy on Disaster Management, 2009.
    (c) National Plan on Disaster Management 2016.

[10][CO5]

VI SEMESTER

BTECH CIVIL ENGG

END TERM EXAMINATION   MAY-2023

CE310   GEOTECHNICAL PROCESSES

TIME 3 HOURS   MAX MARKS: 40

> NOTE: Question no 1 is compulsory. Attempt rest of the
> questions as per instruction given. Draw neat
> sketches if required.

1.A site in Meerut consists of a clay deposit of depth 8 m extending from 1 m from ground surface to 9.0 m followed by a very stiff soil stratum. The undrained cohesion of the soil is 18.5 kN per sq m. A stone column system of diameter 400 mm and length 9 m with centre to centre spacing of 1.1 m is installed in the site. The water table is at a depth of 1.0 m from ground surface. The average saturated unit weight of the soils is 18.5 kN per cubic metre. The coefficient of volume change is 5×10^{-4} square m per kN, angle of shearing resistance of column material is 42^0 and K_0 is 0.6. Determine

a. safe bearing pressure of untreated soil

b. load carrying capacity of the stone column with its tributary soil

c. number of stone column required for a column carrying a load of 650 kN

d. size of foundation required

e. consolidation settlement of the stone column system

[8][CO-3]

2. Attempt any two parts.

a. Explain Hogentoglar's theory of compaction. What is the effect of compaction on permeability, swelling characteristics and shear strength of the soil. [4][CO-1]

b. What are the limitations of sand drain.

An embankment is proposed to be constructed over a layer of clay 8 m thick, underlain by an impermeable stratum. The embankment is 3.5 m high and the unit weight of 18.5 kN/m^3. The clay has following properties:

Coefficient of consolidation in radial and vertical directions are 7.5 m^2/year and 4.5 m^2/year respectively. Coefficient of volume change =2.7 x 10^{-4} m^2/kN

Sand drains of 300 mm diameter are proposed to be installed in a square pattern, at spacing of 3 m centre to centre. Determine magnitude of settlement that can be expected due to consolidation of clay layer after 6 months of effective embankment loading. [4][CO-2]

c. With suitable example explains the application of geomembrane and geocell. [4][CO-5]

3. Attempt any two parts.

a. Explain the mechanism of lime stablisation. Compare lime stablisation with cement stablisation. [4][CO-2]

b. Discuss the installation procedure of vibroflotation technique. What are the factors influencing this technique. How the effectiveness of vibroflotation can be evaluated. [4][CO-3]

c. What is the principle of electro-osmosis method? Discuss the factors affecting. [4][CO-3]

4. Attempt any two parts.

a. Discuss followings for the planning of grouting project-
 • Investigation
 • Depth and size of grout holes
 • Pattern of grout holes [4][CO-2]

b. Discuss the classification of soil nailing. What are the parameters, on the basis of which soil nailing is analysed. [4][CO-3]

c. Discuss the identification of collapsible soils. What are the preventive measures adopted to minimise the collapse behaviour of the soil. [4][CO-5]

5. Attempt any two parts.

a. What is the mechanism of soil reinforcement. How a reinforced retaining wall is checked for external stability. [4][CO-4]

b. Discuss the role of geotextiles in following structures-
 • Embankment and retaining wall
 • Landslide protection and erosion control [4][CO-4]

c. What is the mechanism of expansive soil? What are the factors affecting magnitude of swelling pressure. [4][CO-5]

62

END TERM EXAMINATION   May-2023

CE314 TUNNEL, PORTS AND HARBOURS ENGINEERING

Time: 03:00 Hours   Max. Marks: 40

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

1. a) Explain the tunnels classification on the basis of the distinct positions.
   b) The tunnel has a cross-sectional area of 70 square meters and a length of 5 km. The excavation rate is 2.5 cubic meters per day per drill, and there are 6 drills working simultaneously. Calculate the total volume and time required to complete the excavation. [CO 1]

2. a) Explain in detail the merits and demerits of Water Transportation as compared to other means of transportation.
   b) A wave with a wavelength of 150 m and a height of 5 m is approaching a harbor entrance. If the water depth at the entrance is 10 m, check whether the wave will break before it reaches the harbor entrance? Also mention the desired criteria for the same.   [CO 2]

3. a) With the help of neat sketches, explain different types of breakwater and their composition.

b) A tsunami with a wavelength of 500 kilometers and a speed of 800 kilometers per hour is approaching a shoreline. If the water depth at the shoreline is 10 meters, what will be the height of the tsunami when it reaches the shoreline? [CO 4]

4. a) Explain the mechanism of Littoral Drift with the help of neat sketches.

b) Calculate the speed of non-breaking wave approaching shallow water when the depth of water is 2.56 m. Also calculate the translatory speed of wave when the mean wave height is 12m.

[CO 3]

5. a) Explain the technique of dredging with the help of classification on the broad basis.

b) What are the possible advantages and disadvantages of contract dredging system? [CO 5]

6. a) Write a brief note on construction and functioning of Groins with the help of neat sketch.

b) A groin is constructed 50 meters into the ocean and built with a height of 2 meters above the mean sea level. The water depth at the end of the groin is 6 meters. Calculate the the width of the base and the angle of repose for the groin. [CO 5]

7. a) Explain the need and functioning of the dock fenders with the help of neat sketches.

b) Calculate the maximum displacement weight for absorbing impact kinetic energy of 28.6 tonne-m , if the velocity normal to the dock is 0.46 m/s in a dock fender. Also calculate effective tonnage required for creating impact energy. [CO 4]

SIXTH Semester

B.Tech.

END TERM EXAMINATION   **May-2023**
CE 322   TRAFFIC AND TRANSPORTATION PLANNING

Time: 3.0 Hours   Max Mark: 40

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

1 (a) Explain the method of public transport survey with types of data collected in the survey.   [4] [CO1]

(b) Explain by drawing sketch concept of screen line survey and corden line survey of study area.   [4] [CO1]

2. Explain any four of the following terms with the help of sketches:

(a) interzonal, intrazonal and through trips (b) CBD

(c) Travel fore casting (d) Base year (e) Horizon year   [4x2=8] [CO1]

3. (a) Explain multiple linear regression analysis in term of use in transportation planning.   [4] [CO2]

(b) What is trip generation? Explain in detail the factors governing trip generation and attraction rates.   [4] [CO3]

4. The distribution of present trips among the Zones A, B and C are given in O – D matrix below. The future trips generated (T_1) are also given in last column. Distribute the future trips among the zones using Detroit factor method.   [8] [CO4]

O D	A	B	C	T_i
A		100	200	360
	60			
B	100	20	300	1260
C	200	300	20	3120

65

5. The following data shows average household size and total trips made per day for a particular zone of study area. Develop the trip production equation and check its validity. [8] [CO4]

Average house hold size	Total trips made per day
2	4
3	6
4	7
5	8
6	10

6. Write short note on: [4X2=8] [CO4]

(a) All-or-nothing assignment method (b) Diversion curve method.

4th SEMESTER
B.Tech.

END TERM EXAMINATION   May-2023

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) What is Natural Disaster? What are the effects of natural disasters on people and infrastructure?   [5][CO1]

b) What are the current and future impacts of infrastructure resilience on quality of life? Explain.   [5][CO2]

Q.2 a) How do you measure optimal resilience and the effectiveness of risk reduction?   [5][CO3]

b) Explain, "Infrastructure can be deciding factor in whether or not the situation becomes a disaster."   [5][CO3]

Q.3 a) What is risk modeling? Why use of risk modeling is increasing? Discuss.   [5][CO4]

b) Identify the types of hazards likely to affect homes and communities and describe steps to prepare for emergencies?   [5][CO4]

Q.4 a) What is the impact of infrastructure on development? [5][CO5]

b) Discuss the roles that the Government, State, and Market must play for the development of the economy.   [5][CO5]

Q.5 a) Explain the Interdependence of Infrastructures with Figure.   [5][CO6]

b) Discuss the principle of Land use?   [5][CO6]

Q.6 Write short note (any four):   [2.5x4][CO2-CO6]
a) Risk
b) Hazard education
c) Individual response to risk
d) Effect of urban modernization on the environment
e) Risk modeling

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

VIII Semester

B.Tech.

End Term Examination   **May-2023**

CE404 Construction Technology & Management

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

Note: All Questions are Compulsory.

Q1 What is motivation and labour welfare for construction modern technology projects? Discuss communications and contracts for major modern construction technology projects.   (C01) (10)

Q2 Differentiate between

   1. Function 0f CPM and PERT

   2.Function of projects resources and project monitoring   (CO2)(10)

Q3 Write short notes on
   1.Factors affecting the selection of construction modern technology
      Equipments.
   2.Dewatering and Pumping Equipments for contruction modern technology
      management.   (CO3) (10)

Q4 Enumerate the types of equipments management for Hiring cost Productivity cost and work motivation study? Discuss merits and demerits.   (CO4)(10)

Q5 Explain Specifications and Quality control for modern costruction technology management projects? Discuss advantages and dis advantages.

(CO5) (10)

8th SEMESTER

B.Tech.

END TERM EXAMINATION

May-2023

CE416 Geo-Environmental and Geo-Hazards Engineering

Time: 3:00 Hours

Max. Marks: 50

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

Q.1 a) How can advancements in technology, such as remote sensing and data analytics, be leveraged to enhance geo-environmental and geo-hazard monitoring? Discuss. [5][CO1]

b) What is surface contamination? List the sources of sub-surface contamination? [5][CO2]

Q.2 a) What is Landfill? List the type of landfill with neat diagram. [5][CO3]

b) What do you understand by leachate management? What are the different ways of monitoring and control of leachate? [5][CO3]

Q.3 a) What do you mean by land subsidence? Explain recent Joshimath land subsidence. [5][CO4]

b) Describe the flood hazard assessment and mapping. Discuss benefits and the barriers related to it? [5][CO5]

Q.4 a) What is Landslide? List the type of landslide and explain any one of them with neat diagram. [5][CO5]

b) Discuss about landslide remedial measures, prevention and its control. [5][CO6]

Q.5 Write note: (any four): [2.5x4][CO2-CO6]

a) Naturally occurring contaminants
b) Ground heave
c) Waste management
d) Vertical seepage
e) Soil Stabilization

B.TECH. (CIVIL)
END TERM EXAMINATION   MAY-2023
CE420: TRAFFIC ENGINEERING
Duration: 3 Hours   Max. Marks: 40

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

Q.1 Write short notes on   [CO2][4×2=8]
  a) Space sharing concept
  b) Estimation of Accident rate
  c). Application of PCU value
  d) Method of Channelization

Q.2 A two lane road with two way traffic is 1000 vehicles per hour in both direction and a minor road is branching off on one side. Assuming that vehicle arrival rates at any point along the road follow a random Poisson's distribution, compute the number of vehicles travelling along the major road at headway of 5 seconds or more.
If the right turning traffic is prohibited at the junction and traffic from minor road accepts a gap of 7 seconds or more for merging into traffic stream of major road, how many vehicles would be able to merge into traffic stream of major road?   [CO3][8]

Q.3 Mention the details that are collected in an accident study. A vehicle of 4 tonne weight skids 28 m before it collides with parked vehicle of 2 tonne weight. Both vehicles skid 7 m after collision and stop. Find out the original speed of moving vehicle. Coefficient of friction is 0.35.   [CO4][8]

Q.4 Who are vulnerable road users (VRUs)? Describe the provisions for safety that are required to be designed and provided for VRUs in urban areas.   [CO2][8]

                                                    P.T.O.

Q.5 A fixed time 2-phase traffic signal is proposed at an intersection having a North-South and an East-West road where turning traffic is found negligible. The design hour flows from the various approaches and their saturation flows are as given in the following table.

Flow in PCU/hr	North	South	East	West
Design Hourly Flow (q)	800	800	1200	1200
Saturation Flow (s)	1850	2000	3600	3600

Design the traffic signal for optimum cycle time and green times giving the minimum overall waiting time at intersection. The time lost per phase due to starting delays is 2 seconds. The value of amber period is 2 seconds for North-South road and 3 seconds for East-West road. Draw the phase diagram.　　　[CO4][8]

Q.6 (a) Discuss objectives of road safety audit and mention different stages of auditing a highway project.　　　[CO1][4]

(b) Explain applications of ITS in traffic control and regulation.　　　[CO2][4]

Roll No............

71   *April/May-2023*

B.Tech. END SEMESTER EXAMINATION

CE-422 VULNERABILITY AND RISK ANALYSIS

Time: 3.00 Hours

Max. Marks:40

Note: Attempt Five questions. Question number ONE is compulsory.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Answer all the following questions (Any four)   [2x4=8]
  (a) Define Disaster as per UNISDR 2016   [CO1]
  (b) Draw disaster management cycle.   [CO1]
  (c) What is Poisson distribution and its application?   [CO2]
  (d) What does the KS test show?   [CO3]
  (e) What is damage ratio.   [CO5]

Q.2 (a) How hazard, risk, vulnerability are interconnected to each other?
                                                            [CO1][2]
  (b) Explain different techniques used to describe the vulnerability of
      building.   [CO4] [6]

Q.3 (a) Define terms: Retrofitting and Recovery   [CO1][2]

  (b) What is fragility curve and vulnerability curve? How do you
      obtain fragility curve for a component?   [CO5][6]

Q.4 (a) what is normal distribution and its properties.   [CO2][2]

  (b) What is Hazard, Risk, Vulnerability and Capacity Analysis
      (HRVCA). Explain in detail.   [CO4][6]

P.T.O.

Q.5 (a) How to determine the best fitting data distribution for risk analysis. [CO3] [4]

(b) The safety of a building in an earthquake-prone area is under consideration. The past 100 years of data indicate that there were four strong earthquakes in the area. Also, a, detailed evaluation indicates that during a strong earthquake, the probability that the building will suffer damage is 0.10. Assume that damage events for different earthquakes are statistically independent.

(i) What is the probability that there will be no strong earthquake in the area in 50 years, the service life of the building?

(ii) What is the probability that there will be only two strong earthquakes in 50 years? [CO2][4]

Q.6 (a) What is Post Disaster Need Assessment (PDNA). [CO4][3]

(b) Define Risk. What are the steps of monte carlo simulation for risk analysis? [CO4][5]

SIXTH SEMESTER

B.Tech (REGULAR)

END TERM EXAMINATION   *MAY 2023*

COURSE CODE- CE424   COURSE TITLE- HAZARD MONITIRING PREDICTION AND MITIGATION

Time: 3:00 Hours   Max. Marks: ~~80~~ 40

> **Note :** . Attempt all Questions.
>
> Assume suitable missing data, if any.

Q.1 What is Landslide? Explain their causes, prevention and mitigation.
[10][CO1]

Q.2 What is a volcano? Explain the different types of volcano with the help of diagrams.
[10[CO2]

Q.3 Explain the human impact on natural disasters.
[05][CO3]

Q.4 Write short notes on the following:
   (a) Flood Frequency.
   (b) Recurrence Interval of Flood   [05][CO4]

Q.5 How we can Monitor and predict natural hazards in the environment?
[10][CO5]

Total no. of Pages: 02

End Term Examination

Fourth Semester

Roll no...... ... .

May-2023

B.Tech. COE

Paper Code: CO 202 Database Management System

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]

a) What is a checkpoint? How is the checkpoint information used in the recovery operation following a system crash?

b) What is the difference between JOIN and OUTER JOIN operator?

c) What is the degree of relationship? Discuss with diagrammatic representation about the various types of degree of relationship?

d) How is mirroring implemented in Databases?

e) Explain transitive dependencies with suitable example.

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.

$$A \rightarrow BC$$
$$CD \rightarrow E$$
$$B \rightarrow D$$
$$E \rightarrow A$$

[4][CO4]

(b) A relation $R(A, B, C)$ has FDs $AB \rightarrow C$, $C \rightarrow A$. Is R in 3NF or in BCNF? Justify your answer.   [2][CO5]

(c) What are secondary indexes and what are they used for?   [2][CO7]

Q3. (a) What do you mean by disjoint constraints of specialisation/ generalisation? Explain with an example.   [2][CO2]

(b) Consider a B+ tree for the following set of key values: [6][CO7]
(2,3,5,7,11,17,19,23,29,31)

The values are added in the ascending order. Construct B+ trees for the cases where the number of pointers that will fit in one node is as follows:

   (i)   Four
   (ii)   Six
   (iii) Eight

Q4. (a) If there are three transactions with 1,2,3 operations respectively. [4][CO6]
Then find:
   (i)   Total number of schedules
   (ii) Total number of serial and non-serial schedules
(b) What is recoverable schedule? Why is recoverability of schedules desirable? Are there any circumstances under which it would be desirable to allow non-recoverable schedules? Explain your answer with suitable example. [4][CO6]

Q5. (a) Suggest two reasons for the popularity of strict two-phase locking protocol. [2][CO5]
(b) Consider the following schedule S for transactions T1, T2, T3, T4:

T1	T2	T3	T4
	READ(X)	WRITE(X) COMMIT	
WRITE(X) COMMIT			
	WRITE(Y) READ(Z) COMMIT		
			READ(X) READ(Y) COMMIT

Check whether the schedule is Conflict serialization and/or recoverable? [2][CO6]
(c) Compare the deferred and immediate modification versions of the log-based recovery schemes in terms of ease of implementation and overhead cost. [4][CO6]

END

Total no. of Pages: 02

B.Tech.(CO)

End-Term Examination

Roll no....................

Fourth Semester

May-2023

CO-204 Operating Systems Design

Time: 3 Hours   *Max. Marks: 40*

Note: Attempt any 8 Questions.
Assume suitable missing data, if any.

Q.1 Justify the statement "Operating System can be viewed as a government, resource allocator and a control program". Calculate the Average Turn Around Time & Average Waiting Time using Highest Ratio Response Next Scheduling.   [5] [CO2]

P.No.	Arrival Time	Burst Time
1	0	3
2	2	6
3	4	4
4	6	5
5	8	2

Q.2 What is the criterion used to select the time quantum in the case of a round-robin scheduling algorithm? Explain it with a suitable example.
                                                                   [5] [CO2]

Q.3 Why is a deadlock state more critical than starvation? Describe the resource allocation graph with a deadlock, with a cycle but no deadlock.
                                                                   [5] [CO3]

Q.4 With the help of diagrams, explain the concept of demand paging and demand segmentation. For a page reference string as 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6 and with three memory frames, calculate the number of page faults using Optimal, and LRU page replacement algorithms.   [5] [CO4]

77

Q.5 Explain different operations on File. Write short notes on: [5] [CO4]
i) Contiguous memory allocation
ii) Linked File allocation methods

Q.6 Describe the SSTF disk scheduling algorithm using the following data. The read/write head is initially at position-cylinder 53. The cylinder sequence of requests is 98, 183, 37, 122, 14, 124, 65. 67. Find the total head movement. [5] [CO5]

Q.7 Explain the difference between [5 [CO4]
(i) Physical and Logical address
(ii) Internal and External Fragmentation
(iii) Scheduler and dispatcher

Q.8 Consider a logical address space of 8 pages of 1024 words each, mapped on to a physical memory of 32 frames. How many bits are there in the logical and physical address? [5] [CO4]

Q.9 Explain the paging scheme of memory management. What hardware support is needed for its implementation? [5] [CO4]

Q.10 Explain different methods used to solve the problem of security a the operating system level. [5] [CO5]

78

FOURTH SEMESTER
B.Tech (CSE)

END TERM EXAMINATION   *May-2023*

CO206 Computer Organisation and Architecture

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) Design a 4-bit binary to Gray Code converter.   [CO1] [5]
(b) Describe a multiplexer using suitable example.   [CO1] [5]

Q.2 (a) What is Booth algorithm for multiplication? Draw flow chart for Booth algorithm.   [CO3] [5]
(b) Draw a flowchart for second pass of assembler.   [CO2] [5]

Q.3 (a) Describe General Register Organization and stack organization for central processing unit.   [CO3] [5]
(b)Explain the DMA data transfer mode and its respective block diagram.   [CO5] [5]

Q.4 (a) Explain Programmed I/O and Interrupt-initiated I/O with the help of a flowchart?   [CO4] [5]
(b) Design an input logic for microprogram sequencer for control memory.   [CO3] [5]

Q.5 (a) How is set associative mapping different from direct mapping and associative mapping?   [CO6] [5]
(b) Suppose the system is using a 4-way Set associative mapping in the cache. The cache size is 16 KB, block size is 8 words, word size is 32 bits. The size of main memory is 4GB. What is the number of bits required for cache tag? (Note: memory is word addressable).   [CO6] [5]

P.T.O

79

Q.6 (a) Draw a flow chart for adder and subtractor operations. [CO3] [5]
(b) The following program is a list of instruction in hexadecimal code. The computer executes the instruction starting from address 100. What are the content of AC and the memory word at address 103 when the computer halts?

[CO2] [5]

Location	Instruction
100	5103
101	7200
102	7001
103	0000
104	7800
105	7020
106	C103

Q.7 Write short note on ANY TWO of the following. [2X5]
(a)BCD Subtractor [CO
(b) Instruction Cycle [CO2]
(c)Logic Microoperations [CO3]

---------------------------------All the Best------------------------------------

4th Semester

B.Tech

END TERM EXAMINATION   MAY-2023

CO208   ALGORITHM DESIGN AND ANALYSIS

Time-3:00 Hours   Max. Marks-50

Note: Answer any 5 Questions.   Write pseudo codes for all algorithms asked.   Assume suitable missing data, if any.

Q1 (a) Write an optimized algorithm to find k largest values from an array of size n. Also discuss about the time and space complexity of the proposed algorithm.

Example: Input: $n = 7$, array $= [10, 5, 90, 3, 15, 70, 20]$, $k = 4$

Output: 15 20 70 90   [6M][CO2]

(b) Using greedy strategies for the fractional knapsack find an optimal profit to the knapsack instance with number of items $(n)=7$, weight of knapsack $(m)=15$, profit vector as $(10,5,15,7,6,18,3)$, and weight vector as $(2,3,5,7,1,4,1)$.   [4M][CO3]

Q 2 (a) Consider an undirected graph $G = (V,E)$ with nonnegative edge weights $w_e >= 0$. Suppose that you have computed a minimum spanning tree of G, and that you have also computed shortest paths to all nodes from a particular node $S \in V$. Now suppose each edge weight is increased by i.e. the new weights are $w'_e = w_e + 1$.

     (i)   Does the minimum spanning tree change? Give an example where it changes or prove it cannot change.

     (ii)   Do the shortest paths change? Give an example where they change or prove they cannot change.

                          [2+2=4M] [CO4]

(b) Suppose Bellman Ford Algorithm for a single source shortest path problem is run on the following graph. Draw a table showing the intermediate distance values of all the nodes at each iteration of the algorithm and show the final shortest-path tree by taking vertex 'A' as a source vertex.   [CO4] [7M]
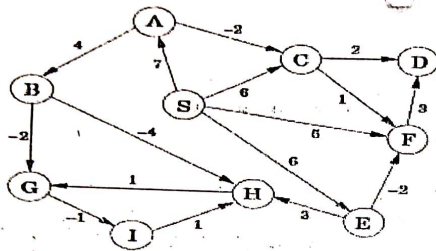
Q3.(a) Find the minimum spanning tree of the graph given below using Kruskal's algorithm. Clearly write all steps involved.
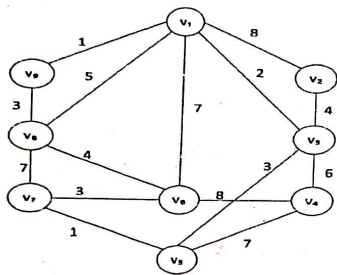

[7M][CO4]

(b) A long string consists of the four characters A, C, G, and T. They appear with frequency 31%, 20%, 9% and 40%, respectively. What is the Huffman encoding of these four characters? [3M] [CO3]

Q4. Using the idea of dynamic programming perform the matrix chain multiplication of four matrices, namely, A, B, C, D with order as 10x5, 5x15, 15x8, 8x20, respectively. Find the minimum number of scalar multiplications needed to parenthesize the matrices and also produce the corresponding parenthesized matrices. [10M][CO5]

Q5. What is travelling salesman problem (TSP)? Find the solution of following travelling salesman problem using branch and bound method. Obtain the reduced cost matrix and the portion of the state space tree that will be generated by LCBB (Least cost branch and bound).

[10M][CO6]
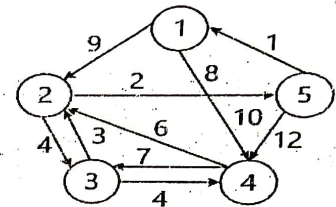
Q6. (a) Given an array of n distinct integers which denotes the denominations and a target integer which denotes the total amount, your task is to write an algorithm using the **Backtracking strategy** which will output all distinct ways of creating the total amount from the given denominations. Also, discuss the time and space complexity of the proposed algorithm.

Example: Denominations = [2, 3, 5], Total amount = 8
Output:
[2, 2, 2, 2]
[2, 3, 3]
[3, 5]
Note that the same denomination can be chosen unlimited number of times. You have to output only the unique combinations, for example, [3,5] and [5,3] are considered equivalent. [8M] [CO6]

(b) What do you mean by optimal substructure and overlapping subproblems in Dynamic programming. [2M] [CO5]

4th SEMESTER

B.Tech. (BT)

END TERM EXAMINATION   MAY-2023

CO252 Data Structure and Algorithms

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

> Note: All questions are compulsory.
> Kindly check the paper code before start your exam.
> Assume suitable missing data, if any.

Q1(a) Given the following list of numbers: [21, 1, 26, 45, 29,   **[4] [CO4]**
28, 2, 9, 16, 49, 39, 27, 43, 34, 46, 40] . What will be
the array after 3 recursive calls to merge sort?

(b) Consider a hash table with size **M =11** and a hash   **[6] [CO6]**
function with H1(k)=k%M. The keys are 11, 12, 19,
20, 52, 44, 56, 37, 60 are inserted into order.
(i)Perform the insertion in the hash table using linear
probing method. Consider the has function H(k,i)
=(H1(k)+i) %M.

(ii) Perform the insertion in the hash table using
double hashing with $H_1(k) = k\%M$ and $H_2(k) = 7-(k\%7)$

Q2.(a) What are the different types of queue and what are the   **[5] [CO2]**
applications of the queue. Write a program to
implement queue using stack.

(b) Construct a binary search tree for the given in-order and   **[5] [CO3]**
pre-order traversal. What will be the post order
traversal of the constructed BST?
Pre-Order: 20, 10, 5, 4, 8, 15, 18, 30, 25, 40, 50
In-Order: 4, 5, 8, 10, 15, 18, 20, 25, 30, 40, 50

Q3.(a) Consider an initially empty B-Tree of order 4. Insert the **[6] [CO3]** following elements into the B-Tree: 5, 3, 21, 9, 1, 13, 2, 7, 10, 12, 4, 8 and delete the following elements from the B- Tree: 2, 21, 10, 3, 4.

OR

(a) Insert the following keys into the AVL tree: 10, 85, **[6] [CO3]** 15, 70, 20, 60, 30, 50, 65, 80, 90, 40, 5, 55 and delete the following elements from the newly created AVL tree. 50, 60, 55, 40

(b) Write an algorithm to convert infix expression into the **[4][CO2]** prefix expression. Apply the algorithm on the following infix expression to a prefix expression.
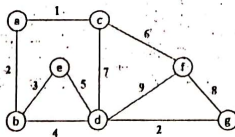Infix: a + b * c / d ^ e ^ f * g − h ^ e

Q4.(a) Find out the minimum cost spanning tree by using **[4] [CO5]** Kruskal's Algorithm on the graph given below:
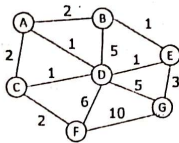
Show all necessary steps of your solution.

OR

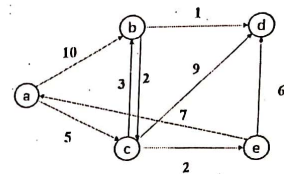**(a)** Find out the minimum cost spanning tree by Prim's **[4] [CO5]** algorithm from the source vertex a on the graph given below:

Show all necessary steps of your solution.

(b) Write down the working strategy of Dijakstra's **[6] [CO5]** algorithm? Apply Dijakstra's algorithm to find the shortest path from the source vertex **a.**

***************************End***************************

VI-SEMESTER
B.Tech.(CO)

END SEMESTER EXAMINATION   **May– 2023**
CO302 Compiler Design

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

Note: Attempt any _five_ questions

Q.No. 1

A. Construct SLR (1) parsing table and compute FIRST & FOLLOW for the following grammar: [4] [CO#2]

$$S \rightarrow DcDg$$
$$S \rightarrow PgPc$$
$$P \rightarrow \epsilon$$
$$D \rightarrow \epsilon$$

B. What is the role of context free grammar (CFG) in compiler design? Construct CFG for Language $L=\{0^a\ 1^b\ |\ a \neq b\}$ and Eliminate Left recursion from following grammar   [4] [CO#1]

$$S \rightarrow A$$
$$A \rightarrow Ad|Ae|aB|aC$$
$$B \rightarrow bBC|\ f$$
$$C \rightarrow g$$

Q.No. 2

A. How top down parsing is different from bottom up parsing? Design predictive parsing table for the following grammar: [4] [CO#2]

$$S \rightarrow aBDh$$
$$B \rightarrow Bb|c$$
$$D \rightarrow EF$$
$$F \rightarrow f/\epsilon$$
$$E \rightarrow g\ /\epsilon \qquad \text{(where 'S' is start symbol)}$$

B. Explain the working of LALR parser and Construct canonical LR parsing table for following grammar   [4] [CO#4]

$$S \rightarrow Aa|\ bAc\ |dc\ |bda$$
$$A \rightarrow d$$

Q.No. 3

A. Define CLOSURE(I) and GOTO(J,X) functions and construct the sets of LR(0) items for the following grammar.   [4][CO#3]

$$S' \rightarrow S$$
$$S \rightarrow iSeS|iS|a \quad \text{(where 'S' is start symbol)}$$

B. Explain loop unrolling and Loop jamming with example and construct program flow graph for the following program fragment.   [4] [CO#6]

```
int main() {
    extern int f(int); ...
    int i;
    int *a;
    for (i=0; i<10; i++ ) {
    a(i)=f(i); }}
```

Q.No. 4

A. Translate the following expression into three address statements

$$a= a+b*c$$
$$b= c+d*c$$
$$d= b+c*e$$

Also give quadruple and triple representation of the same? [4] [CO#4]

B. What are the various three address code representations? Generate three address code for the following program fragment   [4] [CO#3]

```
while (x<y and u<v) do
if x=1 then y=y+1
else
while x<=v do
x=x+3
```

Q.No. 5

A. What is an operator precedence parsing? Explain operator precedence parsing Algorithm.
[4] [CO#2]

B. What is DAG? What are its advantages in context of optimization? Construct DAG for the expression   [4] [CO#6]

$$Z=X-Y+X*Y*U-V/W+X+V$$

Q.No. 6

A. Explain various data structures used for symbol table and also compare the midsquare method and folding method used for generating hash values.   [4] [CO#3]

B. How is boot strapping of a compiler is done to a second machine? And also explain the function of each phase of compiler with suitable example.   [4] [CO#1]

Q.No. 7

A. Explain error recovery strategies adopted by complier.   [4] [CO#5]

B. Explain following with suitable examples   [4] [CO#2]
   a. Syntax directed translation Schemes
   b. LEX and YACC

END SEMESTER EXAMINATION . *May-2023*

CO304 ARTIFICIAL INTELLIGENCE

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. Answer *any TWO* of the followings

[a] Assume that you are hired by a company to evaluate the potential for using artificial intelligence (AI) techniques (not robots) to improve efficiency and reduce costs. You are given a list of tasks and are asked to identify which of the tasks can be replaced by an AI agent. The major tasks involved in the manufacturing process are: Assembly line tasks, Quality control inspections, Inventory management, Predictive maintenance, and Logistics

(i)   Identify which of the tasks can be automated using AI techniques.

(ii)   Evaluate the benefits and limitations of using AI to perform the identified tasks. [Maximum two sentences for each task]

[2+2] [CO1]

[b] Consider the tree shown in Fig. 1. Perform a depth-first search (DFS) of the tree. Let the start node and goal node are S and G, respectively. Also, perform a breadth-first search (BFS) of the tree. Which nodes are visited first in DFS and BFS?

[2+2] [CO2]

Fig. 1

---

accurate predictions (Q) based on the given Horn clauses and facts. Use AND-OR graphs for explanation.   [4] [CO2]

5. [a] Consider two deep learning models, A and B, used for detecting fraudulent transactions. Model A is 98% effective at recognizing fraudulent transactions when they occur but has a 15% false positive rate (indicating that a transaction is fraudulent, when it is not). Model B is 93% effective at recognizing fraudulent transactions, but has a 7% false positive rate. The two models use independent techniques for identifying fraud. Fraudulent transactions constitute 0.5% of all transactions. Let's say a transaction is evaluated using only one of these models, and that model flags the transaction as fraudulent. Which model's positive result is more indicative of a transaction genuinely being fraudulent? Justify your answer mathematically.   [4] [CO2, CO3]

[b] Consider a Bayesian network representing the relationship between weather conditions and two variables: "*Rain*" (R) and "*Slippery Roads*" (S). The network consists of the following conditional probability Tables (CPTs): $P(Rain) = 0.3$; $P(Slippery\ Roads = true \mid Rain = true) = 0.8$; $P(Slippery\ Roads = false \mid Rain = true) = 0.2$; $P(Slippery\ Roads = true \mid Rain = false) = 0.1$; $P(Slippery\ Roads = false \mid Rain = false) = 0.9$. You encounter a situation where the roads are slippery (S = true). Based on this information and the provided Bayesian network, calculate the probability of rain (R) being true.   [4] [CO2, CO3]
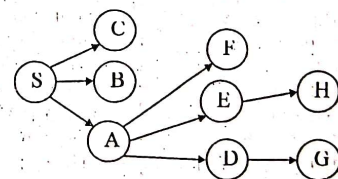
----**Best of Luck**----

[c] Suppose that the search algorithm is modified to use iterative deepening depth-first search (IDDFS). Assume that the maximum depth of the tree is 3. In what order are the nodes visited? Compare the number of nodes visited by DFS, BFS, and IDDFS. Which algorithm visits the fewest nodes in this case?   **[2+1+1] [CO2]**

2. [a] Consider a robot that needs to navigate through a grid world from its starting position to the goal position using A* algorithm. The grid world is represented by a 4x4 grid where each cell represents a state. The robot can move up, down, left, or right in the grid world and each move has a cost of 1. Assume that the robot is initially at (0,0) and wants to reach the goal at (3,3). There are four obstacles in the grid world: (1,1), (0,2), (2,1), and (3,2). The heuristic function $h(n)$ is the Manhattan distance between node n and the goal. Apply the A* algorithm to find the optimal path from the initial state to the goal state. Show the order in which the nodes are expanded, the cost g and h values of each expanded node, and the final optimal path.   **[3+1] [CO1, CO2]**

[b] Consider the robot navigation problem in 2[a]. Apply the uniform-cost search to find the optimal path from the initial state to the goal state. Show the order in which the nodes are expanded. Compare the performance of A* search to uniform-cost search on this problem. Which algorithm is more efficient and why?   **[3+1] [CO1, CO2]**

3. Answer *any TWO* of the followings

[a] Consider the state of tic-tac-toe game as shown in Fig. 2. The objective of the game is to get three of your own symbols (either 'X' or '0') in a row, column, or diagonal. The symbol X represents AI player. The heuristic function for AI player is defined as below:

The heuristic function assigns to each move a score of: +10 for immediate win; +5 for blocking opponent's immediate win (in next move); +3 for creating potential winning position e.g. two X with one empty cell in a row, column, diagonal; +2 for blocking the opponent winning position; +1 for occupying the center cell.

Find the next two moves of AI player by applying Steepest-Ascent hill climbing algorithm with above heuristic function. Show each step clearly. Represent each by row and column number. Assume that opponent is a perfect player.   **[4] [CO1, CO2]**

X		0
		X
0		

Fig. 2
2

[b] Consider a game tree of level 5 for two players MAX and MIN. Level 1 (MAX): A; Level 2 (MIN): B, C, D; Level 3 (MAX): E, F, G, H, I, J; Level 4 (MIN): K, L, M, N, O, P; Level 5: Q, R. Nodes B, C, & D are child nodes of A. Nodes (K, L), (M, N), (O, P), and (Q, R) are child nodes of F, G, J, and M, respectively. An evaluation function is used to assigns score to leaf nodes. The evaluation scores of leaf nodes are given in Table I. Here symbol ? represents inability of function to assign score. Is it possible to find minimax value and optimal strategy to play the game for MAX players? Also, calculate alpha and beta cut-offs if possible.   **[4] [CO3]**

Table I

Node	E	K	L	Q	R	N	H	I	O	P
Score	2	3	?	1	?	7	6	1	?	20

[c] Explain the purpose of alpha and beta values in the alpha-beta pruning technique in minimax algorithm. Suppose you have a game tree with a depth of 4 levels. At level 3, a beta cutoff occurs during the alpha-beta pruning process. Explain the conditions that lead to a beta cutoff and how it affects the search.   **[2+2] [CO2]**

4. [a] Consider the following propositional logic statements:

If a computer system has insufficient memory (M), then the performance degrades (D). If the performance degrades (D) or the CPU is overheating (O), then the system crashes (C). If the system crashes (C) and the hard disk fails (H), then data loss occurs (L). If data loss occurs (L), then the backup process is initiated (B). If the backup process is initiated (B) and the system is restored (S), then the downtime is minimized (X).

Prove by resolution that *if a computer system has insufficient memory (M) and the hard disk fails (H), then the downtime is minimized (X).*   **[4] [CO2]**

[b] Consider the following set of Horn clauses and facts:

If the model is well-trained (P), then it produces accurate predictions (Q). If the dataset is large (L) and the preprocessing is done correctly (M), then the model is well-trained (P). If the regularization is applied (R) and the batch size is optimized (B), then the preprocessing is done correctly (M). If the learning rate is set appropriately (L) and the cost function is minimized (C), then regularization is applied (R). If the features are well-defined (A) and the dataset is balanced (B), then the dataset is large (L). If the features are well-defined (A) and the model produces accurate predictions (P), then the dataset is large (L). The features are well-defined (A). The dataset is balanced (B). The cost function is minimized (C).

Using forward chaining, determine whether the model produces

3

88

B.Tech. _____ SEMESTER

END TERM EXAMINATION   *May-2023*

COURSE CODE (CO306)   COURSE TITLE COMPUTER NETWORKS

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

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

Q1. a) Suppose a data link layer uses CRC (Cyclic Redundancy Check) to detect errors in transmitted data. If the data word is 101001 and the generator polynomial is $x^3 + x + 1$, what is the remainder obtained after performing CRC and Code word received at the receiver side? [3] [CO2]

b) A sender transmits 10 packets to a receiver using the Stop-and-Wait protocol. The propagation delay is 100 ms and the transmission time for each packet is 10 ms. If the acknowledgement delay is negligible, what is the time taken to transmit all the packets, Explain steps?   [3][CO3]

c) Draw UDP header and explain each field.   [2][CO2]

Q2. a) In Selective Repeat protocol, the sender's window size is 4 and the receiver's window size is also 4. The sequence numbers range from 0 to 7. The sender sends packets 0, 1, 2, 3 and they are all acknowledged. The sender then sends packets 4, 5, 6, 7, but packet 6 is lost. The sender then sends packet 6 again. What is the minimum number of packets that need to be retransmitted and why?   [2][CO3]

b) Explain congestion control algorithms with the help of a diagram. [3][CO3]

c) A CSMA/CD network has a data rate of 100 Mbps and a propagation delay of 5 μs. The minimum frame size is 512 bytes. What is the minimum packet transmission time?   [3][CO2]

Q3. a) Suppose there are 5 stations in a CSMA p-persistent network. The channel is idle with a probability 0.2 and each station has a probability of 0.5 of transmitting in a given time slot. If station 1 is ready to

transmit, what is the probability that it will successfully transmit on the first attempt? [4][CO2]

89

b) i) Given the IP address 10.0.0.0/8, how many subnets and hosts per subnet can be created? [2][CO3]
ii) What is the network address and broadcast address for the IP address 10.20.30.40/26? [2][CO3]

Q4. a) Answer IPv4 header questions [2][CO3]

   i. What is the size of the IPv4 header in bytes?
   ii. How many bits are used to represent the IPv4 address?
   iii. What is the maximum size of an IPv4 datagram?

   iv. What is the value of the TTL (Time To Live) field in the IPv4 header for a packet that has to traverse 15 routers?

  b) Write a short note (Any two) [4][CO5][CO6]
     ii) Remote Procedure Call (RPC)
     iii) Domain Name System (DNS)
     iv) Simple Mail Transfer Protocol (SMTP)
  c) What is a digital signature, explain with the help of diagram and mention applications of digital signature. [2][CO6]

Q5. a) In TCP, the initial RTT is 20 ms. The acknowledgements for the first four segments are received in time 25 ms, 18 ms, 23 ms, and 21 ms. Using the basic algorithm, find the timeout timer value for the first five segments. Use $\alpha = 0.5$. [3][CO6]

  b) If a datagram of size 5000 bytes is transmitted over a network with an MTU of 1200 bytes, and the header length is 20 Bytes. What is the offset of the first, second and third fragments? [3][CO4]

  c) Suppose Alice and Bob want to establish a shared secret key using Diffie-Hellman key exchange. They agree to use a prime modulus $p = 13$ and a base $g = 3$. Alice chooses a secret integer $a = 4$ and sends g^a mod p to Bob. Bob chooses a secret integer $b = 3$ and sends g^b mod p to Alice. What is the shared secret key that Alice and Bob can use to encrypt and decrypt their messages? [2][CO4]

Q6. a) What is the difference between guided and unguided transmission media? Give an example of each. [2][CO1]

  b) Why TCP is slower but more reliable than UDP Protocol in Transport Layer, Explain. [2][CO4]

  c) What is count to infinity in distance vector routing? How does split horizon prevents routing loops in distance vector routing, Explain. [4][CO3]

96

End Term Examination

May-2023

Sixth Semester

B.Tech. COE

Paper Code: CO 318 Advanced Database Management System

Duration: 3:00 Hours

Max Marks: 50

Note: All questions are compulsory.
Marks for questions are indicated alongside
Assume suitable missing data, if any.

Q1.
a) Explain stable storage. [1][CO1]
b) Using the concept of Object Relational database, give the syntax for performing following operations (attempt any four): [4][CO1]

   i.   Create composite datatype Name(firstname. Lastname) and Address (street, city, zipcode)
   ii. Create a table Employee(Name, address, date_of_birth)
   iii. Create a sub-table Manager(m_id, managing_dept) which inherits Employee table
   iv. Insert a record into Manager table with sample values
   v.   Write a SQL query on Manager table to retrieve all first name and last name of employees managed by all managers.

Q2.
a) List and explain measures for query cost evaluation. [3][CO2]
b) What are the various applications of real-time databases? [2][CO6]

Q3.
a) Briefly explain Two-phase commit protocol. [3][CO5]
b) Discuss relative advantage of centralized and distributed databases. [2][CO5]

Q4.
a) Explain how the following differ: fragmentation transparency, replication transparency, and location transparency. [3][CO5]
b) What are the methods of query processing? [2][CO2]

Q5.
a) Give any two parallel join algorithm.   [3][CO4]
b) Explain data fragmentation in distributed database.   [2][CO5]

Q6. Differentiate between the following:
a) Intra-operation & Inter-operation Parallelism.   [2.5][CO4]
b) Recovery and atomicity.   [2.5][CO3]

Q7.
a) Explain speedup and scale-up in parallel system.   [2][CO4]
b) Give brief description of any three parallel database architectures.

[3][CO4]

Q8. Explain any three advanced recovery algorithm.   [5][CO3]

Q9.
a) Explain long duration transactions.   [2][CO6]
b) Explain issues related to storage of data concerned with mobile
computing.   [3][CO6]

Q10.
a) Explain the architecture of remote backup system with a neat diagram. Describe the issues that must be addressed in designing a remote backup system.   [4][CO3]
b) List any two approach for maintaining "Availability" in distributed databases.   [1][CO5]

END

VI SEMESTER
B.Tech.

END TERM EXAMINATION   **May-2023**

CO326 OBJECT-ORIENTED SOFTWARE ENGINEERING

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

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

Q.1 a) What is UML? Explain the objectives of modelling.

b) Explain the importance of requirements. How many types of requirements are possible?

c) What is the purpose of extension and inclusion association between use cases.? Explain with the help of an example.   [10] [CO2, CO3]

Q.2 a) How is a class diagram different from an ER diagram

b) Differentiate between aggregation and composition relationships.

c) Explain various types of classes along with their notations. [10] [CO4]

Q.3 a) Consider the railway reservation system. Draw the sequence diagram for reservation and cancellation of trains.

b) Describe the various types of messages in UML with their notation.
                                                      [10] [CO5]

Q.4 a) Consider a traffic light system. Draw its state chart diagram. Specify the rules according to which the system is controlled.

b) Differentiate between interaction diagrams and state chart diagrams.
                                                      [10] [CO6]

Q.5 Write a Short note on:
(a) Software testing tools
(b) State-based testing
(c) Class testing   [10] [CO7]

END TERM EXAMINATION

May-2023

CO408   Intellectual Property Rights

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 Answer the following questions briefly:
  i.   What is meant by infringement of Copyright?   [CO-1]
  ii. Discuss any two provisions of the TRIPS agreement.   [CO-5]
  iii. Explain the licensing in Trademark.   [CO-4]
  iv. Write the procedure for registration of an industrial design.   [CO-2]
  v.   Distinguish between Novelty and Inventiveness.   [CO-1] [2*5=10]

Q.2 a) "Protecting the created intellectuality is a challenge now days, Because of the cloning of one's idea is easier than the new creation"–How this statement is realistic in practicing business?   [CO-5]

   b) What are the benefits of protecting copyrights and related rights? Discuss the differences between a patent and a copyright? Explain by a suitable example.   [CO-3] [5+5=10]

Q.3 a) Hypothetically, you are setting a new cold drink manufacturing company with new and innovative machineries and recipes. You plan to use your knowledge of IPR to safeguard your new company from old bigshot companies as well as new budding companies. Describe in detail, what intellectual property rights you will register and how you will benefit out of it.   [CO-4]

   b) Explain the importance and protection of IPR. When information is called confidential information? What precautions an owner of such information has to take to sustain it as such confidential information?
                                                                          [CO-4] [5+5=10]

Q.4 a) India provides protection to Intellectual Property Rights in accordance with its obligations under the TRIPS agreement of the WTO. Discuss with a suitable example. [CO-2]

b) As a trademark policy can you register or use a mark that sounds the same as an existing mark but looks different and also discuss the grounds of refusal of registration of a trademark? [CO-4] [5+5=10]

Q.5 a) Discuss the salient features of the Design Act, 2000 [CO-1]

b) Discuss the registration procedure and criteria for granting patents. [CO-3] [5+5=10]

Q.6 Write short notes on the following.
   a) WCT
   b) WIPO [CO-5]
   c) WPPT [CO-5]
   d) Trademark Infringement. [CO-5]
   [CO-4] [2.5*4=10]

_____END_____

(i) calculate the total number of likes, comments and shares on all posts made by users.

(ii) calculate the total number of posts made by each user.

(iii) calculate the engagement rate for each post, defined as the sum of likes, comments, and shares divided by the total number of followers of the user who made the post. (Assume number of followers as 1000)

[b] Given the following dataset: [3+2] [CO3]

[40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100]

Draw a box plot for the given dataset. Further, when should boxplots be used as opposed to histograms?

[c] Explain the following: [2.5+2.5] [CO2]

(i) Pig and Pig Scripting

(ii) Zookeeper and Role of Zookeeper in Hadoop ecosystem

---Best of Luck---

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

EIGHTH SEMESTER
B. Tech
END TERM EXAMINATION   May-2023
CO414 BIG DATA ANALYTICS
Time: 3:00 Hours   Max. Marks: 50

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

Q.1 [a] Amazon (a large retail company) wants to analyse the sales data to gain insights into customer behaviour and improve their marketing strategies. Describe how the various V's of big data are applicable in the given case study.   [5] [CO1, CO3]

[b] World Health Organization (WHO) wants to improve the patient outcomes by analysing and reporting their electronic medical records (EMRs). Describe the process and challenges of analysing and reporting.   [3+2] [CO1, CO4]

Q.2 [a] A retail company 'X' collects large volume of customer data like in-store purchases, online orders, and customer feedback. Company 'X' wants to use this data to gain insights into customer behaviour and preferences. However, data is unstructured, inconsistent, and contain errors. As a big data analyst, write the techniques which you will use to ensure the reliability and accuracy of data.   [5] [CO3, CO4]

[b] Assume, you are a member of a big data analytics team. Your team is using sliding window counting algorithm to analyse a data stream of customer transactions. Team want to count the

number of unique customers in a sliding window of size 10 from the following sequence of customer IDs in the stream: 1001, 1002, 1001, 1003, 1004, 1001, 1005, 1006, 1004,1007, 1008, 1009, 1010, 1006, 1001, 1011, 1012, 1013, 1014, 1015. What is the number of unique customers in each sliding window? [5] [CO2, CO5]

Q.3 Attempt *any TWO* of the followings [5+5]

[a] Explain the functionality of following HDFS components:
   (i) Client
   (ii) Block
   (iii) Rack
   (iv) Heartbeat
   (v) Secondary Name Node [1x5=5][CO1]

[b] Discuss how job runs on MapReduce. Write down the step by step procedure. [5][CO2]

[c] A big data analytics team is managing a Hadoop cluster with 10 worker nodes. The cluster is running out of the storage capacity, and the team decides to add 5 more worker nodes to the cluster to increase the storage capacity. Assume that each worker node has 4TB of storage capacity, and the cluster currently has 30 TB of data storage on it. Team wants to ensure that the data is evenly distributed across all the worker nodes after adding the new nodes. [1.5+1.5+2][CO2, CO3]
   (i) What is the current storage utilization of the Hadoop cluster?

(ii) After adding the new nodes, what will be the storage capacity of the Hadoop cluster?

(iii) How much storage capacity will be added to each worker node after adding the new nodes?

Q.4 Attempt *any TWO* of the followings [5+5]

[a] Elaborate the steps involved in setting-up a Hadoop cluster. [5] [CO1]

[b] A company has a Hadoop cluster and they want to analyse and identify the security risk. You are a big data analyst working for the company. Explain the security risks which can be identified in the Hadoop cluster. Further, briefly discuss about the pillars of security. [3+2] [CO3, CO4]

[c] In HDFS maintenance, a big data analyst 'T' uses two major features which are Rolling upgrades and Decommission. Explain the above two features for HDFS maintenance. Moreover, explain how 'T' can monitor the performance and health of a Hadoop cluster. [3+2] [CO1, CO2]

Q.5 Attempt *any TWO* of the followings [5+5]

[a] A social media platform has collected user data on the number of likes, comments, and shares on posts made by users over the past year. They want to analyse this data to gain insights into user engagement and behaviour. Data "social_media_data" have following attributes "user-id", "post-id", "likes", "comments" and "shares". Write Hive queries for the following: [1.5+1.5+2] [CO2,CO5]

EIGHT SEMESTER   **B. Tech**

END TERM EXAMINATION   ,   .   .   .   **May-2023**

CO418 NATURAL LANGUAGE PROCESSING

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

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

Q.1 [a] Describe the text patterns matching the following regular expressions:

       (i) /[wh]..te?/

       (ii) /(w|h)?ere\?/

       (iii) /[wh]^[0-9]/   [2x3=6] [CO1]

[b] What is the syntactic structure of the sentence: **"I went to store to buy some apples."** Also, represent the same using tree diagram.

                                 [4] [CO1, CO3]

Q.2 [a] Suppose you are building a language model to predict the next word in a sentence using n-gram approach. You have a training corpus of text and you have to calculate the probability of a trigram (3 gram) sequence "I am happy". Given the following counts from your training corpus, what is the probability of this sequence according to your model?   [5][CO2, CO3]

- Count of "I am happy": 10
- Count of "am happy": 20
- Count of "happy": 50
- Count of "I am": 1000
- Count of "am": 2000
- Count of "I": 5000
- Total number of trigrams in the corpus: 100,000

[b] Distinguish between bounded movement and unbounded movement. What expressions were added to the augmentation system to enable it to handle unbounded movement? [5] [CO1, CO2]

Q.3 You are working on a chatbot project for a retail company that wants to provide customer support via chat interface. The chatbot should be able to understand and interpret user queries and respond appropriately. However, the company is concerned about the chatbot's ability to accurately interpret the meaning of user queries. What are some potential issues that may arise with semantic interpretation in chatbots, and how can they be addresses? [10][CO2, CO3]

Q.4 Explain viterbi and HMM using Pseudocode with an example? [10][CO2]

Q.5 Write a short note on: [2x5=10][CO1, CO2]

[a] Unification   [d] Part-of-speech tagging

[b] WordNet   [e] PCFGs

[c] Maximum Likelihood Estimation

Q.6 How can top-down chart parsing be used to parse a sentence and generate a parse tree , consider the following production:

S->NP VP

NP -> Det N

VP -> V NP

Det -> "The"

N -> "cat" | "mouse"

V -> "chased"

Generate a parse tree by applying grammar rules for the following sentence: **"The cat chased the mouse."** [4+6][CO3, CO4]

---Best of Luck---

VIII SEMESTER

B.Tech

END TERM EXAMINATION   *May-2023*

CO428   **Data Warehousing and Data Mining**

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

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

Q.1 Differentiate between the following: [4x2=8][CO2]
  a) Dimensionality Reduction and Data Reduction
  b) Covariance and Correlation
  c) ROLAP and MOLAP
  d) Support and Confidence

Q.2 a) What is the significance of Precision and Recall measures? Explain in detail using an example.   [4][CO1]
  b) Explain Snowflake schema in detail. What is a hypercube and how do rollup and drill down operations help in analysis? [4][CO3]

Q.3 The output of a classifier is described in the below table. Generate the confusion matrix and evaluate the classifier based on Specificity, Sensitivity, False Positive Rate and False Negative Rate.   [8][CO4]

Item#	1	2	3	4	5	6	7	8	9	10
Predicted class	A	A	A	B	A	B	B	B	A	B
Actual class	B	A	B	B	B	B	A	A	A	A

Q.4 a) What problems can occur when clustering is applied to the real-world databases? Compare and contrast various clustering methods. [3][CO3]

b) With the help of an example, explain how principal component analysis utilises eigen vector and eigen value. [3][CO2]

c) What are the limitations of K-Nearest Neighbour technique and how may they be addressed. [2][CO2]

Q.5 a) The table given below shows parameters A1, A2 and A3 based on which classification may be done. Using this information, generate the decision tree. Comment on the status of overfitting in the tree and its resolution. [3][CO4]

A1	Y	N	Y	N	Y	N	Y	N
A2	Y	Y	N	N	Y	Y	N	N
A3	Y	Y	Y	Y	N	N	N	N
Class	C1	C2	C2	C1	C1	C2	C2	C1

b) Calculate the city-block distance between the two data points $X_1(1,3)$ and $X_2(2,3)$. [2][CO1]

c) Suppose there are 2 white and 3 black coins in a box B1 and 3 white and 4 black coins in a box B2. One box is selected at random and a coin is drawn from it. If the coin drawn is found black, what is the probability that the box chosen was B1? [3][CO4]

CH202 Fluid Mechanics

Time: 3 Hours   Max. Marks - 40

Instructions to the candidates:

1)   Attempt all questions

Q.1 Write answers in one word.   (10×1)

(i) Polymeric melts are generally _____ types of fluids.
(Newtonian/ Non-Newtonian)   [CO1]

(ii) Continuous Decanter is used for separating the two _____
fluids. (Miscible/ Immiscible).   [CO1]

(iii) Viscosity of a Newtonian fluid is _____ with increasing
temperature. (Increasing/Deceasing/Constant)   [CO1]

(iv) If a Newtonian fluid is flowing inside a pipe, the local velocity of
fluid will be maximum at the _____ of the pipe.   [CO1]

(v) Equation of Motion is valid for _____ types of fluids.
(Newtonian/ Non-Newtonian, All)   [CO1]

(vi). A fluid is flowing between two parallel plates. One plate is moving
with the velocity V_1 and second plate is moving with velocity V_2 . If no-
slip condition is applicable, what will be the velocity of fluid at the
solid surface of both plates?   [CO1]

(vii) If value of "n" is greater than one for a Non-Newtonian fluid the
viscosity of fluid will _____ with increasing velocity of shear
rate of fluid. (Increase/Decrease/Remain constant).   [CO1]

(viii) Write the types of drag forces exerted on a solid body by a flowing
fluid.   [CO5]

(ix) What is the range of Reynolds number for Stokes' law? [CO5]

(x) Write the mathematical expression of Reynolds Number? [CO1]

Q.2 Write short answer (In one sentence)
(5×2)

(i) In a food processing plant, vegetable oil having density 850 kg/m³ and viscosity 0.001 Pa.s is flowing at the average velocity of 2 m/s through a circular pipe of diameter 60 mm. Calculate the Reynolds number. Determine the behaviour of flow (laminar/transition/turbulent).
[CO2]

(ii) Write the mathematical expression of Stocks' law. [CO5]

(iii) A fluid having density 1000 kg/m³ is flowing with an average velocity 2 m/s through a circular tube. At study sate and fully develop flow, the shear stress applied on the wall due to flow is 10 N/m². Calculate the value of friction factor.
[CO3]

(iv) A fluid having density 1000 kg/m³ is flowing through a 50 mm diameter circular tube with average velocity of 2 m/s. The diameter of circular tube is reduced to 10 mm as shown in the figure below. Calculate the average velocity of the fluid in 10 mm tube section.

[CO6]

(v) Write the boundary condition for liquid air interface when a fluid is freely falling on an inclined surface. [CO2]

Q.3 (i) Write the mathematical expression of the Bernoulli's equation. What are the assumptions used in Bernoulli's equation? (3) [CO3]
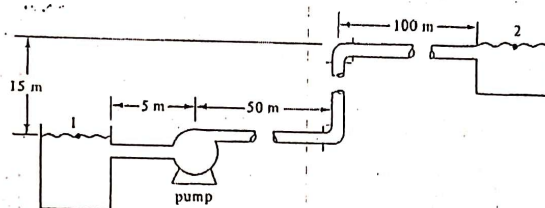
(ii) Which type of fluid flow (Laminar/Turbulent) is more efficient in industrial scale operations. Give the reasons of your answer. (3) [CO1]

(iii) Write the mathematical expressions of power law and Bingham plastic models with explanations. (4) [CO1]

Q. 4 (i) Define the Wall Drag, Form Drag and Drag Coefficient. How does the values of drag coefficient vary with the different range of Reynolds number?
(5) [CO5]
(ii) Water at 20 °C is being pumped from a tank to an elevated tank at the rate of 5.0×10^{-3} m³/s as shown in figure below. The pump has the efficiency of 65 % calculate the power needed for the pump. (5)
[CO6]
(Internal diameter of pipe 0.1023 m; cross sectional area 8.219×10^{-3} m²; Fluid properties: density 998.2 kg/m³; viscosity 1.005×10^{-3} Pa.s; Fanning friction factor 0.0051; Friction factor for elbows 0.75)

END

B.Tech – IV Semester
END TERM EXAMINATION   **May-2023**
CH204   Chemical Reaction Engineering-I
Time: 03:00 Hours   **Max. Marks: 40**

Note : All questions are compulsory.
      Use pencil to draw diagram (s)
      Use of graph paper is permitted·
      Assume suitable missing data, if any.

Q.1 Using Integral rate method of data analysis, Prove that for nth order reaction,

$$t_{1/2} \alpha \frac{1}{C_{A0}^{n-1}}$$ [5] [CO3]

Q.2 After 8 minutes in a batch reactor, the reactant 'A' $[C_{A0}=1$ mole/lit] is 80% converted. After 18 minutes, conversion is 90%. Using Integral Method, find the rate equation to represent this reaction.   [5][CO1] [CO2]

Q3. (a). Differentiate between Isothermal and Adiabatic Reactor   [2.5][CO4]
    (b). What are the merits of Semi-Batch Reactor, over Batch and Continuous reactor.   [2.5][CO4]

Q 4. Derive the performance equation for a Plug-Flow Reactor.   [5][CO4]

Q 5. What do the flow behaviour of real reactors deviates from ideality. [5][CO5]

Q6 . Define the term 'RTD'. Explain the Pulse Input Method of tracer to determine the RTD. How E Curve is obtained from C curve?   [5] [CO5]

Q7. Pure gaseous reactant A ($C_{A0}=100$ millimol.lit) is fed at steady state into a mixed reactor (V=0.1 litre), where the reaction 2A--->R, takes place and the following data is obtained at different gas feed rates.

Run Number	1	2	3	4
V_0 (lit/h)	30	9.0	3.6	1.5
C_A out (millimole/lit)	85.7	66.7	50	33.3

Find the rate equation for this reaction.   [10][CO5]

--------------------------------END--------------------------------

IV SEMESTER

B.Tech

END TERM EXAMINATION   *May-2023*

CH206: Mechanical Operations

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

> **Note: All questions are compulsory**
>   **Assume suitable Missing data, if any**

Q.No.			Marks	CO
1 [a]		Discuss the factors to be considered for selecting equipment and operating conditions for filtration process.	2	3
	[b]	What is hinder settling of particles? Find the terminal settling velocity of 40% by volume of sand particles in a fluid having hindered velocity of 6.5 μm/s. The Richardson-Zaki index is 4.2.	3	4
2 [a]		Define the term angle of repose. Calculate the flowability of bituminous coal. The angle of repose is 35 °. The angle of internal friction is 60°.	2	5
	[b]	Differentiate between (a) cake filtration and depth filtration. (b) sedimentation and flocculation	3	3 4
3 [a]		Calculate the specific surface area silica sand, The data of screen analysis is given below. Density of silica is 3.2 g/cc and sphericity of 0.71.	2.5	1

Mesh no.	Sieve size, mm	Mass fraction
4	4.75	-
5	3.35	0.15
6	2.80	0.35
8	2.00	0.30
10	1.80	0.10
Pan	-	0.10

[b] A crushed ore was screened, using a 340 mesh screen to separate the oversize material to be recycled for further crushing. The mass fraction of the oversize material in feed, overflow and underflow were found to be 0.6, 0.7 and 0.2 respectively. Calculate the mass ratios of overflow to feed and underflow to feed. Calculate the screen effectiveness based on the oversize materials.   2.5   1

4   Grain is milled at a rate of 10 t/h and the power required for this operation is 67.5 kW. The details of size analysis before and after the milling is given in the table. Assuming that Bond's law best describes the relationship between energy required and change in particle size, determine the work index for the grain and thus find the total power requirement to mill down to a distribution where 80% passes 100 mm.   5   1

Feed sample		Milled sample	
Average sieve size (mm)	Mass fraction	Average sieve size (mm)	Mass fraction
6730	0.00	605	0.00
4760	0.05	425	0.08
3360	0.15	300	0.12
2380	0.70	212	0.65
1680	0.10	150	0.11
		100	0.04

5   In batch filtration process, show that the rate of filtration is directly proportional to the pressure difference across a filter medium and inversely proportional to the resistance of a cake and filter medium.   5   3

A filter press is used to filter a sludge forming a non uniform compressible cake. At a constant pressure difference, 12000 L filtrate is obtained in 1 h. washing is done with 2400 L of water, it proceeds exactly as filtration. The filtrate has the same properties as the wash water. Neglecting the resistance of filter cloth, calculate the washing time required.

6   Consider the one-dimensional motion of particles. Derive a general expression for terminal velocity of a particle settling under gravity in a fluid. Determine the settling velocity of spherical particles (density= 2500 Kg/ m^3) settling under laminar conditions in water at 25°C. The average particle diameter is 1000μm. Viscosity and density of water at 25°C are 1.00 cP and 998 kg/m^3.   5   4

7   The lead particles (density 7800 Kg/m^3) and quartz particles (density 2650 Kg/m^3), settling separately in water at 20°C with identical terminal velocity. Find the ratios of their diameters under (a) Strokes law region (b) Newton's law region.   5   4

8   Write the advantage and disadvantages of hydraulic and Pneumatic Transportation of solid particles. 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 from 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   5   5

106

RollNo:............

4th Semester

B.Tech

END TERM EXAMINATION   MAY 2023

CH208   HEAT TRANSFER

Time: 3:00 Hours   Max. Marks: 40

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

Q1 a) What are the different laws of Heat Transfer. Explain each law in details.   [5][CO1]

b) A plane wall of fireclay brick 25cm thick is having temperature 135^{0}C and 50^{0}C on two sides. The thermal conductivity for clays varies as :

K=0.838(1+0.0007T),

Where T is in degree Celsius.

Calculate the heat loss per square meter through the wall.   [3][CO2]

Q2 a) Define condensation. Differentiate film-wise condensation and dropwise condensation. Explain in brief each factors affecting the condensing heat transfer.   [5][CO3]

b) A saturated vapor at 352^{0}K condenses on the outside of a pack of 16 horizontal tubes arranged in 4x4 array. Estimate the rate of condensation per meter length of array, if the tube surface is maintained at 315K.

Where, D_o=12.5mm , λ=13kJ/kg, ρ=1150kg/m^3

k=0.071W/m.K, u=0.26 x 10^{-3}kg/m.s   [3][CO3]

Q3 a) Explain the following terms with explain:

i) Gray Body   ii) Opaque Body

iii) Black Body   iv) White Body   [2][CO4]

b) Define and explain kirchoff's law and plunk's law. Discuss the radiation between two surfaces.   [4][CO4]

|07

c) Estimate the total heat loss by convection and radiation from an unlogged steam pipe 50mm and at 130°C to surrounding air at 25°C, take ε=0.9   [2][CO4]

Q4 a) Define Evaporators. Classify it. Write down the principle and industrial application of each type of evaporators.   [5][CO5]

b) Explain in detail the factors affecting the evaporation process   [3][CO5]

Q5 a) Define dimensionless group and its importance in heat transfer operation. List the dimensionless group used in heat transfer process and explain the physical significance at least 3 of them. List the advantages, disadvantages and limitation of dimensionless group.   [6][CO3]

b) A steam pipe, 10cm ID and 11cm OD is covered with an insulating substance (K=1W/mk). The steam temperature and the ambient temperature are 200°C and 20°C respectively. If the convective heat transfer co-efficient between the insulation surface and air is 8W/m²K, find the critical radius of insulation. For this value of r_o calculate the heat loss per meter of pipe and the outer surface temperature. Neglect resistance of the pipe.   [2][CO2]

Q6 Explain the following in detail:

a) Insulating material   [4][CO1]

b) Characteristics curve of boiling liquid   [4][CO3]

Q7 a) What is heat exchanger? Classify heat exchanger with suitable industrial uses.   [4][CO5]

b) What are the limitations of LMTD method in heat exchanger analysis? How is E-NTU method superior to LMTD method in heat exchanger analysis.   [4][CO5]

SIXTH SEMESTER

B.Tech.

END TERM EXAMINATION   *May-2023*

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 term bioreactor? Explain the various [1+3+1]
parts of bioreactor with the neat and well labeled diagram. [CO1]
Enlist the various types of bioreactors.

b) Gaseous A absorbs and reacts with B in liquid according [5][CO3]
to

$$A (g \rightarrow l) + B (l) \rightarrow R (l),$$
$$- r_{Al} = kC_A C_B$$
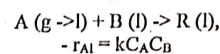
in a packed bed.

(i) Calculate the rate of reaction.

(ii) Determine 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

Q.2 a) Define the term Catalyst deactivation. What are the [5+5]
catalyst deactivation mechanism? Explain the various [CO3,CO4]
prevention measure used for catalyst deactivation.

b) The second order reaction A----> R is studied in an
experimental recycle reactor with very large recycle ratio.
The data are as follows:
Amount of catalyst used = 3 g
Void volume of reactor = 1 litre
Feed to the reactor: v_o = 1 litre/h with C_{AO} = 2 mol/l
Concentration of A in the exit stream from the recycle
system ($C_{A\ out}$) = 0.5 mol/l
(i) Find the rate constant for the reaction.
(ii) Calculate the amount of catalyst needed in a packed
bed reactor to achieve 80% conversion for feed to the
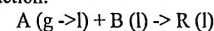reactor: v_o = 1000 l/h and C_{AO} = 1 mol/h

Q.3 a) Draw the various types of concentration profiles for mass [5+5]
transfer with chemical reaction. [CO3,CO1]

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 determine
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) We plan to remove about 80% of the A present in a gas [5+5]
stream by absorption in water containing reactant B in a [CO2,CO3]
packed tower. Material B reacts with A as per the
following reaction:
$$A\ (g \to l) + B\ (l) \to R\ (l)$$
The reaction is extremely rapid. Therefore, k =∞
Determine the height of tower for countercurrent
operation using the following data.

Data: The gas and liquid flow rates are:
F_g/A_{cs} = 1*10⁵mol/(h.m²) at π =10⁵ Pa
F_l/A_{cs} = 7*10⁵ mol/(h.m²)
H_A = 12.5 (Pa.m³)/mol
C_T (molar density of liquid) = 56000 mol/m³
p_{Ain} = 100 Pa
For the packed bed:
k_{Ag} a = 0.32 mol/(h.m³.Pa)
k_{Al} a = 0.10 h⁻¹
$C_{B\ in}$ = concentration of reactant B in water entering the
tower = 32 mol/m³
Assume the diffusivities of A and B in water are the
same.

b) Briefly explain the characterization of heterogeneous
catalyst based on the properties.

110

Roll no................

VI Semester

B.Tech

END TERM EXAMINATION   May-2023

CH304   Mass Transfer-II

Max. Marks: 40

Time: 03:00 Hours

Note : All questions are compulsory,
       Assume suitable missing data, if any.
       Use pencil to draw diagram(s)
       Use of graph paper is permitted

Q.1 Differentiate between:
(a) Maximum Boiling Azeotrope and Minimum Boiling Azeotrope   [3][CO1]
(b) Liquid Liquid Extraction and Distillation   [3] [CO3]
(c) Single Stage Extraction and Multi-Stage Extraction   [3] [CO3]

Q.2: With neat and Clean Diagram, Explain the principle and working of Oslo crystalliser   [5][CO4]

Q.3: A continuous fractionating column is to be designed to separate 350 gmoles/min of a binary mixture containing 40% (by weight) of benzene and 60% (by weight) of toluene. The top product contains 97% (by weight) Of benzene and the bottom product contains 98% (by weight) of toluene. A reflux ratio of 3.5 moles to 1 mole of product is to be used. The feed is liquid entering the column at its boiling point.

(a). Determine the number of ideal plates.

(b). Calculate the moles of overhead product and bottom product.

Given: Molecular Weight of Benzene=78

    Molecular Weight of Toluene=92

Equilibrium Data:

x	0	0.100	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.0
y	0	0.185	0.36	0.50	0.61	0.70	0.78	0.84	0.90	0.95	1.0

[10][CO2]

Q.4 Define the term 'Leaching' How oil is extracted from seeds by leaching? How the temperature effect the rate of leaching? [5][CO4]

Q.5(a).: The Picric acid is to be extracted with Benzene, as extraction solvent The aqueous solution contains 0 2 moles of picric acid per litre Calculate the quantity of the benzene required to be contacted with 5 L of aqueous solution in order to form a benzene solution containing 0 02 moles of picric acid per litre (Neglect the difference between the volume of then solution and that of the pure solvent) Given that, the Distribution Coefficient K= 0 505 [2] [CO3]

(b). Explain the terms: 'Selectivity' and 'Plait Point' with reference to Liquid Liquid Extraction. [2] [CO3]

Q6 (a). Write a note on the characteristics of a good Adsorbent [2] [CO5]

(b). Explain the mechanism of heterogeneous reaction A (g)+ B(g)---→ R(g), on the surface of a solid catalyst. Draw a neat diagram and List all the steps. [5][CO-5]

----------------------END----------------------

B.Tech. Chemical Engineering

END TERM EXAMINATION   *MAY-2023*

<u>CH306</u>   **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] Evaluate the current scenario of the Indian Chemical industries.
[3][CO5]

[B] During the development of a Flow chart for a particular chemical process, how equipment designation is done for instant identification of that equipment by its unique number. Explain with an example. [3][CO2]

[C] Draw the Flow Chart of the Hydrogenation of Vegetable Oils
[2][CO2]

Q.2[A] Describe the recovery of by-product glycerine during the manufacturing of soap using the Process flow diagram. [4][CO3]

[B] Explain the Paper manufacturing processes by using flow charts.
[4][CO1]

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]

[B] Explain the Ammonia manufacturing process using a flow chart.
[4][CO1]

113

Q.4[A] Develop the flow chart for manufacturing sulphuric acid and oleum. [4][CO2]

[B] Describe the recovery of by-products hydrogen and chlorine during the manufacturing of sodium hydroxide using the Process flow diagram. [4][CO3]

Q.5[A] How the pressure-temperature parameters are controlled to produce the different varieties of hydrogenated oils? [3][CO4]

[B] If bagasse is to be used for pulp production instead of wood-base material, suggest a modification in the sulfate pulp process. [3][CO3]

[C] What is the problem with the storage of sugar canes? [2][CO4]

Q.6[A] Compare the advantages and disadvantages of Membrane process for manufacturing sodium hydroxide. [2][CO4]

[B] Write the quantitative requirements of raw materials required for producing 1 ton of ammonia. [2][CO1]

[C] What are the grades of phosphate fertilizer available in market? [2][CO5]

[D] Comment on the current scenario of soap industry in India based on total demand in market and production capacity. [2][CO5]

2

Sixth Semester   **B.Tech.**

END SEMESTER EXAMINATION   *May-2023*

CH308 (Food Technology)

Time: 3.00 Hours   *Max. Marks: 50*

> **Note:** <u>Be brief</u>. 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 Roll number and name clearly. What is food, and why do we need Food, and what are the basic components of food? Looking at hunger related deaths, the extent of food processing, level of food wastage, in our country, what are your views and data to back up your answer?   1+9 Marks. (CO-1)

2. What are vitamins, essential minerals and trace minerals/elements, their need in our nutrition, and, the bioavailability of nutrients.   6 Marks. (CO-1)

3. Write about microbial related food borne illness, symptoms and possible causative agent/microbe. What is HACCP in the food industry?

               10 Marks. (CO-2).

4. How Pasteurization and Blanching is done, mention the temperature and timing. What is the utility of Food Irradiation, which what kind and source of radiation used in industry?   10 Marks. (CO-2).

5. What is fermentation? What is starter culture, write on wine production and the alcohol content of various alcoholic beverages.   10 Marks. (CO-3).

6. Write about milk and milk products, what kind of quality control is done during milk processing.   10 Marks. (CO-3).

7. What is food preservation, and types of food preservatives? What is "High Pressure Food Preservation" also called "Pascalization".   10 Marks. (CO-4).

8. What is the importance of food packaging, materials used in food packaging? Briefly mention about Active Packaging.   10 Marks. (CO-5).

GOOD LUCK
******

115.   Roll No.............

VI SEMESTER
B.Tech
END TERM EXAMINATION   *May-2023*
CH312: Polymer Processing Techniques
Time 3:00 Hours   Max. Marks: 40

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

Q.No.		Marks	CO
1	Justify the statement with suitable example		
[a]	Dispersive and distributive mixing of additives in polymer take place simultaneously in internal batch mixer	3	2
[b]	Addition of plasticizer reduces the glass transition temperature of polymers.	2	1.
2 [a]	Addition of glass fibers improve the mechanical properties of polymer composite. A company added glass fiber filler in the Polypropylene matrix to improve the mechanical properties. However, after compounding, no improvement was observed. Write the causes and suggest additional additive for compounding formulation.	3	4
[b]	Write the functions of antistatic additives.	2	1
3[a]	Compare the properties following PVC formulations.	3	4

Component	Formulation 1 (PHR)	Formulation 2 (PHR)
PVC	100	100
Diisononyl phthalate	55	35
Tri xylyl Phosphate	-	20
Calcium carbonate	10	-
China Clay	-	10
Antimony oxide	5	-
Tribasic lead sulphate	4	4
Stearic acid	0.5	0.5

[b]	Define the term hiding power and blowing efficiency	2	2

4[a] Write the mechanism of flame retardancy for halogenated and metal hydroxide compounds. 3

[b] Differentiate between exothermic and endothermic blowing agents. 2

5 [a] Discuss the mixing mechanisms on two roll mill with neat diagram 3

[b] Why polymer powder is used as raw material for rotational molding process? 2

6 [a] What are the factors which affect the flow properties of solid polymer in the hopper 3

[b] Write the functions of feed throat and breaker plate. 2

7 [a] Discuss the mechanism of melting in single screw extruder. 3

[b] How do you improve additive mixing in the single screw extruder? 2

8 In a particular extruder screw the channel depth is 2.5 mm, the screw diameter is 35 mm, the screw speed is 80 rpm, the flight angle 17° 42' and the pressure varies linearly over screw length of 840 mm, from zero at entry to 20 MN/m^2 at the die entry and the viscosity of melt may taken as 200 Ns/m^2 Estimate (a) the drag flow (b) the pressure flow (c) the total Flow 5

9 A single screw extruder has the following dimensions. Screw length=500mm, screw diameter= 25 mm, flight angle = 17° 42' , Channel depth=2 mm. if the extruder is coupled to a die which is used to produce films. Calculate the output from the extruder/die combination when the screw speed is 100 rpm. The width of slit die is 100 cm and height of slit die is 0.2 mm. The length of the die is 25 cm and the viscosity of the melt may be taken as 400 Ns/m^2. 10

117

END SEMESTER EXAMINATION

SECOND SEMESTER

MSc

May 2023

CH406 (Catalysis)

[Time: 3 Hours]

[Max. Marks: 50]

Instructions: All Questions are compulsory
Neat diagrams must be drawn wherever necessary.
Assume missing data if any.

Q1 a) Define homogeneous and heterogeneous catalysis using suitable examples? Among the two, which one is preferred and why?
b) What are the different industrial applications of heterogeneous catalysis? Explain in detail.

CO1, CO3 (5+5= 10 marks)

Q2 a) Give a detailed mechanism for the acid base catalysed hydrolysis of amides.
b) Define Hammett acidity function. Show how it compares the strength of strong acids. Mention name of four super acids with their H_o value.

CO1, CO2 (5+5= 10 marks)

Q3 a) Discuss in detail about the different characteristics of transition metals which make them ideal as a catalyst? Give suitable examples
b) Detailed mechanism of cobalt catalyzed hydroformylation reaction of terminal alkene is given. For each of the metal complex indicate
i) Oxidation state of Cobalt
ii) Total valence electron count of the complex based on concept of $18e^-$ count
iii) Identify each of the reaction type occurring in the catalytic loop

118

$HCo(CO)_4$

CO

RCH_2CH_2CHO

$HCo(CO)_3$

$CH_2=CHR$

$RCH_2CH_2COCo (H_2)(CO)_3$

$HCo(CO)_3(CH_2=CHR)$

H_2

$RCH_2CH_2COCo(CO)_3$

$RCH_2CH_2Co(CO)_3$

$RCH_2CH_2Co(CO)_4$

CO
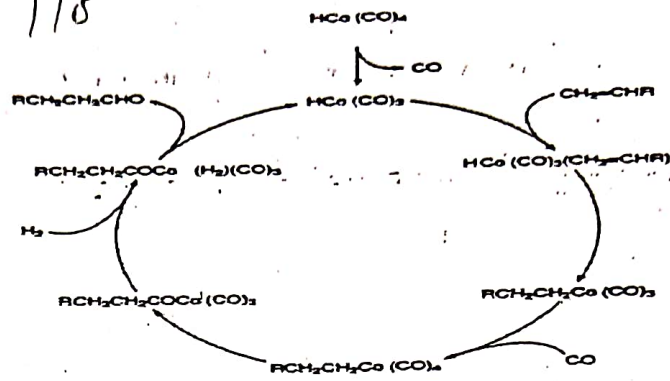
CO3 (5+5= 10 marks)

Q4 a) Explain in detail about

i) Carbonylation of methanol

ii) Oxidation of cyclohexanone

b) Differentiate between competitive and non- competitive Langmuir Hinshelwood adsorption isotherm.

CO3, CO5 (5+5= 10 marks)

Q5 a) Write short note on

i. Insertion

ii. Migration

iii. β-Elimination

b) Explain adsorption-desorption kinetics.

CO3, CO4 (5+5= 10 marks)

END SEMESTER EXAMINATION   B.Tech

EIGTH SEMESTER   May 2023

CH408 (Speciality Polymers)

[Time: 3 Hours]   [Max. Marks: 50]

Instructions: *All Questions are compulsory*
Neat diagrams must be drawn wherever necessary.
Assume missing data if any.

Q1a) Comment on various routes to improve thermal and chemical stability of polymers. Aromatic polyamides have better thermal stability compared to aliphatic polyamides. Do you agree with the statement? Justify your answer.

b) Why polymer shows liquid crystalline behavior. With appropriate schematic diagrams explain the following terms Nematics, Smectic, and Cholesteric phases in case of liquid crystalline polymers (LCPs).

CO1, CO2 (5+5=10 marks)

Q2 a) What is polymer impregnated concrete (PIC)? Explain in detail the important properties and application of PIC?

b) Discuss in detail about intrinsic and extrinsic type of conducting polymers using suitable examples.

CO3, CO5 (5+5=10 marks)

Q3 a) Discuss silicone polymers w.r.t preparation, structure, properties and applications.
b) Explain in detail the band theory in case of conducting polymers using MOT and quantum approach.

CO1, CO2, CO3 (5+5=10 marks)

120

Q4 a) Explain in detail about the synthesis, structure, properties and applications of Polyphosphazenes.

b) Distinguish between natural synthetic and natural biopolymer. What are the basic requirements for a polymer to be used in biomedical applications?

CO3, CO4 (5+5=10 marks)

Q5 Write short note on.
a) Role of polymers in corrosion inhibition
b) Luminescent polymers

CO5 (5+5=10 marks)

Total no of pages 01
FOURTH SEMESTER
END SEMESTER EXAMINATION

|2|

Roll No...........
B.TECH[CHE]
May-2023

CH410 Process Engineering and Design

Time: 3 Hours   Max. Marks - 50

Instructions to the candidates:

1)   Data book along with formulas and graphs required for designing will be provided by examination centre
2)   Assume any missing information
3)   Attempt all questions

Q.1 A lube-oil cooler for 2 MW steam turbine is to be designed for following operating conditions: Lube-oil, conforming to ISO VG-46 grade, flows at the rate of 450 L/min and is to be cooled from 65°C to

45°C with cooling water.
Kinematic viscosity of lube oil = 45.5 cSt at 40°C
Density of lube oil = 869 kg/m³
Specific heat of lube oil = 2.1413 kJ/(kg .°C)
Thermal conductivity of lube oil at 55°C = 0.13 W/(m.K)
Viscosity of lube oil at 55°C = 15 cP or m Pa.s
Cooling water inlet/outlet temperatures = 35°C/39°C

(20) [CO2, CO3]

Q.2 For the separation of dimethylformamide (DMF) from its dilute solution in water, liquid-liquid extraction may require lower operating cost than atmospheric distillation. Methylene chloride is considered to be a preferred solvent for extracting DMF from its aqueous solution.
DMF-water solution having a flow rate of 1000 kg/h and containing 20% DMF by mass is to be counter currently extracted with methylene chloride to reduce the DMF concentration to 1% in the final raffinate. Determine (a) the minimum amount of solvent which can be used and (b) the number of theoretical stages if actual amount of solvent is double than the minimum required. (Assume Water and Methylene chloride completely insoluble liquids)
    Data: Phase equilibrium equation is given by equation Y = 0.5555 X at 25° C (Equilibrium and Operating Curves are straight lines)

(20) [CO3, CO4]

Q.3 For the liquid-liquid extraction system, given in Q.2, calculate number of transfer units (N_{toR}). If actual amount of solvent is double of minimum amount of solvent.   (10) [CO3, CO4]

VIII SEMESTER
B.Tech. Chemical Engineering

END TERM EXAMINATION   MAY-2023

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] Define the following terms:
  (i) Hazard and (ii) Risk   [2][CO2]
  [B] A university has 1200 full-time employees. In a particular year this university had 38 reportable lost-time injuries with a resulting 274 lost workdays. Compute the OSHA incidence rate based on injuries.   [3][CO2]

  [C] Comment on the Initiation stage of Flixborough, England Accident.   [2][CO2]
  [D] Suggest an Organization and Administration control of Noise in an Industry?   [3][CO5]

Q.2[A] Explain with a suitable example the difference between Laws and Regulations.   [3][CO1]
  [B] How law is created in the United States?   [2][CO1]
  [C] What are the effects of different doses of nuclear radiation on a human being, when exposed?   [2][CO2]
  [D] Which hearing protective devices are used in the industry?   [3][CO2]

Q.3[A] Classify the hazardous chemicals into different classes. [3][CO3]
  [B] How should toxic chemicals be stored?   [4][CO3]
  [C] What are the possible causes of accidents while transporting chemicals by road and how can be prevented?   [3][CO3]

1

15)

Q.4[A] Explain the procedure for completing the Hazards and Operability (HAZOP) Studies [5][CO4]

[B] The storage tank system shown in figure is used to store process feedstock. Overfilling of storage tanks is a common problem in the process industries. To prevent overfilling, the storage tank is equipped with a high-level alarm and a high-level shutdown system. The high-level shutdown system is connected to a solenoid valve that stops the flow of input stock. Develop a fault tree for the top event of "storage tank overflows." [5][CO4]
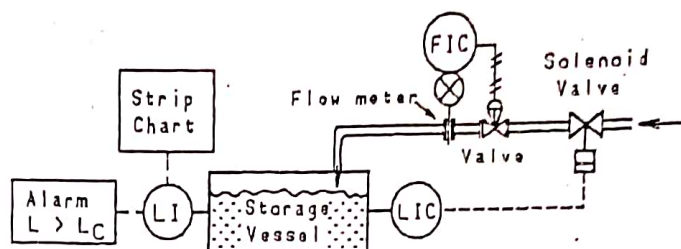
Q.5[A] What is a Safety audit? What purposes does it serve? [4][CO5]

[B] If you are a member of an Audit Team, which steps you will follow to conduct an Effective Safety Audit in a plant? [3][CO5]

[C] How Safety Training is conducted in a Chemical plant? [3][CO1]

Q.6[A] What do you mean by "gold-plated" Hazard identification? [2][CO4]

[B] Who are involved in Formal Safety Audit? [2][CO5]

[C]Write any four Human Factors evaluation Topics. [2][CO4]

[D] What information you can find on a Warning Label while storing and transporting hazardous chemicals? [2][CO3]

[E] Which 2 Ministries of the Government of India frame safety and health or environmental rules for the safeguard of the citizens of India? [2][CO1]

VIII Semester
B.Tech.
ENDTERM EXAMINATION   May 2023
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 is biomass, bioenergy, and bio-power? What are the social, economic and environmental impacts of bioenergy?

      (1+9 Marks) (CO-1).

2. What is the difference in 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).

3. How long (years) 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 using food-based feedstocks for fuel/biofuel production. (10 Marks) (CO-3).

4. Let us take biomass and how can you utilize this biomass into value-added products like biogas, biodiesel, ethanol. What is Torrefaction.

      (10 Marks) (CO-4).

5. How can you convert biomass into bio-oil, bio-char, & syngas. Why do you think thermochemical method is preferred in case of waste-tires as compared to any other sources of biomass.   (10 Marks) (CO-2).

6. Our city of Delhi, generates how much municipal solid waste (MSW) per day, and how much is used as landfill and how much for energy generation. Mention the process that you think is used to generate bioenergy in these wastes to energy plants.   (10 Marks) (CO-4).

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).

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)

GOOD LUCK
******

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

IV SEMESTER
B.Tech.

END TERM EXAMINATION   **May-2023**

CS 262   Algorithm Design and Analysis

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

1) Solve the following:
   a) Write the following in terms of asymptotic notation (Big O notation)
   $$\sum_{i=1}^{n} \log_2 i$$
   (3[CO2]

   b) $T(n) = T(n-1) + 1/n + 1$ (3) [CO2]

   c) In a village, people build houses in the same side of the road. A thief plans to loot the village. He wants maximum amount of money without having any risk of getting caught. By some means, the villagers know that their adjacent house is being looted or not and thus they become alert. So the thief cannot loot contiguous two houses. Given that the thief knows the amount of money stored in each house and the road is straight and there is no turning, which is/are the most efficient algorithmic strategy to solve this problem?
   (4) [CO1, CO3]

2)
   a) Derive the time complexity of Quick Sort? Give examples where we can get the worst case time complexity of Quick Sort. (4) [CO1, CO3]

   b) MAX-HEAPIFY is an important subroutine for manipulating max-heaps. Its inputs are an array A and an index i into the array. When MAX-HEAPIFY is called, it is assumed that the binary trees rooted at LEFT(i) and RIGHT(i) are max-heaps, but that A[i] may be smaller than its children, thus violating the max-heap property. The function of MAX-HEAPIFY is to let the value at A[i] "float down" in the maxheap so that the sub-tree rooted at index i becomes a max-heap. Following is the algorithm for MAX-HEAPIFY. Answer the following questions.   (6) [CO3]

MAX-HEAPIFY(A, i)

```
1   l ← LEFT(i)
2   r ← RIGHT(i)
3   if l ≤ heap-size[A] and A[l] > A[i]
4       then largest ← l
5       else largest ← i
6   if r ≤ heap-size[A] and A[r] > A[largest]
7       then largest ← r
8   if largest ≠ i
9       then exchange A[i] ↔ A[largest]
10          MAX-HEAPIFY(A, largest)
```
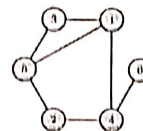
i. Show that the worst-case running time of MAX-HEAPIFY on a heap of size n is O(log.n).

ii. What is the effect of calling MAX-HEAPIFY(A,i) when the element $A[i]$ is larger than its children?

iii. Illustrate the operation of MAX-HEAPIFY(A, 3) on the array A = (27, 17, 3, 16, 13, 10, 1, 5, 7, 12, 4, 8, 9, 0).

3)

a) Given four matrices M1, M2, M3 and M4 with dimensions (10×100); (100×20); (20×5); (5 ×80) respectively, find the minimum scalar multiplication. (3) [CO3]

b) Discuss the recursive, memoization and dynamic programming approach for finding out longest common subsequence. Consider two strings A = "qpqrr" and B = "pqprqrp". Let x be the length of the longest common subsequence (not necessarily contiguous) between A and B and let y be the number of such longest common sub sequences between A and B. What will be the value of x and y? (7) [CO2, CO3]

4)

a) Solve Travelling Salesman Problem using Branch and Bound Algorithm step wise step in the following graph. (5) [CO1, CO3]

b) Discuss three different real world problems of your choice separately that can be solved using Dynamic programming, Backtracking and branch and bound approaches with proper justification. (5)[CO1,CO2,CO3]

5)

a) Differentiate between Types of Complexity Classes P, NP, NP hard and NP complete in detail with suitable example. (3) [CO4]

b) Explain SAT problem. Why it is taken as base problem in terms of exploring its relation with other NP hard problems. (2) [CO4, CO5]

c) State Cook's theorem and give your comment on it. (2) [CO4]

d) Show that finding the maximum independent set problem is reducible to minimum vertex cover problem in the following graph. (3) [CO5]

6)

a) Discuss the time complexity and approaches of Rabin Carp and KMP string matching. (4) [CO5]

b) Find minimum spanning tree of the graph given in 4(b) using the prim's algorithm. (6) [CO3]

******All the Best******

Total No. of Pages-02

FOURTH SEMESTER
END SEMESTER EXAMINATION

Roll No. ....

B.Tech. [ECE]
(May- 2023)

155

EC- 202   Analog Electronics-II

Time: 3:00 Hours

Max. Marks: 40

Note:
   1. Attempt any FOUR Questions.
   2. Assume suitable missing data, if any.
   3. All abbreviations have their usual meaning.
   4. Use the answer sheet space judiciously. <u>No EXTRA</u> Answer sheet
      will be provided.

1.[a] Determine the lower 3 dB frequency f_L of the transistor [7][CO.1]
      amplifier shown in **Fig. 1**, assume $R_S = 1$ KΩ, $C_{B1} = C_{B2}$
      $= 10$ μF, $C_E = 200$ μF, $R_1 = R_2 = 100$ KΩ, $R_C = R_L = R_E$
      $= 1$KΩ, $\beta_0 = 100$, and the bias current $I_C = 2.5$ mA.

1.[b] Comment on change in bandwidth with negative feedback [3][CO.2]
      in an Amplifier. Derive the expression for lower 3 dB
      frequency and upper 3dB frequency with negative
      feedback.

2.[a] Identify the feedback topology for the circuit shown in [7][CO.2]
      Fig.2, also draw its equivalent circuit and determine the
      R_i, R_o, β, A, R_{if}, and R_{of}.

2.[b] Derive the expression for input and output impedance of a [3][CO.2]
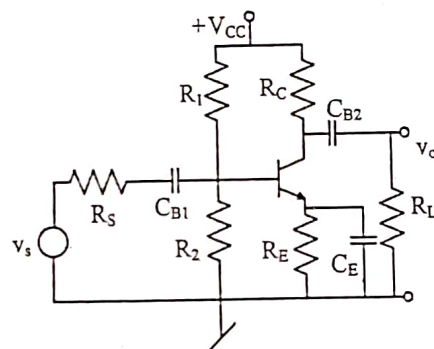   shunt-series negative feedback amplifier.
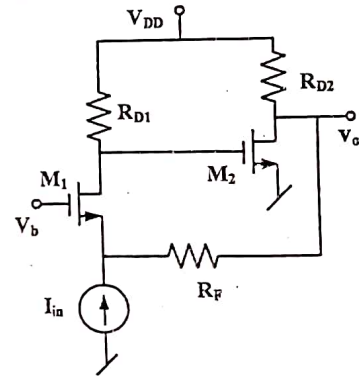

Fig. 1

Fig. 2

1

3.[a] State Barkhausen Criterion. Draw the circuit of BJT based [6][CO.3] Hartley's oscillator and derive an expression for condition and frequency of oscillation. Given that the two inductors are 2 mH and 20 μH, while frequency is to be changed from 950 KHz to 2050 KHz. Calculate the range over which capacitor is to be varied.

3.[b] Giving circuit of a class B complementary symmetry [4][CO.4] push-pull configuration derive expression for maximum efficiency and maximum power dissipation.

4.[a] A sinusoidal signal $v_s = 5 \cos 0.8 \times 10^3 \pi t$ is applied to a [3][CO.4] power amplifier. The resulting collector current is given by:

$$i_C = (10 \times 10^{-3} + 25 \cos 0.8 \times 10^3 \pi t + 2 \cos 1.6 \times 10^3 \pi t + 0.8 \cos 2.4 \times 10^3 \pi t + 0.4 \cos 3.2 \times 10^3 \pi t) \text{ Ampere}$$

Calculate the total harmonic distortion and the total power of the amplifier for a load resistance of 200 Ω.

4.[b] With the help of amplifier circuit, explain the difference [4][CO.4] between power amplifier and voltage amplifier. Explain why a heat sink must be used with a power amplifier. Based on the location of Q point in load line, classify different types of Power amplifiers.

4.[c] A feedback amplifier having loop gain given by: [3][CO.2]

$$A(s)\beta(s) = \frac{100}{(1 + \frac{s}{10^7})(1 + \frac{s}{10^8})}$$

Using asymptotic bode plot, calculate Gain crossover and Phase crossover frequency. Also comment on stability of an amplifier.

5.[a] Mention the advantage of Crystal oscillator over other [6][CO.3] oscillators. Explain the principle of oscillation in the crystal oscillator and also draw its equivalent circuit and determine the resonating frequencies. A 2-MHz quartz crystal is specified to have $L = 0.52H$, $C_S = 0.012\ pF$, $C_p = 4\ pF$ and $r = 120\Omega$. Calculate parallel and series resonating frequency.

5.[b] List and explain briefly different steps involved in [4][CO.5] fabricating monolithic IC.

2

(c) Discuss short notes on FPGA and ASIC   (2) [CO5]

Q.6 (a) Demonstrate the transition diagram for given flow table. Also reassign the states to make the table race free using minimum number of additional states, if required.   (4) [CO4]

	00	01	11	10
a	b	(a)	d	(a)
b	(b)	d	(b)	a
c	(c)	a	b	(c)
d	c	(d)	(d)	c

(b) Construct the Moore state table for the circuit shown below. (2)

[CO2]
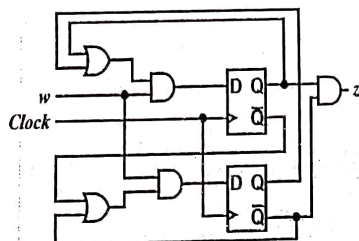
(c) Find the distinct states and construct the Primitive Flow Table and Merger graph for an asynchronous sequential circuit with inputs, x1 and x2, and output, z. The initial input state is x1 = x2 = 0. The output value is to be 0 if and only if the input state is x1 = x2 = 1 and the preceding input state is x1 = 0, x2 = 1.   (2) [CO2]

-End-

Q.1 (a) Design an asynchronous circuit that has inputs x1 and x2 and output Z. The circuit is required to give an output '1' whenever the input sequence (0,0), (0,1) and (1,1) received but only in that order.(4) [CO2]

(b) Implement the hazard free switching circuit for the following Boolean function.

$$F (A, B, C, D) = \sum m (0, 2, 6, 7, 8, 10, 12)$$ (4) [CO3]

Q.2 (a) Construct the minimized state table using merger graph and compatibility graph method from the following state table.   [4] [CO3]

PS	XY=00	XY=01	XY=10	XY=11
a	a, -	c, 1	e, 1	b, 1
b	e, 0	c, -	-, -	-, -
c	f, 0	f, 1	e, 0	-, -
d	-, -	-, -	a, 0	d, 1
e	-, -	-, -	a, 0	d, 1
f	c, 0	-, -	b, 0	c, 1

(b) Mention the Verilog/VHDL code of 4-bit adder/subtractor using a control signal.   (2) [CO1]

(c) Demonstrate state diagrams for Mealy and Moore FSM to obtain 2's complement of a number.   (2) [CO2]

Q.3 (a) Implement the connection diagram for A and B using ROM and and PLA.   (4) [CO5]

$$A = W\ Y' + X\ Y'\ Z$$

$$B = W\ X'\ Y' + X'\ Y + W'\ Y'\ Z$$

(b) Investigate the given transition table and determine all race conditions. Also state whether they are critical or non- critical. **(4) [CO4]**

x1x2 →	00	01	11	10
y1y2 ↓		Y1Y2		
00	10	00	11	10
01	01	00	10	10
11	01	00	11	11
10	11	00	10	10

Q.4 (a) Sketch an ASM chart for a 4-bit rotate right shift register as shown below in Table. Consider that initial value is 1000. **(2) [CO5]**

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

(b) Demonstrate the state diagram using ASM chart given below. Also, mention the expression for Z using ASM chart. **(2) [CO5]**
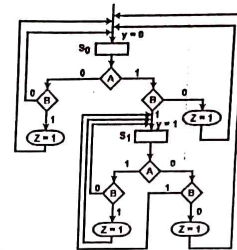
(c) Demonstrate Reduction of the given table using Partitioning minimization method. **(4) [CO3]**

PS	NS, z	
	$x = 0$	$x = 1$
A	E, 0	D, 1
B	F, 0	D, 0
C	E, 0	B, 1
D	F, 0	B, 0
E	C, 0	F, 1
F	B, 0	C, 0

Q.5 (a) Interpret all the test vectors to detect α at s-a-0 fault, for the circuit shown below. **(4) [CO4]**
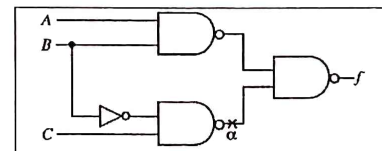
(b) Mention the VHDL/Verilog code for a synchronous D flip flop with reset using the clock attribute and WAIT statement. **(2) [CO1]**

4th SEMESTER

159   **B.Tech-ECE (EC206)**

END TERM EXAMINATION   May-2023

COURSE CODE EC206 COURSE TITLE Communication Systems

Time: 03:00 Hours   Max. Marks: 40

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

Q.1 (a) A modulating signal $20\sin(2\pi * 10^3 t)$ is used to modulate a carrier signal $40\sin(2\pi * 10^4 t)$. Determine modulation index, percentage modulation, frequencies of the sideband components and their amplitudes. What will be the band width of the modulated signal?

(b) In AM transmitter $v_c(t) = V_c \cos(\omega_c t)$ be carrier signal, and $v_m = V_m \cos(\omega_m t)$. Compute the expression for total RMS power of modulated AM signal in terms of carrier power and modulation index.

[4+4][CO-1,2]

Q.2 (a) Show the functioning of balanced modulator using diodes. Show mathematically the functioning.

(b) A 30MHz carrier is modulated by a 300 Hz modulating signal. The carrier voltage is 5V and maximum deviation is 10KHz. Write down the mathematical expression for FM & PM waves. If the modulating frequency is increased to 3KHz, keeping everything else constant, then write down expression for FM and PM waves.

[4+4][CO-2,3]

Q.3 (a) Draw block diagram and describe its functioning of Armstrong method of FM generation and prove its outcomes mathematically.

(b) Explain mathematically the functioning of PLL.

[4+4][CO-2]

Q.4 (a) The PDF of random variable is as below:

$$f(x) = \begin{cases} K; & a \le x \le b \\ 0; & else \end{cases}$$

Where "K" is constant.

i. Determine the value of "K".

160

ii. Let a = -1 and υ – 2, calculate $p(|x| \ge c)$ for c – 2

(b) Define/Solve and give mathematical examples of following:

    i. Ensemble Average
    ii. Wide-sense stationary
    iii. Compute $E[x(t) + x(t + \tau)]^2$
    iv. Gaussian Density function

[4+4][CO-4]

Q.5 (a) Explain the following terms mathematically

    i.   Thermal noise
    ii.   Short noise
    iii. White noise
    iv. Noise temperature

(b)
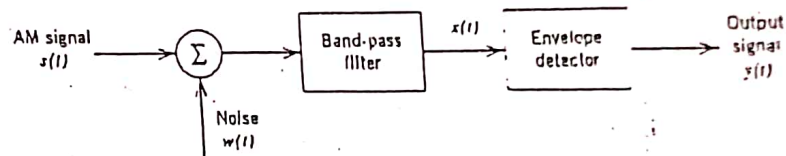
Compute output signal to Noise Ratio for the given AM Receiver. Assume any missing data.

[4+4][CO-5]

B. Tech. IV SEMESTER END-TERM EXAMINATION - May-2023 -

COURSE CODE: EC 208

COURSE TITLE: COMPUTER ARCHITECTURE

Time: 03:00 Hours

Max. Marks: 40

Note: Assume suitable missing data, if any.

Q.1) Answer the following questions:

a) The next address generator in microprogrammed control organization is sometimes called as: [1] [CO1]
  i. Sequence counter
  ii. Microprogram sequencer
  iii. Program counter
  iv. None of these

b) What should be the condition in the CD field to perform RET? [1] [CO1]

  i. U
  ii. I
  iii. S
  iv. Z

c) Loss of character in received data stream is denoted by: [1] [CO3]

  i. Framing Error
  ii. Overrun Error
  iii. Parity Error
  iv. None

d) _____ is a single control line that informs destination unit that a valid is available on the bus? [1] [CO3]
  i. Ping
  ii. Token
  iii. Handshake
  iv. Strobe

e) The method of accessing the I/O devices by repeatedly checking the status flags is _____ [1] [CO3]
  i. Interrupt Initiated I/O
  ii. Direct Memory Access
  iii. Programmed I/O
  iv. All of these

f) How many 128 X 8 RAM chips are needed to provide a memory capacity of 2048 bytes? [1] [CO3, CO5]
  i. 2
  ii. 4
  iii. 16
  iv. 32

g) Calculate the average access time of memory if cache access time is 100 ns, main memory access time is 1000 ns and the hit ratio is 0.9. [1] [CO3]
  i. 100 ns
  ii. 200 ns
  iii. 500 ns
  iv. 1000 ns

h) The following methods are used for writing into cache memory: [1] [CO3]

   i. FIFO   ii. Write-through

   iii. LRU   iv. Both (a) and (c)

Q.2 A) 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. [4] [CO2]

B) Calculate the time required to process 8 tasks using a six-segment pipeline. Draw its space-time diagram also. [4] [CO4]

Q.3 A) Design the match logic circuit for associate memory and draw the diagram also. Assume that there are m number of words each of n bits. [4] [CO3]

B) Derive the truth table of an 8 X 3 priority encoder. The three outputs xyz from the priority encoder are used to provide a vector address of the form 1100xyz0. Calculate the eight vector addresses starting from the one with highest priority. [4] [CO3]

Q.4 A) Write a symbolic microprogram routine for ISZ (Increment and skip if zero) instruction including microprogram for fetch and indirect routine. [4] [CO1]

B) Evaluate the following numerical arithmetic expression using stack operations by first writing it into reverse Polish notation.

$$(3+4) [10 (2+6) +8]$$ [4] [CO5]

Q.5 A) Propose 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. [4] [CO5]

$$D_2T_3: SC \leftarrow 0$$

B) A computer system needs 2K bytes of RAM and 2K bytes of ROM. The size (words × bits/word) of RAM and ROM chips are 256 × 8 and 512 × 8, respectively. Determine the number of RAM and ROM chips and find the address range for all. Design the interface of all the chips with CPU also. [4] [CO3, CO5]

4th SEMESTER

B.Tech.(CS and IT)

END TERM EXAMINATION   May-2023

EC262   Digital Electronics

Time: 3 Hours   Max. Marks: 40

Note: Answer *any* FIVE questions. All question carries equal mark. Assume suitable missing data, if any.

Q1. a) Convert the Gray code 110011 into Hex code.

b) Convert the Excess-3 code 1010 0100 into Binary code.

c) Prove that $BCD + A\bar{C}\bar{D} + ABD = BCD + A\bar{C}\bar{D} + AB\bar{C}$.

d) If $\bar{A}B + C\bar{D} = 0$, then prove that $AB + \bar{C}(\bar{A} + \bar{D}) = AB + BD + \bar{B}\bar{D} + A$.

e) Realise $f = B(A + CD) + A\bar{C}$ by using multilevel NAND Gate.

f) Show how a 16 input MUX is used to generate the function
$$Y = \bar{A}\bar{B}\bar{C}D + BCD + A\bar{B}\bar{C} + AB\bar{C}D$$

g) What are asynchronous inputs in a flip-flop? Shoe them in logic diagram of SR-FF.

h) Give the logic diagram for dividing any input clock frequency by 4.

[8M] [CO1, CO2]

Q2. a) Design a synchronous counter using D-FF to count the frequency 0-2-4-6-8-10-12-14 and repeat.   [4M] [CO2]

b) The content of a 4-bit shift register is initially 1101. The register is shifted 6 times to the right with serial input being 101101. What is the content of the register after each shift?   [2M] [CO2]

c) Show the output of a 3-bit twisted ring counter with 5 clock pulses. The initial content in the ring counter is 000.   [2M] [CO2]

Q3. a) Prepare the k-map for the function f= AB+CD.   [2M] [CO1]

b) Give the implementation of a square function output of BCD number using diode matrix ROM.   [4M] [CO3]

c) State the difference between static and dynamic RAM.   [2M] [CO3]

/64

Q4. a) With neat diagram explain the operation of a 4-bit R-2R ladder type D/A converter. State the advantage of R-2R ladder type over weighted resister type A/D converter. **[4M] [CO4]**

b) With neat diagram explain the working principle of a astable multivibrator and state its applications. **[4M] [CO4]**

Q5. a) What is Moore and mealy sequential machine. Give an example of each. **[3M] [CO5]**

b) Describe the features of ASM chart. **[2M] [CO5]**

c) Implement a three-bit binary to gray code converter circuit using MUX. **[3M] [CO1]**

Q6. a) Define the followings-
(i) Figure of merit   (ii) Fan-out
(iii) Noise immunity   (iv) Fan-in   **[4M] [CO6]**

b) With neat diagram discuss the operation of ECL (OR/NOR) gate circuit. State the advantage of ECL logic family. **[4M] [CO6]**

****

IV SEMESTER

B.Tech

END-TERM EXAMINATION   *May-2023*

EC272: Communication Systems

Time: 3 Hours   Max. Marks: 40

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

Q.1 Describe the following: [2x4 = 8 M]

i.   Information capacity and bit error rate.
                                                            [CO1]

ii. External noise and internal noise.   [CO4]
iii. Thermal Noise and Shot Noise.   [CO4]
iv. Quadrature phase shift keying.   [CO5]

Q.2 Attempt the following:

i.   Consider an angle-modulated signal
$$x(t) = 10 \cos (2\pi f_c t + 3 \sin (2\pi f_m t))$$
Assume PM and $f_m = 1\ kHz$. Calculate the modulation index and find the bandwidth when message frequency is (a) doubled and (b) when the message frequency is decreased by one-half. [4M] {CO2}

ii. The output signal from an AM modulator is given as
$$s(t) = 20 \cos (2000\pi t) + 5 \cos (1800\pi t) + 5 \cos (2200\pi t)$$

Determine the (a) modulating signal and the carrier signal, (b) the modulation index and (c) the ratio of power in the sidebands to the power in the carrier.   [4M] [CO2]

Q.3 Answer the following:

i.   Outline the basic elements of Pulse Code Modulation system in detail along with suitable block diagram and illustrations.
                                                      [4M] [CO 3]

ii. The digitization of a television signal using PCM is to be performed. The signal bandwidth is 4.5 MHz and the specifications of the modulator include the following:

      Sampling: 15% more than the Nyquist rate
      Quantization: uniform with 1024 levels
      Encoding: binary.

Determine (i) the Nyquist rate, (ii) the minimum permissible bit rate (iii) the minimum transmission bandwidth and (iv) the SQNR for the given specifications. [4M] [CO3]

Q.4 Attempt any two from the following:

i. Outline the pulse modulation techniques and their applications. [4M] [CO3]

ii. Demonstrate the technique for generating instantaneously sampled PWM and PPM signals. [4M] [CO3]

iii. Demonstrate the Delta Modulation technique with the help of block diagrams for its transmitter and receiver section. Also, describe the quantization errors suffered by a DM system. [4M] [CO3]

Q.5 Attempt any two of the following:

i. Determine the expression for E_b for BPSK modulated signal. The binary sequence 00100101 is applied to an ASK modulator with bit duration 1 μs, and sinusoidal carrier wave has a frequency of 10 MHz. Determine the transmission bandwidth of the ASK signal and plot the transmitted ASK waveform. [4M] [CO5]

ii. Illustrate Binary Frequency Shift Keying digital modulation technique, its generation and detection and justify that BFSK is a special case of Frequency Modulation. [4M] [CO5]

iii. Assess the role of modulation index in deciding whether the AM signal be demodulated using coherent detector or an envelope detector. Justify that an envelope detector can be used for the demodulation of a DSB-SC signal obtained from a modulating signal which is always positive. [4M] [CO2]

IVth SEMESTER

B.Tech.

END TERM EXAMINATION

May-2023

EC272a   Computer System Architecture

Time: 03:00 Hours

Max. Marks: 40

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

Q.1(a) Explain Bus Arbitration.   [2][CO1]

(b) Differentiate between Hardwired and Microprogramed control?
                                                                   [2][CO2]

(c) Differentiate between Synchronous and Asynchronous Serial Communication?   [2][CO5]

(d) Explain in detail Memory Hierarchy.   [2][CO6]

Q.2 (a) Explain the concept of Horizontal and vertical microprogramming with diagrams.   [4][CO2]

(b) Explain bus architecture along with bus arbitration. [4][CO1]

Q.3 (a) Explain signed bit subtraction along with algorithm and hardware implementation.   [4][CO3]

(b) What are addressing Modes and its significance. Explain the different types of the same.   [4][CO3]

Q.4 (a) What are Modes of Transfer. Explain the different types of Modes of Transfer.   [4][CO5]

(b) What are Interrupt and its significance. Explain the different types of the same.   [4][CO4]

Q.5 (a) There are two signals encoded in a single transition and the signal is changing after every 10ms. Calculate baud rate and number of bits per second.   [4][CO5]

168

(b) What is ASSOCIATIVE MEMORY. Explain hardware implementation of the same. [4][CO6]

Q.6 (a) Explain General Register Organization with diagram. [4][CO4]

(b) Explain Cache Memory in detail along with the performance of Cache memory system. [4][CO6]

END TERM EXAMINATION

May-2023

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
question from remaining five.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1(a) Given a choice between NAND and NOR based function realization
in static CMOS, which one would you prefer and why.   [2][CO3]

(b) With downscaling of device dimensions by a factor of 10, what
would you expect for drain current will be ---- and --- times of the
original value if constant field scaling and constant voltage scaling
are used.   [2][CO1]

(c) What would be the impact of increasing threshold voltage of NMOS
transistor on CMOS VTC in terms of noise margins (V_{IL}, V_{IH})?

[2][CO2]

(d) Will there be any charge sharing in (i) dynamic CMOS inverter (ii)
dynamic 2 input NAND gate? Explain.   [2][CO4]

Q.2(a) An NMOS transistor, operating in the linear region with $V_{DS} = 50$
mV, is found to conduct 25 μA for $V_{GS} = 1$ V and 50 μA for $V_{GS} = 1.5$ V. What is the apparent value of threshold voltage V_T? If $k'_n = 50$
μA/V^2 , what is the device W/L ratio? What current would you expect
to flow with $V_{GS} = 2$ V and $V_{DS} = 0.1$ V? If the device is operated at
$V_{GS} = 2$ V, at what value of V_{DS} will the drain end of the MOSFET
channel just reach pinch-off?   [4][CO1]

(b) Design a CMOS inverter with switching threshold voltage of $\frac{2}{3}V_{DD}$.
What is the resulting ratio of W_P/W_N? (Assume $L_P = L_N$, $\mu_N = 2.5\mu_P$,
$|V_{TP}| = V_{TN} = 0.2 V_{DD}$,)   [4][CO2]

Q.3 (a) Design a combinational circuit for $F = \overline{(A+B)(CD+E)}$ using static CMOS and size the transistors using equivalent inverter method. Assume $(W/L)_{n,inv.} = 2$; $(W/L)_{p,inv.} = 4$. [4][CO3]

(b) Design a combinational circuit for $F = \overline{A.(B+C)+D}$ using depletion load and size the transistors in pull down network such that equivalent $\left(\frac{W}{L}\right)_n$ in worst case is 2/3. Calculate $\left(\frac{W}{L}\right)_{Load}$ such that V_{OL} does not exceed 0.4 V. Assume $V_{T0}(enhancement) = 1\,V, V_{T0}(depletion) = -3\,V$ and $\gamma = 0$. [4][CO3]

Q.4 (a) Design the following Boolean functions using multiple output domino logic [4][CO4]
$C_1 = G_1 + P_1C_0$, $C_2 = G_2 + P_2G_1 + P_2P_1C_0$,
where $P_i = \bar{A}_i O_i + A_i \bar{O}_i$, $G_i = A_i O_i$ (i = 1,2,3)

(b) Consider the circuit of Fig. 1. (i). Give the logic function of x and y in terms of A, B, and C. Sketch the waveforms at x and y for the given inputs. Do x and y evaluate to the values you expected from their logic functions? Explain. (ii). Redesign the gates using np-CMOS to eliminate any race conditions. Sketch the waveforms at x and y for your new circuit. [4][CO4]
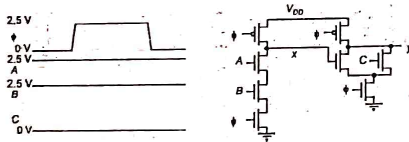
Fig.1

Q. 5 (a) An implementation of a D Flip-flop is show in Fig. 2. Answer the following [4][CO5]
(i) Is this a static or dynamic flip-flop?

(ii) Is this positive edge triggered or negative edge triggered?
(iii) Calculate t_{setup}, t_{CtoQ} and t_{hold} for this flop in terms of the transmission gate and inverter delays.
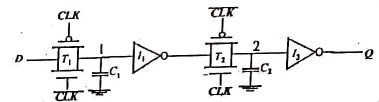
Fig. 2

(b) Analyze the circuit of Fig. 3 and compute propagation delay, setup and hold time. Can you embed the logic into the circuit? Illustrate your answer with suitable example. [4][CO5]
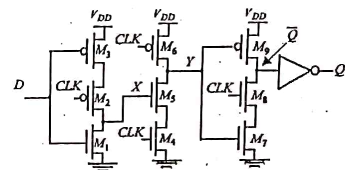
Fig. 3

Q. 6 (a) The transistors in 6T SRAM cell have to be properly sized to perform correct read and write operation. Explain. [4][CO6]
(b) Differentiate between different VLSI design styles. Which out of these is most suitable for a time critical design? [4][CO6]

/7)

SIXTH SEMESTER
B.Tech. (EE)

END TERM EXAMINATION **May 2023**
EC 304 Digital Signal Processing

Time: 3 Hours Max. Mark: 50

> **Note: All questions are compulsory to answer.**
> **Assume suitable missing data, if any.**

Q1a. Calculate the DFT of the sequence $x[n] = \{1,1,-2,-2\}$ (2) [CO2]

OR

Using Linear convolution find $y(n) = x(n) * h(n)$ for the sequence $x(n) = (1,2,-1,2,3,-2,-3,-1,1,1,2,-1)$ and $h(n) = (1,2)$ using Overlap Save method. (2) [CO2]

Q1b. For the sequence $x(n) = \delta(n) + 2\delta(n-2) + \delta(n-3)$ find the 4- point circular convolution of $x(n)$ and $h(n)$, if $h(n) = \delta(n) + \delta(n-1) + 2\delta(n-3)$ (2) [CO2]

OR

Derive Decimation in Time FFT algorithm for N=4 (2) [CO2]

Q1c. Obtain FIR linear phase cascade realization of the system function. (2) [CO3]

$$H(Z) = \left(1 + \frac{1}{2}Z^{-1} + Z^{-2}\right)\left(1 + \frac{1}{4}Z^{-1} + Z^{-2}\right)$$

Q1d. Determine the Direct II realization for the following system. (2) [CO3]
$y(n) = -0.1y(n-1) + 0.72y(n-2) + 0.7x(n) - 0.252x(n-2)$

Q2. (a) For given multirate systems, develop an expression y(n) in terms of x(n)
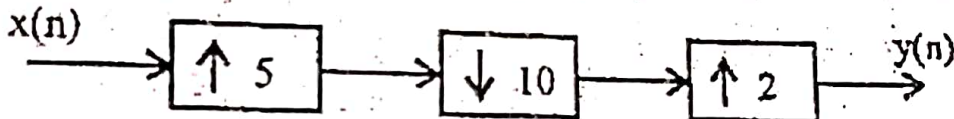
(2) [CO5]

(b)What is frequency warping? (2) [CO4]

Q2c. Design an ideal highpass filter with a frequency response

$$H_d(e^{jw}) = \begin{cases} 1 & for -\frac{\pi}{4} \le |w| \le \pi \\ 0, & for\ |\dot{w}| \le \frac{\pi}{4} \end{cases}$$ (4) [CO4]

Find the value of h(n) for N = 11 and find H(z) and frequency response.

Q3a. The transfer function of analog Butterworth filter is given by $H(s) = \frac{1}{s^2+\sqrt{2}s+1}$. Using bilinear transformation technique, design a digital low pass filter with cutoff frequency of $w_c = \frac{2\pi}{3}$. 　　　　　　　(4) [CO4]

Q3b. The transfer function function of the analog filter is given by $H(s) = \frac{0.25(s+8)}{(s+1)(s+2)}$. Obtain the transfer function of the digital filter H(z) using impulse invariant technique. Assume the sampling frequency to be 10 Hz. 　(4) [CO4]

Q4a. Validate the decimation identity shown in the figure

(a)　　　　　　(b)
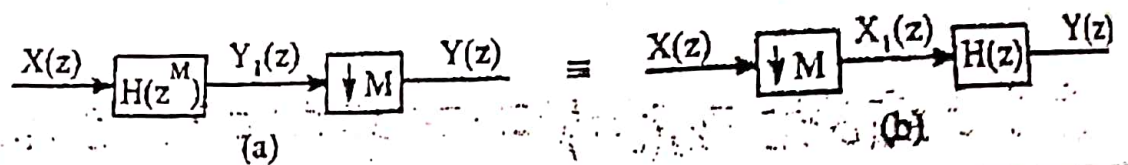
(2) [CO5]

Q4b. Design the process of converting a CD player digital signal sampling at 42.5 kHz to a professional audio workstation digital signal sampled at 48 kHz.
(2) [CO5]

Q4c. Represent the $(-0.25)_{10}$ number in (i) 1's compliment (ii) 2's complement (iii) floating point representation with 5-bit for mantissa and 3-bit for exponent.
(3) [CO6]

Q4d. Assess the importance of finite word length effects in digital signal processing domain. 　　　　　　　　　　　　(1) [CO6]

Q5 a. What are anti- aliasing filter and image rejection filter. 　(2) [CO5]
Q5b. What are the advantages of Harvard and super Harvard architecture.
(2) [CO7]

Q5c. Write short notes of TMS320C67XX series introduction and architecture.
(4) [CO7]

VI TH SEMESTER   **B.Tech (ECE)**

Supplementary Examination   **May 2023**

EC306 Embedded Systems

Time : 3 Hrs   **Maximum Marks: 40**

Note: Question No 1 is compulsory and answer any 7 questions from remaining. Assume missing data if any.

1	a	What is the significance of Q Flag in ARM processor	1	CO1
	b	Content of PIE1 is 0x06 What do you infer from this	1	
	c	How many invisible registers are there in ARM processor?	1	
	d	MOVLW D'250' MOVWF TIME LOOP_ONE_MS: NOP ; DECFSZ TIME,F ; GOTO LOOP_ONE_MS ; Evaluate the code and write the value of variable TIME once it leave the loop. Also justify your answer	1	
	e	What is the function of dirty bit?	1	
2	a	Does PIC support analog input / output devices? If so configure PIC for interfacing two analog devices, one as input and other as output device.	2	CO3
	b	Write a program to add two 24-bit numbers stored at 0x10~0x12 and 0x13~0x15 and leave the sum at 0x20..0x22.	3	CO2
3		Write an assembly language program to find out the number of repetitions of an alphabet in a string of 10 alphabets expressed as ASCII numbers	5	CO2

4	Write an assembly language program for adding a series of "10" 64 bit numbers using ARM microcontroller	5	CO
5	Differentiate between the following instructions	3	CO4
a	STMIA R10!, {R0-R7} and MRC CP_2 ADD R0, CR0, CR1	2	
b	BGE Loop and BLX R0		
6 a	What are the features of Digital Signal Processors	2	CO4
b	Explain different methods of rounding used in removing guard bits in Digital Signal processor And Analyse the methods for suitability depending on application	3	
7	Explain the working of a DRAM cell. Compare the performance of SRAM and DRAM. Discuss the methods to improve the speed of DRAM access.	5	CO5
8	Explain different CACHE mapping policies	5	CO4
9 a	Define Bus Arbitration and different method of BUS arbitration	3	CO5
b	Explain PCI bus architecture with the help of block diagram	2	
10	What do you mean by exception in the context of ARM microcontroller Write down and explain all exception modes. and explain how ARM microcontroller does exception handling	5	CO5

Find the test vector abcdhk using D-algorithm for h1 line sa1 fault. Assume 'phi' be dont care.
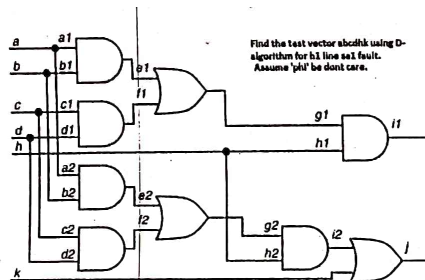
Fig. 4

(c) In Fig.5, determine the test vectors using verification testing. [4][CO#4]

Consider the following dependence matrix for verification testing:

	x1	x2	x3	x4
Z1	1	1	0	0
Z2	1	0	0	1
Z3	1	0	1	0
Z4	0	1	0	1

Fig.5

****************************END****************************

ℓ

END TERM EXAMINATION   *May-2023*

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 Design a BIST architecture for CUT shown in Fig.1 as per the following specifications: **(a)** Use cellular automata as TPG whose cells follow Rule 150 and 90 as shown in Fig.2 and seed is 1110.

(b) Use MISR with characteristic polynomial x^4+x^3+x+1 and determine the signature, if f1 is connected at input of first flipflop and f2 at second, using both tabular and division method. [10][CO#4]
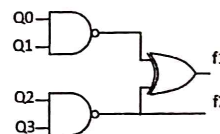
Fig.1
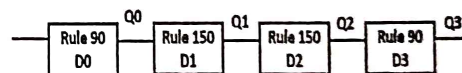
Fig.2

Q.2 For the Boundary Scan Standard, answer the following: [10][CO#4]
(a) What is the other name of boundary scan standard?

(b) Name the external pins in a boundary scan wrapper.

1

(c) Draw the internal architecture of a boundary scan cell. Also explain different modes of its operation.

(d) For Fig.3, write the sequence of modes of operations for detecting f stuck at 0 fault. In how many clock cycles, the testing will be completed?

[10][CO#4]
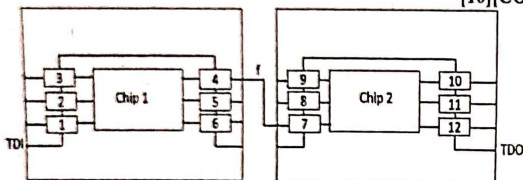
Fig.3

Q.3 (a) Let 0 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?

[3][CO#5]

(b) Consider a PLA on which the following functions are implemented:

$F1(x1,x2,x3)= \sum(0,2,3)$
$F2(x1,x2,x3) = \sum(0,4,7)$
$F3(x1,x2,x3)= \sum(0,1,2)$
$F4(x1,x2,x3)= \sum(0,1,3,4)$

Determine the expressions of check bits while designing self-checking PLA using modified Berger codes?

[6][CO#5]

(c) Define self-testing and fault secure properties of totally self-checking circuits.

[1][CO#5]

Q.4 Consider the following RAM test algorithm:{⇑(W0);⇑(R0, W1, R1);⇓(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. [10][CO#2]

(a) Consider a coupling fault in which a change in the cell content 30018 causes cell 0 to change. In which march element this fault will be detected?

(b) Write the pseudo code for this algorithm.

(c) 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?

(d) 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?

(e) Will the above test be able to detect stuck at 0 fault? If yes, in which march element?

Q.5 (a) For a circuit having two blocks (block1 is NAND and block 2 is AND) with unshared inputs, if S1 and S2 denote the syndromes of the functions realized by the blocks 1 and 2, respectively, what will be the input–output syndrome relation S for the circuit if the terminating gate is NAND?
[2][CO#4]

(b) Consider a fault f1 which is equivalent to fault f2. Fault f2 is equivalent to fault f3. A fault f4 dominates fault f1 and fault f5 dominates f4. Which of the following faults must be retained in the reduced fault set after collapsing to detect all the faults in the circuit?
[2][CO#1]

(c) A chip designer had to design a chip which could implement the function f = (A+B+C)'. He made a mistake and designed the chip which was implementing ((A+C)'.B)'. Determine the following: Primitive d-cube of fault, singular cubes of function f, propagation D-cubes.
[6][CO#1]

Q.6 (a) If the output of CUT m(t) is 10110001. It enters in external XOR SISR with characteristic polynomial $x^3+ x+ 1$. Determine the signature.
[2][CO#4]

(b) In Fig.4, determine the test vector abcdhk using D-algorithm for h1 line stuck at 1 fault. Assume Φ be don't care.
[4][CO#1]

2

3

END TERM EXAMINATION   May-2023

COURSE CODE: EC 316   COURSE TITLE: Wireless Sensor

Networks

Time: 03:00 Hours   Max. Marks: 50

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

Q.1 Compare cellular networks and adhoc wireless networks qualitatively
    and quantitatively.   [10][CO1]

Q.2 Explain wireless mesh networks giving at least two examples in detail.
                                                     [10][CO1]

Q.3 (a) Discuss the different types of power sources that are used in
        wireless sensor networks.   [5][CO2]
    (b) Compare adhoc wireless networks and wireless sensor networks.
                                                      [5][CO3]

Q.4 Explain (i) Smart Dust (ii) WINS   [10][CO4]

Q.5 Compare MACA and MACAW protocol in detail.   [10][CO5]

VIth SEMESTER

B.Tech.

END TERM EXAMINATION   May-2023

EC320 Soft Computing

Time: 03:00 Hours   Max. Marks: 50

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

Q.1 (a) List and explain in brief various heuristic search algorithms used in artificial intelligence.

(b) For the graph shown in Figure 1, let the start and goal node as S and G, respectively, and the heuristics of each node as h(S), h(A), h(B), h(C), h(D) and h(G) as 5, 3, 4, 2, 6, 0, respectively. Explain the working of A* search algorithm for this scenario.
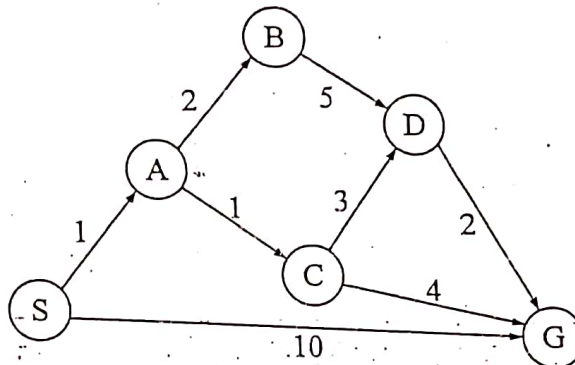
Figure 1

[5+5=10][CO1]

Q.2 (a) Assume a network with single neuron having four input with the initial weight vector as $W = [1\ -1\ 0\ 0.5]^T$, needs to be trained using set of three input vectors as $x_1 = [1\ -2\ 1.5\ 0]^T$, $x_2 = [1\ -0.5\ -2\ -1.5]^T$ and $x_3 = [0\ 1\ -1\ 1.5]^T$, taking learning rate =1, find the weight vector after one Epoch of training the neuron through Hebbian learning. (Assume neuron to be bipolar binary)

(b) Explain in detail the architecture and working of Bi-directional associative memory.

[5+5=10][CO2]

Q.3 Explain the following related to fuzzy set theory:
(a) Support of a set, (b) Crossover point, (c) α-cut and strong α-cut, (d) Intersection and union of two sets and (e) Law of contradiction.

[2*5=10][CO3]

179

Q.4 (a) The fuzzy sets P and Q are defined on X as follows.

$\mu(x)$	x_1	x_2	x_3	x_4	x_5
P	0.1	0.2	0.7	0.5	0.4
Q	0.9	0.6	0.3	0.2	0.8

Find the following.

(i) $P_{0.2}$ and $Q_{0.3}$ (ii) $(P \cup Q)_{0.6}$ (iii) $(P \cup \bar{P})_{0.8}$ (iv) $P \times Q$

(b) Explain Mamdani method of fuzzy implication with a suitable example.

[2*5=10][CO3]

Q.5 (a) Table below shows a population of four strings. Assuming that the string represents a binary encoding of a number 'n', and that the fitness function is given by $F_i=100/n$, fill in the rest of the tables

String No.	String	n	F_i	$\dfrac{F_i}{\sum F_i}$	No. Surviving	Mating Pool
1	10111	23				
2	00111	7				
3	01001	9				
4	01010	10				

Mating Pool	Mate	Crossover point	New Population	n	New F_i

(b) Explain the following related to Genetic algorithm
(i) Crossover
(ii) Encoding

[6+4=10][CO4]

SIXTH/EIGHT SEMESTER

B.Tech. [EC]

END SEMESTER EXAMINATION   **MAY(2023)**

EC-332 INFORMATION THEORY & CODING

Time: 3 Hours   Max. Marks :50

> **Note :**   Answer *ANY FIVE* questions. Assume suitable missing data, if any.

1 (i) Define Equivocation and what is meant by it.   [10][CO1]
(ii) Define Hamming bound and write the expression for it.   [CO2]
(iii) Define perfect code. What is the condition for it?   [CO2]
(iv) Write and explain the Kraft inequality.   [CO2]
(v) Define the sphere packing bound.   [CO2]

2 (a) State and prove Shannon first Fundamental theorem for code
length.   [5][CO2]
(b) Consider a (7,4) linear block code with following generator matrix [5][CO2]

$$G = \begin{bmatrix} 1\ 1\ 0\ 1\ 0\ 0\ 0 \\ 0\ 1\ 1\ 0\ 1\ 0\ 0 \\ 1\ 1\ 1\ 0\ 0\ 1\ 0 \\ 1\ 0\ 1\ 0\ 0\ 0\ 1 \end{bmatrix}$$

Draw the encoding and syndrome circuit for this.

3(a) Consider a cyclic code generated by $g(x) = 1+x+x^3$, (i) Find the systematic
form of the generator matrix.   [5][CO2]
(ii) Draw the encoding circuit for this.
(iii) Find out the encoding circuit output, if the input message is (1011).

(b) Draw the encoding circuit and syndrome circuit for the (7,4) cyclic code
based on the corresponding generator polynomial $g(x) = 1+x+x^3$.   [5][CO2]

4(a) Consider a (2,1,2) convolutional encoder as shown in Fig. 1   [5][CO5]
   (i)   Write the impulse response of the encoder.
   (ii)   Draw trees and state diagram for this encoder.
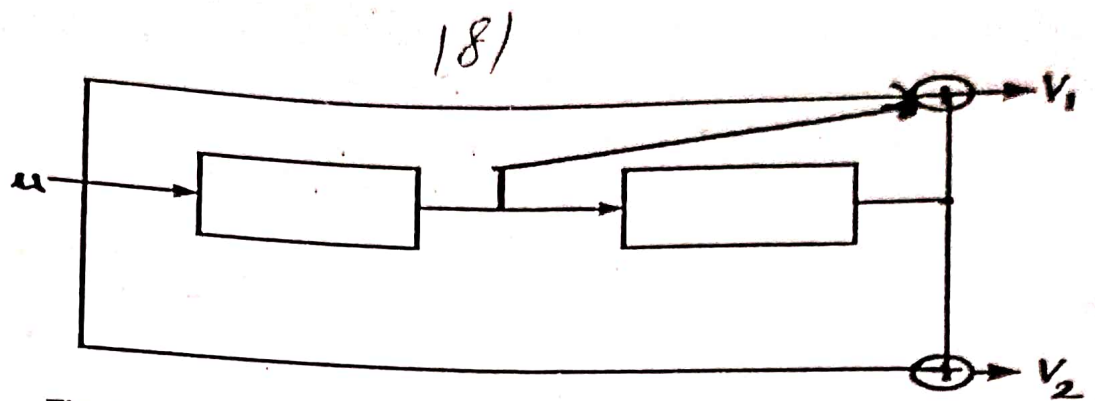
Fig. 1 A (2,1,2) convolution encoder

4(b) Consider a (15,5) triple error correcting BCH code with $g(X) = 1+X+X^2+X^4+X^5+X^8+X^{10}$. 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 and the error locations and hence the corrected code. [5][CO4]

5(a). What is standard array? Explain with an example. [5][CO3]

5(b) Consider the following belief propagation algorithm used in decoding of an LDPC code - the code bit $b_i = 0$ is mapped to the symbol-1 and $b_1 = 1$ to +1. Let r_i be the received symbol. For the Gaussian channel with variance σ and signal to noise ratio $\frac{E_s}{N_o} = \frac{1}{2\sigma^2}$, we have the probability density function

$$p(r_i|b_i) = \frac{1}{\sigma\sqrt{2\pi}} \exp(\frac{-r_i - (1 - 2b_i)^2}{2\sigma^2})$$

Find the conditional L-value $L(r_i|b_i)$. [5][CO5]

6(a) Explain the implementation of RS coding and BCH coding with examples and compare RS coding with BCH coding. [5][CO4]

(b)With examples, explain the implementation of time domain approach and transform domain approach for convolution encoding. [5][CO5]

B. Tech.

END TERM EXAMINATION   May-2023

EC-336   FLEXIBLE ELECTRONICS

Time: 3 Hours   Max. Marks : 56

Note : 1. Question 1 and 2 are compulsory.
2. Answer any 5 Questions out of Q-3 to Q-8
3. Assume suitable missing data, if any.

Q 1.   List three applications of each device.   [6M] [CO4]
(a) TFT
(b) Graphene
(c) Organic solar cell

                                                [14M] [CO3, 4, 5]

Q 2.   Write a short notes on
(a) Passivation and Encapsulation
(b) Electronic skin
(c) Bootstrapping Technique
(d) Paper display
(e) Wearable flexible antenna
(f) Aerosol jet printing
(g) Sintering and Glass transition temperature

Q 3.   Explain Operation of OTFT with diagram? What are the key device parameters for OTFT parameter extraction explain in detail with equations?   [6M] [CO4]

Q 4.   Define Organic semiconductor in terms of HOMO and LUMO? Which all properties of substance changes due to HOMO-LUMO gap?   [6M] [CO3]

Q 5.   (a) What is OLED? How it works? Draw the diagram of single and multilayer OLED.   [3M] [CO5]

(b) List different types of OLED, its characteristics and applications.

[3M] [CO5]

Q 6.   (a) Which device parameters are used for determining the performance of Dual gate organic transistor, and why?   [3M] [CO1,2]

(b) What is CNT? List its properties and its advantages and disadvantages.

[3M] [CO3]

Q 7.   (a) What is Life-Cycle Assessment in flexible electronic device discuss with relevant diagram.   [3M] [CO3]

(b) List the Properties associated with an ideal substrate material for flexible electronics applications.   [3M] [CO3]

Q 8.   (a) Draw the circuit diagram of RFID system and explain its working.

[3M] [CO1, 2]

(b) Explain dimensional·scaling in Flexible Processor and Memory circuit design with diagram.   [3M] [CO1, 2]

****--------------------------------END--------------------------------****

8TH SEMESTER [B.Tech]

END TERM EXAMINATION   MAY-2023

COURSE CODE: EC432
COURSE TITLE: Bio-Impedance Based Measurements

Time: 03 Hours   Max. Marks: 50

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

1. What do you mean by the Piezo electric and triboelectric effects? How these can be used in the bio-medical diagnostics?   [05] [CO2]

2. Why are phase modulation-based techniques are most commonly used in digital communication systems, whereas it is seldom used in analog communication domain?   [05] [CO1]

3. What do mean by black box? How its analysis is done, show it with appropriate circuits?   [05] [CO3]

4. Draw the circuit diagram of instrumentation differential amplifier and also explain its working.   [05] [CO3]

5. Discuss the various risk considerations during the interface between patient and amplifier with proper illustrations.   [05] [CO2]

6. Elaborate the power line noise cancellation techniques.   [05] [CO3]

7. What is lock-in amplifiers? Why it is required? Make a comparison between analog and digital lock-in amplifiers.   [05] [CO4]

8. Explain the current mode lock-in amplifiers with the help of suitable block diagram, and also highlight its advantages.   [05] [CO4]

9. What do you mean by the validation & calibration of bio-impedance? How validation & calibration of bio-impedance is performed? Suggest methods for the same.   [05] [CO5]

10. Comment upon the challenges in measurement, analysis, and validation of bio-impedance.   [05] [CO5]

11. What is the future scope of bio-impedance based non-invasive medical diagnostics? Substantiate your opinion with suitable facts.   [05] [CO1]

12. Write short note on any two: -   [05] [CO5]
    a] ECG   b] EEG   c] EMG

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

THIRD SEMESTER   **B.Tech. ENE**
END SEMESTER EXAMINATION   **(May -2023)**
        EN 202   GEOTECHNICAL ENGINEERING
Time: 3.00 Hours   *Max. Marks: 40*
Note: Answer all questions. All Questions carry **Equal Marks**.

        Assume suitable missing data, if any

1. A borrow area soil has a natural water content of 10% and bulk density of 1.80 gm/ cc. Soil is used for an embankment to be compacted at 18% moisture content to a dry density of 1.85 gm/cc. Determine amount of water to be added to 1 mt³ of borrow soil. How many cubes meter of excavation is required for 1 mt³ of compacted embankment?   CO1

    (b) For a natural clay, the liquid limit is 55%, the plastic limit is 28%, and the percent finer than 0.002mm is 29%. Classify the soil based on unified soil classification system. Estimate its activity, Plasticity Index, Liquidity Index, Consistency Index and Flow Index.   CO1

2. (a) Derive an expression for determining permeability of soil by falling head permeameter.   CO2

    (b) State assumption and limitation of Boussinesq's theory for finding out the stress at a point because of the application of point load. Write Boussinesq's equation.   CO2

3. a) State the assumptions and limitations of Terzahi's theory of consolidation.   CO3

(b) The laboratory test for a standard proctor is shown below. Determine the optimum water content and maximum dry density. If the specific gravity of the soil is 2.67, draw the zero air void (ZAV) curve and 100% saturation line.　　　CO3

Volume of Proctor Mold in cm3	Weight of wet soil in the mold (kg)	water content in %
1000	3.92	11
1000	4.19	13
1000	4.33	15
1000	4.38	17
1000	4.34	19
1000	4.29	21

4. (a) A series of direct shear test was conducted on a soil, each test was carried out till the sample failed, following results were obtained. Determine C and φ also plot the failure envelope.　　CO4

Sample No.	σ_n in kN/sq.m.	τ in kN/sq.m.
1	15	18
2	30	25
3	45	32

(b) Enumerate the merit and demerit of Tri - axial test over other lab test to determine shear parameter of soil.　　　CO4

5. (a) With the help of suitable sketch explain the conditions of earth pressure at rest, active and passive when a back fill is retained by a concrete retaining wall.　　　CO5

(b) Explain the assumptions and limitations of Terzaghi's bearing capacity theory.　　　CO5

6. Write short notes on any four following

(a) Newmark's Chart　　　CO2

(b) Plasticity chart　　　CO1

(c) Factor effecting compaction　　　CO3

(d) Necessity of pile foundation　　　CO5

(e) Earth pressure at rest　　　CO5

(f) Vergin compression curve　　　CO3

(g) Thixotropy　　　CO1

IV Semester **B.Tech. (Env)**
END SEMESTER EXAMINATION   May- 2023
EN-204 Water Engineering: Design & Application
Time: 3 Hours   Max. Marks: 40

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

1. (a) Which are the discrete particles removed in an ideal sedimentation tank under the following conditions
   (i) Horizontal flow
   (ii) Vertical flow   (4 Marks) (CO3)
   (b) Compute the dimensions of a continuous flow rectangular sedimentation tank for a population of 20,000 persons with a daily per capita water allowance of 120 litres. Assume detention period to be 6 hours.   (4 Marks) (CO3)

2. (a) How will you determine the optimum coagulant quantity by jar test?   (4 Marks) (CO3)
   (b) Distinguish between Slow sand and rapid sand filters ?   (4 Marks) (CO4)

3. (a) Draw a neat sketch of a rapid gravity filter and describe how it works. Also explain the process of Back washing (4 Marks) (CO4)
   (b) What is meant by disinfection in treating public water supply? What is its importance? What are the chemicals which are used as disinfectants and what are their comparative merits and demerits?   (4 Marks) (CO5)

4. (a) Explain the drinking water quality standards as per BIS ?   (4 Marks) (CO2)
   (b) List the bacteriological tests to be done and explain any one in detail   (4 Marks) (CO6)

5.(a) Enumerate the common tests which are to be carried out in the examination of water at laboratories attached to water treatment plants, and explain the significance of each of them. (4 Marks) (CO5)

(b) Illustrate with sketches, the different types of layouts of pipe systems in distributing water, and compare their merits and demerits.

(4 Marks) (CO2)

6. Write short notes on the following　　　　(8 Marks)
   (i)　　Water borne diseases　　(CO4)
   (ii)　　M.P.N　　(CO3)
   (iii)　　Socket and Spigot Joint and expansion Joint (sketches)
   　　　　(CO2)
   (iv)　　Canal Intake with sketch　　(CO1)

FOURTH SEMESTER
END-TERM EXAMINATION

B.Tech. (Env.)
May - 2023

EN206   ENGINEERING GEOLOGY, GIS AND REMOTE SENSING

Maximum Marks: 40
Duration: 3 Hours

> Note: Answer ANY TWO PARTS from each question.
> All questions are compulsory and carry equal marks.
> Assume suitable missing data, if any.

	Marks	CO#
Q. 1 Attempt ANY TWO of the following		
a. Appraise the role of geology for engineering applications with examples.	4	CO1
b. Sketch the configuration of (i) synclinical fold and (ii) reverse fault. Label the components.	4	CO1
c. Explain unconformity with help of a sketch.	4	CO1
Q. 2 Attempt ANY TWO of the following		
a. Illustrate rock cycle, also explain various stages.	4	CO2
b. Apply physical properties to distinguish minerals.	4	CO2
c. Compare weathering, erosion and denudation of rocks.	4	CO2
Q. 3 Attempt ANY TWO of the following		
a. Compare the zone of aeration and the zone of saturation.	4	CO3
b. Apply Darcy's Law to explain permeability.	4	CO3
c. Explain the types of water-bearing strata.	4	CO3
Q. 4 Attempt ANY TWO of the following.		
a. Evaluate the importance of geo-referencing in GIS.	4	CO4
b. Distinguish between raster image and vector image.	4	CO4
c. Apply GIS for air pollution control.	4	CO4
Q.5 Attempt ANY TWO of the following		
a. Develop a methodology for remotely imaging earth's surface temperature.	4	CO5
b. Explain (i) multi-spectral imaging and (ii) hyper-spectral imaging	4	CO5
c. Analyze the working of remote sensing.	4	CO5

B. Tech. [Environmental Engineering]

End Term Examination   (May-2023)

Course Code EN-208 Course Title: Fluid Mechanics and Hydraulic Machines

Time: 3.00 Hours   Max. Marks: 40

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

1. (a) State Bernoulli's theorem for steady flow of an incompressible fluid. State the various assumptions for Bernoulli's equation.   [2][CO2]

(b) An orifice meter with orifice diameter 10cm is inserted in a pipe of 20cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter gives readings of 19.62 N/cm² and 9.81 N/cm² respectively. Coefficient of discharge for the orifice meter is given as 0.6. Find the discharge of water through pipe.   [6][CO2]

2. Water at 15°C flows between two large parallel plates at a distance of 1.6 mm apart. Determine (i) the maximum velocity (ii) the pressure drop per unit length and (iii) the shear stress at the walls of the plates if the average velocity is 0.2 m/s. The viscosity of water at 15°C is given as 0.01 poise.   [8][CO3]

3. (a) What do you understand by hydrodynamically smooth and rough boundaries.   [2][CO3]

(b) Derive the expression for velocity distribution for turbulent flow in smooth pipes.   [6][CO3]

4. (a) Explain the different types of hydraulic similarities that must exist between a prototype and its model.   [2][CO4]

(b) The efficiency η of an fan depends on density ρ, dynamic viscosity μ of the fluid, angular velocity ω, diameter D of the rotor and the discharge Q. Express η in terms of dimensionless parameters. [6][CO4]

or

(a) Explain the different model laws. [2][CO4]

(b) The discharge through a weir is 1.5 m³/s. Find the discharge through the model of the weir if the horizontal dimension of the model is (1/50) the horizontal dimension of the prototype and vertical dimension of the model is (1/10) the vertical dimension of the prototype. [6][CO4]

5. (a) Explain the different classification of turbines. [4][CO5]

(b) What do you mean by gross head, net head and efficiency of turbine? Explain the different types of the efficiency of a turbine. [4][CO5]

or

Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer by $\frac{u}{U} = \frac{y}{\delta}$, where u is the velocity at a distance y from the plate and u = U at y = δ, where δ = boundary layer thickness. Also calculate the value of $\delta*/\theta$.

[8][CO5]

4th Semester
B.Tech
End Term Examination   May-23
EN252   Environmental Engineering
Time: 03 Hours   Max. Marks: 40

Note: Attempt any five questions.
Draw neat and labelled diagrams wherever necessary.
Assume suitable missing data.

Q.1(a) Define sludge volume index. What is its importance in sewage
treatment?   [4] [CO1]

Q.1(b) Sketch and explain the types of aeration systems in activated
sludge process.   [4] [CO2]

Q.2(a) A 350 mm diameter sewer is to flow 0.25 depth on a grade
ensuring a degree of self cleansing equivalent to that obtained at full
depth at a velocity of 0.8 m/sec. Find (i) the required grade (ii)
associated velocity (iii) rate of discharge at this depth. Given
Manning's coefficient =0.014, proportionate area =0.315,
proportionate wetted perimeter =0.472, proportionate hydraulic mean
depth (r/R) = 0.7705   [3] [CO3]

Q.2(b) Discuss the factors affecting self purification of polluted
streams. What measures can be adopted to control stream pollution.
                                                      [5] [CO2]

Q.3(a) Explain what is the purpose of providing a Grit Chamber in a
sewage treatment plant, when a sedimentation tank is already
provided ahead of it?   [2] [CO2]

Q.3(b) Design a parabolic (trapezoidal) grit chamber for a horizontal flow velocity of 25 cm/sec, and a flow which ranges from a minimum of 25000 cu.m./day to a maximum of 100000 cu.m./day. Average flow is 62500 cu.m./day. [6] [CO4]

Q.4(a) Design suitable dimensions of trickling filter units for treating 5 MLD of sewage per day. BOD of sewage is 150 mg/L. also design, suitable dimensions for its rotary distribution system, as well as the under drainage system. [5] [CO4]

Q.4(b) Mention the operational troubles of standard rate trickling filter and their remedies. [3] [CO2]

Q.5(a) Design a digestion tank for the primary sludge with the help of given data; average flow 20 MLD, TSS in raw sewage 300 ng/L, moisture content of digested sludge 85%. Assume any other suitable data. [4] [CO4]

Q.5(b) Raw wastewater is entering a treatment plant and contains 250 mg/L SS. If 55% of these solids are removed in sedimentation, find (i) the volume of raw sludge produced per million litres of wastewater. Assume sludge has moisture content of 96%, and specific gravity of solids is 1.2 (ii) unit weight of raw sludge (iii) if 45% of raw sludge is converted to liquid and gas in the digestion tank, find the volume of digested sludge per million litre of wastewater. Assume moisture content of digested sludge as 90%. [4] [CO3]

Q.6(a) Design a conventional activated sludge plant to treat domestic sewage with diffused air aeration system with following data

Population 35000, average sewage flow 180 lcpd, BOD of sewage 220 mg/L, BOD removed in primary sedimentation 30%, overall BOD reduction desired 85% [5] [CO4]

Q.6(b) What is meant by activated sludge ? describe using a sketch treatment of sewage using activated sludge process. Mention the advantages and disadvantages of this system. [3] [CO1]

Q.7(a) Enumerate the different major air pollutants, their characteristics, sources, and health effects on human beings.
[4] [CO1]

Q.7(b) Explain negative lapse rate and temperature inversion condition. How does temperature inversion conditions affect the pollution levels in the immediate environment ? [4] [CO2]

Q.8(a) Explain aerobic composting process for management of municipal solid wastes. Discuss design considerations for aerobic composting process. [4] [CO2]

Q.8(b) Discuss typical composition of municipal solid waste, its sources, and characteristics of solid wastes. [4] [CO1]

193

SIXTH SEMESTER

B.TECH. (ENE)

END-TERM EXAMINATION

MAY– 2023

EN-302   SOLID WASTE MANAGEMENT

Time: 03 Hours

Max. Marks: 40

Note: *Attempt any five questions; assume suitable missing data if any*

1. a) Describe the typical characteristics of Indian solid waste.   4[CO1]
   b) With the help of a neat sketch explain the functions of the different components of sanitary landfill and its operation.   4[CO4]

2. a) Estimate the landfill area required to handle 15 year's MSW for a town of 100000 people. The per capita waste generation is 0.65Kg/day; landfill density is 500Kg/m³, with FIVE three metre lifts. Assume that 20% of the cell volume is soil used for cover, and additional 4.0 hectare land is required for other operations.   4[CO4]
   b) Briefly discuss the measures for effective management of waste in DTU campus.   4[CO5]

3. a) Discuss the significance of composting in waste management. 4[CO5]
   b) Explain the challenges associated with waste management. 4[CO1]

4. Write short notes on
   a) Reduction at Source   4[CO2]
   b) Integrated solid waste management   4[CO2]

5. The annualised truck cost (A) is given as A = 10000+4000V where V is the volume of truck (V-10.2 m³). The truck has two-person crew with charges @Rs. 70/hour in an 8-hour shift. What is the cost per tonne, and per household for refuse collection if each household puts out 0.25 m³ of waste per week with curbside density of 120 kg/m³. Assume that the truck collects waste from 142 households on each of its two trips per day to the disposal site; the crew and truck work five days a week, and curbside pick up is provided once a week for each house.   8[CO3]

6. MSW 'as delivered' has 65.1% of paper, food waste, yard trimmings, wood, and other decomposable matter. The moisture content of this waste is 35%. The elemental analysis of decomposable has following mass percentages:

Element	C	H	O	N	Other	Total
Dry Mass (%)	45.2	6.0	43.7	0.43	4.67	100

Find the chemical formula for the C, H, O, N portion of decomposable. Also find out the percentage of methane generated, per kilogram of waste.   8[CO5]

SIXTH SEMESTER

B. Tech.

END TERM EXAMINATION   *May 2023*

EN304 AIR POLLUTION AND CONTROL

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

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

Q.1   Answer the following:

(i)   In stack sampling, large sized particles are collected on filter paper when:

(a)   stack gas flow rate > sampling flow rate

(b)   stack gas flow rate < sampling flow rate

(c)   stack gas flow rate = sampling flow rate

(d)   none of these

(ii)   Most of the wind motions in the atmosphere is:

(a) Vertcial   (b) Horizontal   (c) Oblique   (d) None

(iii)   Ground level concentration is minimum, when the plume shape is:

(a) Looping   (b) Coning (c) Fanning   (d) Fumigating

(iv)   For legal compliance of PM, one of the following sampling methods is used:

(a) Grab   (b) Continuous   (c) Intermittent   (d) Integrated

(v)   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   [1x5] [CO1]

Q. 2   (a) What is Dry Adiabatic Lapse Rate and show by derivation that Dry Adiabatic Lapse Rate is -1°C/100m.   [2][CO1]

(b) Under what conditions the Gaussian dispersion equation for a continuous point source is valid?   [3][CO2]

Q.3. Classify and compare the degree of stability in the atmosphere under the following situations:

(a) Temperature at ground level is 20°C; temperature at 500 m is 25 °C.
(b) Temperature at ground level is 25°C; temperature at 800 m is 15 °C.
(c) Temperature at ground level is 25°C; temperature at 2000 m is 5 °C.
(d) Temperature at ground level is 30°C; temperature at 500 m is 20 °C.
(e) Temperature at ground level is 25°C; temperature at 1000 m is 20 °C.

[5] [CO5]

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]

(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?

[2][CO3]

OR

Describe the existing scenario of air pollution in the capital city of India along with the actions taken by the government authorities to combat the same.

[5][CO4]

Q.5. (a) Enumerate and describe various natural actions which clean the ambient air over time by removing various pollutants.

[2][CO1]

(b) Write a note on air pollution caused by automobiles and its control.

[3][CO5]

Q.6. Explain the working of any two of the following with neat sketch and with special mention of where these control equipments may be used:

(i) Electrostatic precipitators
(ii) Cyclone Collectors
(iii) Fabric Filters
(iv) Settling Chambers

[2.5x2] [CO4]

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]

****

VI˙ SEMESTER   B.Tech.(Env. Engg.)

END-TERM EXAMINATION   MAY-2023

EN- 306 HYDROLOGY & GROUND WATER ENGINEERING

Duration: 3:00 Hours   Maximum Marks: 50

Note: All questions are compulsory.

Assume suitable missing data, if any.   **Marks   CO**

Use graph paper for plotting.

Q1(a) Prove $Q = \frac{2\pi T s_w}{\ln R/r_w}$ for confined aquifer.   4   5

(b) A 20-cm well penetrates an unconfined aquifer of
saturated thickness 30 m completely. Under a steady   6   5
pumping rate for a long time the draw downs at two
observation wells 15 and 30 m from the well are 5.0 and
4.2m respectively. If the permeability of the aquifer is
22m/day, determine the discharge and the drawdown at
the pumping well.

Q2(a) Two catchments A and B are considered meteorologically
similar. Their catchment characteristics are given below.   5   4

Catchment A	Catchment B
L = 25 km	L = 40 km
Lca = 15 km	Lca = 20 km
A = 200 km²	A = 380 km²

For catchment A, a 3-h unit hydrograph was developed
and was found to have a peak discharge of 60 m³/s. The
time to peak from the beginning of the rainfall excess in
this unit hydrograph was 9.0 h. Using Snyder's method,
design & plot a unit hydrograph for catchment B.

OR˙

(a) Tabulated below are the ordinates at 14hrs has interval for
a hydrograph, the area of the catchment 780 km². Separate
the base flow from the total flow by reverse curve method
& determine the depth of direct run-off.

Time (Days)	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Flow (m3/s)	35	680	510	450	295	160	100	96	70	60	48	32	25	15

(b) Flood-frequency computations for the river Chambal at Gandhi sagar dam, by using Gumbel's yielded the following results:

Return Period Tr (years)	Peak flood (m³/s)
50	30,520
100	35,300

Estimate the flood magnitude in this river with a return period of 500 years.

5   4

Q3(a) What do you understand by the term stream gauging? Explain the types of streams gauging.

5   2

(b) The discharge data of 10 years for the river is given below. Draw & plot the flow duration curve for the river and determine the 80% dependable discharge

5   2

Q(m³/s)	10	40	70	100	150	180	90	80
No. of occurrence	2	5	4	6	9	3	7	8

Q4(a) An isolated storm in a catchment produced a runoff of 4.1 cm. The mass curve of the average rainfall depth over the catchment was as below:

4   2

Time from beginning of the storm (h)	0	1	2	3	4	5	6
Accumulated average rainfall (cm)	0	0.55	1.65	3.55	5.68	6.90	7.95

Calculate the ϕ index for the storm.

(b) Explain the graphical representation of rainfall.

3   3

OR

(b) Explain a procedure for checking a rainfall data for consistency.

(c) Explain Thornwaite method.

3   3

Q5(a) Explain the following terms
a. Aquitard
b. Aquiclude
c. Aquifuge

3   1

OR

(a) Explain the types of Precipitation.

(b) Explain rainfall –run-off correlation.

3   3

(c) The ordinates of a 3-h unit hydrograph are given below. Determine the ordinates of 12 – h unit hydrograph.

4   4

Time (h)	0	3	6	9	12	15	18	21	24	27	30	33
3-h UH ordinate (m³/s)	0	25	100	160	190	170	110	70	30	20	6	0

SIXTH & EIGHTH SEMESTER   B.Tech.(Env. Engg.)
END-TERM EXAMINATION   May- 2023

EN310 Surface and Ground Water Pollution

Duration: 3 Hours   Maximum Marks:50

Note: Answer any FIVE questions.

All questions carry equal marks.   Marks   CO

Assume suitable missing data, if any.

		Marks	CO
Q.1 (a)	Briefly explain various sources of ground water contamination. Also describe the migration pattern of Non Aqueous Phase Liquid (NAPL) and Less dense Non Aqueous Phase Liquid (LNAPL) in the subsurface area.	5	2,4
(b)	With the brief diagrammatic representation discuss the major differences between the aeration zone and saturated zone.	5	1,3
Q.2 (a)	What is the general structure of the water quality modelling and what kind of models are used to simulate the water quality in rivers?	5	4
(b)	Define capillary pressure. How can the negative values of the pressure head in unsaturated media can be explained?	5	3,1
Q.3 (a)	What is Soil water characteristic curve? Draw the typical soil- water characteristic curve for the major classes of soil.	5	1
(b)	Write the Fick's law in the cases of diffusion and dispersion. What is the difference in meaning of the proportionality coefficient in the two cases?	5	1,4

Q.4 (a)	Describe various models adopted to represent the variation of infiltration capacity with time.	5	2,3
(b)	Define Darcy's Law. Also discuss the relationship between Darcy's Law and Richard's equation.	5	1
Q.5 (a)	Discuss the soil water interaction in vadose zone. Also describe various issues arise during flow process.	5	1,4
(b)	Derive generalised continuity equation in 3D for steady and uniform ground water flow.	5	2,3
Q.6 (a)	Express the hydraulic conductivity in function of the intrinsic permeability and the fluid properties.	5	1,3
(b)	What role plays the evaporation and evapotranspiration as part of the hydrological cycle? Also discuss various physical factors that influence the evaporation process.	5	1,2

2 00

SIXTH/EIGHT SEMESTER
END-TERM EXAMINATION

B.Tech.
May - 2023

EN312   ADVANCE SURVEYING

Duration: 3 Hours

Maximum Marks: 40

Note: Answer ANY TWO PARTS from each question. All questions are compulsory and carry equal marks. Assume suitable missing data, if any.

	Marks	CO#

Q. 1 Attempt ANY TWO of the following

a. Explain the use of field astronomy in surveying. — 4 CO1

b. Compare and contrast the advantages and disadvantages of using triangulation vis-à-vis trilateration. — 4 CO1

c. Summarize the concept or errors and their adjustment. — 4 CO1

Q. 2 Attempt ANY TWO of the following

a. The following consecutive readings were taken with a dumpy level and a 4m levelling staff on a continuously sloping ground on a straight line at a common interval of 30 m. 0.855 (on A), 1.545, 2.335, 3.115, 3.825, 0.455, 1.380, 2.055, 2.855, 3.455, 0.585, 1.015, 1.850, 2.755, 3.845 (on B). The RL of A was 380.500m. Make a level field book and calculate the reduced levels of points using the height of instrument method and apply the usual checks. Determine the gradient of line AB. — 4 CO2

b. The following bearings were taken in running a compass survey. Line AB- 124°30'0" (Fore Bearing), 304°30'0" (Back bearing). Line BC- 68°15'0" (Fore Bearing), 246°0'0"(Back bearing), Line CD- 310°30'0" (Fore Bearing), 135°15'0"(Back bearing), Line DA- 200°15'0" (Fore Bearing), 174°45'0"(Back bearing). At what stations do you suspect local attraction? Find the correct bearings of the lines and also compute the included angle. — 4 CO2

2o)

c. A camera having focal length of 30 cm is used to take   4   CO2
vertical photography of a terrain having an average
elevation of 1200 m. What is the height above the sea level
at which the aircraft must fly in order to get the scale of 1 :
7000?

Q. 3 Attempt ANY TWO of the following
a. Illustrate the methodology for measuring distance using an   4   CO3
EDM with help of a labelled diagram.
b. Devise a methodology to determine the height of a tower by   4   CO3
triangulation using a theodolite.
c. Analyze the factors that affect photogrammetric   4   CO3
measurements.

Q. 4 Attempt ANY TWO of the following
a. The following perpendicular offsets were taken at 10m   4   CO4
intervals from a survey line AB to an irregular boundary
line: 2.50, 3.80, 4.33, 6.76, 5.30, 7.25, 8.95, 8.25 and 5.50.
Calculate the area in sqm, enclosed between the survey by
the average ordinate rule.
b. Evaluate the importance of the principles of surveying in   4   CO4
advance surveying.
c. Appraise the role of temporary and permanent adjustments   4   CO4
in surveying instruments with examples.

Q.5 Attempt ANY TWO of the following
a. Develop the methodology for setting out bridges.   4   CO5
b. Develop a proposal for an advanced surveying methodology   4   CO5
that can be used in challenging environments such as
underground mining.
c. Write a detailed procedure to carry out the profile and cross-   4   CO5
sectional levelling for a road project.

$2o2$

B.Tech.

END TERM EXAMINATION
MAY 2023

EN 316 Environmental Law and Policy

Time: 3 Hours   **Maximum Marks: 50**

Note: Attempt any FIVE questions. All questions carry equal marks.

1. Justify the reason behind the constitution of joint board along with necessary conditions. Also discuss the role and implications of section 3 of Water Act with reference to Indian scenario.   **(10) [CO 1]**

2. (a) Mention the year against the below mentioned environmental regulations: **(5) [CO 1]**
   - (i)   E(P) Act Notification-Environmental Clearance
   - (ii) The Water Cess Rules
   - (iii) Madras Wild Elephant Preservation Act
   - (iv) Bengal Rhinoceros Preservation Act
   - (v)   Noise Pollution (Regulations and Control)

   (b) Discuss the significance of Sec 3 & 4 of Wildlife Protection Act. **(5)** [CO 2]

3. (a) As per your opinion what are different circumstances, under which the Principle of Compensation can be exercised?   **(5) [CO 4]**

   (b)   Match the followings   **(5) [CO 1]**

1.	Constitution of Wildlife advisory board	Section 16
2.	Criminal liability fixed on directors	Section 4
3.	Constitution of State Pollution Control Board	Section 29
4.	Declaration of National Parks	Section 6
5.	Protected Forest declaration	Section 35

4. Discuss the important four steps that required to consider by relevant authorities in direct regulation as a policy instrument. In addition to this, also signify the importance of Price based mechanism along with its positive and negative aspects.   (10) [CO 3]

5. Define PP. Discuss the controversial issue of 'Scientific uncertainty' in the context of PP.   (10) [CO 4]

6. Write short notes on any two of the followings: (10) [CO 2]
    (i) Instrument Choosing Criteria
    (ii) GEF
    (iii) Ideal Communication Sustainability Model

EN 404   ENVIRONMENTAL IMPACT ASSESMENT AND AUDIT

Duration: 3 Hours   Maximum Marks: 50

> Note: Answer ALL question. All question carry equal marks.
>   Assume suitable missing data, if any.

Q. 1 Answer ALL the following questions:
   a. Enlist quantitative and qualitative methods for impact identification.
   b. Draw a flow diagram to show the steps in the EIA process.
   c. Write short note on Role of EIA in sustainable development.
   d. What are considered as environmental components in context of EIA?

Q. 2 Attempt any TWO questions out of the following:
   a. What is screening? Compare threshold and case-by-case approach.
   b. What are alternatives? What are the reasons for consideration of alternatives?
   c. Discuss various steps involved in assessment and prediction of impacts on air environment.

Q. 3 Attempt any TWO questions out of the following:
   a. What is matrix method? Explain Leopold matrix.
   b. Briefly explain the role of each principal actor in EIA framework.
   c. Write notes on Scoping and its role in EIA process.

Q. 4 Attempt any TWO questions out of the following:
   a. Discuss the problems and challenges that are associated with EIA in developing countries.
   b. Outline the salient features of a project activity and environmental parameter relationship.
   c. Describe the concept of adaptive EIA.

Q. 5 Attempt any TWO questions out of the following:
   a. What are the characteristics of a major project? Explain Schedule I and Schedule II projects with examples.
   b. Suggest mitigation measures for the following environmental impacts from of construction of a dam: (i) Water quality problems for downstream users; (ii) Ground water depletion; (iii) Increase in incidents of water related disease.
   c. Quantify the environmental impact for infrastructure and construction activities.

Total Number of pages 2   205

VIII - SEMESTER

END-TERM EXAMINATION

B.Tech.(Env. Engg.)

MAY-2023

EN 416 NON-CONVENTIONAL ENERGY SYSTEMS

Duration: 3:00 Hours   Maximum Marks: 50

Note: All questions are compulsory.   Marks   CO

Assume suitable missing data, if any.

		Marks	CO
Q1(a)	Compare the present status and future possibilities of Nuclear energy.	4	1
(b)	What is the basic principal of Nuclear energy conversion? Describe the Main considerations in selection a site for Nuclear energy generators.	6	1
Q2(a)	What are the main types of OTEC power plant? Describe their working in brief?	6	3
(b)	Compare the advantages & disadvantages of Hydro electric energy over the tidal energy.	4	3

OR

(b)	Explain the Hydro electric energy potential in India.		
Q3(a)	Write a note on types of geothermal fields. What are the possible sources of geothermal pollution?	5	4
(b)	What is the basic principal of Geothermal energy conversion? Write the advantages & disadvantages of Geothermal energy.	5	4

206

Q4(a) Briefly explain the technologies employed in bioconversion of raw biomass to cleaner fuel?   5   2

OR

(a) Give a brief note on challenges & global outlook of wind energy.

(b) What is the basic principal of solar energy conversion? Write the advantages & disadvantages of solar energy.   5   2

Q5(a) What are the difficulties in tidal power developments?   3   5

(b) What is thermroionic emission effect ? How space charge effect is minimized.   4   1

(c) What are the main applications of Geothermal energy?   3   4

END SEMESTER EXAMINATION

May- 2023

EP-202: CONDENSED MATTER PHYSICS

Time: 3:00 Hours

Max. Marks: 40

Note: Answer ANY FIVE questions.

Assume suitable missing data, if any.

1. (a) Derive an expression for the interplanar spacing between two consequent planes of the (h k l) in the case of a cubic structure. [4][CO1]

   (b) Describe the rotating crystal method for crystal structure analysis.

   [4][CO1]

2. (a) Discuss the assumptions and predictions of Einstein's model. How does the specific heat depend on the temperature in Classical, Einstein and Debye models in comparison with the experimental observations?

   [4][CO 2]

   (b) Show that the reciprocal lattice for a body centered cubic is a face centered cubic lattice. [4][CO 2]

3. (a) Explain the important conclusions of Kronig-Penney model with suitable diagrams. [4][CO 3]

   (b) Calculate the energy difference (in eV) between the ground and first excited states for an electron in one dimensional rigid box of length 1 Å. (Mass of the electron= 9.1×10^{-31} kg and $h = 6.626 \times 10^{-34}$ J-s) [4][CO 3]

4. (a) What are ferrites and explain their structure? What are the distinguishing features of ferrimagnetism? [4][CO 4]

   (b) Enlist the various contributions to total polarization. Derive the Clausius-Mossotti relation expressing the relationship between dielectric constant and atomic polarizability. [4][CO 4]

5. (a) Distinguish between Type-I and Type-II superconductors. Discuss any one application of superconducting materials. [4][CO 5]

(b) Define the critical magnetic field in a superconductor and explain the dependence of the critical magnetic field on temperature? The critical values of the magnetic field are 2×10^5 A/m and 1×10^5 A/m for niobium at 0 K and 8 K, respectively. Calculate the transition temperature.

[4][CO 5]

6. write short notes on the following: [4 × 2 = 8][CO 3-5]

(a) Bloch's theorem

(b) Soft and Hard Magnetic Materials

(c) Ferroelectric & Pyroelectric Materials

(d) Formation of Cooper pairs in a superconductor

All the Best

Table for Fresnel integrals

FRESNEL INTEGRALS

s	C(s)	S(s)
0.0	0.000	0.000
0.2	0.200	0.004
0.4	0.398	0.033
0.6	0.581	0.111
0.8	0.723	0.249
1.0	0.780	0.438
1.2	0.715	0.623
1.4	0.543	0.714
1.6	0.366	0.638
1.8	0.334	0.451
2.0	0.488	0.343
2.5	0.457	0.619
3.0	0.606	0.496
3.5	0.533	0.415
4.0	0.498	0.420
∞	0.500	0.500

EP 204- OPTICS

Time: 3 Hours   Max. Marks: 40

Note: Answer any eight questions.

1. (a) In the double hole experiment using white light, consider two points on the screen, one corresponding to the path difference of $5000A^0$ and other corresponding to the path difference of $40,000A^0$. Find the wavelengths in the visible region which correspond to constructive and destructive interference. What will be the colour of these points?

(b) Draw a neat diagram showing the optical arrangement of a Michelson interferometer.

[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 'Sin^2 Nγ/ Sin^2 γ 'for N =7.

[2, 2,1] [CO# 2]

3. A single square pulse of amplitude A and duration τ_0 is represented by

$$f(t) = \begin{cases} A & -\frac{\tau_0}{2} < t < -\frac{\tau_0}{2} \\ 0 & elsewhere \end{cases}$$

Using Fourier transform, determine and sketch the power spectrum, locating its zeros. Show that the frequency bandwidth for the pulse is inversely proportional to its duration.

[5] [CO# 1]

4. 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.

$$U(\xi, \eta, 0) = A \qquad |\xi| < b/2 \quad \text{and} \quad |\eta| < a/2$$
$$= 0 \quad elsewhere$$
$$\text{for all values of } \eta.$$

Obtain the corresponding Fraunhoffer diffraction.

[5] [CO# 3]

5. (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]

6. (a) Consider a Gaussian beam propagating along the z direction whose amplitude distribution on the plane z = 0 is given by

$$A(\xi, \eta, 0) = A \exp[\frac{-\xi^2 + \eta^2}{w_0^2}]$$

Obtain the expression for the intensity of the propagating beam.

(b) A Gaussian beam is coming out of a laser. Assume $\lambda = 600$ nm and that at z =0, the beam width is 1mm and the phase front is plane. After traversing 10m through vacuum what will be (i) beam width and (ii) the radius of curvature of the phase front.

[3,2] [CO# 3]

7. 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]

8. (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]

9. (a) Explain Cornu's Spiral. Briefly discuss its salient features and applications

(b) In a straight edge diffraction pattern, assume $\lambda = 5000$ A^0 and d = 100 cm. Find approximately the values of (I/I_0) at the positions O, P (y= 0.5 mm), Q (y=1.0 mm) and R (y= -1mm) where O is at the edge of the geometrical shadow region as shown in the figure below.
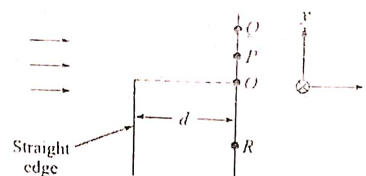
[2,3] [CO# 3]

[Table of Fresnel Integrals is provided below for reference, if required.]

211

4th SEMESTER
B.TECH

END TERM EXAMINATION   MAY 2023
COURSE CODE: EP 206 MICROPROCESSOR AND INTERFACING
TIME: 3 Hours   Max. Marks: 40

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

Q1. [4 Marks][CO6]
Examine the functional block diagram of peripheral interface controller (PIC) microcontroller.

Q2. [3 Marks][CO5]
Appraise the 8253 programmable interval timer with control word and modes of operation.

Q3. [3 Marks][CO5]
Appraise the 8255 programmable peripheral interface with control word and modes of operation.

Q4. [3 Marks][CO5]
Assess the functional block diagram of 8259 programmable interrupt interface.

Q5. [3 Marks][CO5]
a)
Write the control word for 8255 in Mode-0 operation for the following cases:
(i) Port A = input port, Port B = output port, Port C = output port
(ii) Port A = input port, Port B = output port, Port CU = output port, Port CL = input port
b)
Write the control word for 8255 in BSR mode operation for the following cases:
(i) Set Port C Pin 6   (6th bit position: D6)
(ii) Reset Port C Pin 0   (0th bit position: D0)

Q6. [3 Marks][CO2]
What are the different addressing modes of 8086 microprocessors? Explain each addressing mode with examples.

Q7. [3 Marks][CO3]
a) Why is the 8086 memory organized into two banks of even and odd addresses?
b) Explain how the even and odd bank are selected using the $\overline{BHE}$ and A0 signals.

Q8. [3 Marks][CO2]
Explain operation of the following instructions:
(i) POP   (ii) PUSH   (iii) CALL

Q9. [3 Marks][CO4]
a) What are two different types of interrupts?
b) What is the interrupt vector table?
c) Name the pins used to handle interrupts in 8086.

Q10. [4 Marks][CO1]
a) What are the flag control instructions in 8086?
b) What are the arithmetic instructions in 8086?
c) What are the different data transfer instructions available in 8086?

Q11. [3 Marks][CO2]
a) List down the four general purpose registers and their functions?
b) What is the function of the RESET pin?
c) What is the function of the CLK pin?

Q12. [3 Marks][CO3]
Write 8086 instructions to find the square root of any given perfect square number. (Assume suitable number)

Q13. [3 Marks][CO3]
Write 8086 instructions to compute equivalent grey codes for given series of ten binary numbers. (Assume the given series)

Total No. of Pages: 02

B.Tech.

May-2023

END TERM EXAMINATION

EP302 Fiber Optics and Optical Communication

Max. Marks : 40

Time: 3:00 Hours

Note : Attempt **Any five** Questions.
All questions carry equal marks.
Assume suitable missing data, if any.

1. (a) What is material dispersion? Consider 3 optical fibers with the core refractive index profiles as a function of wavelength as given below:

   Optical Fiber 1: $n(\lambda) = 4\lambda^2 + 3\lambda + 2$
   Optical Fiber 2: $n(\lambda) = 18\lambda + 3$
   Optical Fiber 3: $n(\lambda) = 18\lambda - 30\lambda^2$

   Comment on the broadening/shrinking due to material dispersion that will be present in these fibers (stating clearly the reasons for your comments). [4] [CO3]

   (b) Find the material dispersion parameter in ps/km-nm for *Optical Fiber 1* at a wavelength of 850 nm. Find, also, the rms pulse broadening due to material dispersion in this fiber if it is used with a light source with a rms spectral width of 30 nm. [4] [CO3]

2. (a) What are LP Modes. Draw the Intensity distributions for the following modes: LP_{14}, LP_{24}, LP_{32}, and LP_{02} modes. [4] [CO2]

   (b) Explain the importance of the cut-off V number. Comment on the number and type of modes present in a fiber when $0 < V < 5.1356$. [4] [CO2]

3. (a) Why is a PIN photodiode preferred over a PN junction photodiode. Show diagrammatically the depictions of the charge density and E-fields in both cases. [4] [CO4]

   (b) A *p–n* photodiode has a quantum efficiency of 50% at a wavelength of 0.9 μm. Calculate:
   (i) its responsivity at 0.9 μm;
   (ii) the received optical power if the mean photocurrent is 10^{-6} A;
   (iii) the corresponding number of received photons. [4] [CO4]

4. (a) Why are Graded-Index fibers used in optical communication? Explain briefly with the help of a simple diagram. [4] [CO1,3]

(b) Explain the importance of n_{eff} (Effective Refractive Index) for a fiber. [4] [CO1,2]

5. (a) Explain how population inversion is achieved in a p-n junction laser with the help of proper band diagrams. [4] [CO4]

(b) Why is the amplifying medium placed inside a *resonant mirror cavity* for LASING operation? Explain lasing modes for such a cavity and derive an expression for the mode separation (in terms of frequency) as a function of the laser cavity length. [4] [CO4]

6. (a) Assume that, in the manufacture of single-mode fibre, the tolerance in the core radius a is +5% and the tolerance in the normalized refractive index difference Δ is +10%, from their respective nominal values. If the nominal value of Δ is specified to be 0.005, what is the largest nominal value that you can specify for 'a' while ensuring that the resulting fibre will be single moded for $\lambda > 1.2$ µm even in the presence of the worst-case (but within the specified tolerances) deviations of a and Δ from their nominal values? Assume that the refractive index of the core is 1.5. [4] [CO1]

(b) Explain the parameters based on which you can classify an optical source, an optical detector and an optical fiber to be good or bad for an optical communication system. [4] [CO1]

7. (a) Explain, with the help of a energy state diagram, the principle of operation of an EDFA. Why does the Gain of an EDFA fall with an increase in the input signal power? [4] [CO5]

(b) Comment on the choice of feedback lasing wavelength in an EDFA. [4][CO5]

Total No. of Pages: 2

2। ऽ

SIXTH SEMESTER
B.Tech. (Engineering Physics)
END SEMESTER EXAMINATION
May 2023
EP 304: FABRICATION & CHARACTERIZATION OF NANOSTRUCTURES

Time: 3.00 Hours   Max. Marks: 50

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

1. (a) What is crystal structure factor (F) and how is it different from atomic scattering factor (f)? Calculate the crystal structure factor for simple face centre cubic system and analyse the difference with NaCl structure. Also explain the significance of the obtained results. [5] [CO1,4]

(b) The X-ray diffraction pattern of Nickel recorded with Cu Ka radiation (1.54 Å) is given below. Six diffraction peaks exist in the diffraction pattern, and the 2θ values for these peaks are listed in given Table. Analyze and index the peak given and calculate the lattice parameter. [5] [CO4]

Materials: Nickel,	Radiation, Cu Ka (1.54 Å)
Peak	2θ (°)
1.	44.53
2.	51.89
3.	76.45
4.	93.01
5.	98.51
6.	122.12

2. (a) Explain how plasma is created when an electric field is applied to the plasma. Sketch a Paschen curve and explain why it looks the way it does. Explain why there is a critical electric field to obtain plasma. [5] [CO2,3]

(b) A sputter target of TiNi (50%/50%) is used to deposit a TiNi (50%/50%) film with sputtering, why may a sputter-deposited film contain more Ni than Ti? At steady state during sputtering a TiNi (50%/50%) sputter target, (a) what will be the flux ratio between the sputtered Ti and Ni and (b) what will be surface composition at the target surface, if the sputter yields (S ≡ number of

target atoms sputtered ÷ incident ion) for Ti and Ni are STi = 1.0 and SNi = 0.8, respectively? [5] [CO3]

3. (a) Define surface energy of nanostructures. Why calculation of surface energy is important? Calculate the ratio of surface energy of the Aluminium nanostructure surface along {100} and {111} facets. Whereas each atom on {100} and {111} has 4 and 5 broken chemical bonds, respectively. (Assume Al has FCC crystal structure, and all bonds have same strength). [5] [CO1,3]

(b) Why low Miller indices in general have lower surface energy than that with high Miller indices. What you understand from Wulff plot? Construct Wulff plot for a hypothetical two dimensional crystal grown with {10} and {11} facets. Also write the steps used to construct a Wulff plot. [5] [CO1]

4. (a) Differentiate between Atomic Force Microscope (AFM) and Scanning Tunnel Microscope (STM) by clearly stating their working concepts. What are the parameters which influences the resolution of STM? [5] [CO2,4]

(b) With reference to nucleation process in the nanomaterials growth in accordance with Thermodynamic Equilibrium Approach
(1) Show that the energy barrier (Delta G) for heterogeneous nucleation is always smaller or equal than that of homogeneous nucleation.
(2) 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. [5] [CO3]

5. Differentiate between the following: [2x5] [CO1,3,4]

   a) Physical Vapor Deposition and Chemical Vapor Deposition

   b) Dark Field Imaging and Bright Field Imaging

   c) Selected Area Electron Diffraction and X-ray Diffraction

   d) Field Emission e⁻ gun and Thermionic e⁻ gun

   e) Constant Height Mode and Constant Current Mode in STM

6 (a) Explain the working principle of Transmission Electron Microscope (TEM) machine with suitable diagram. What information we can extract from TEM by operating it in different modes. [5] [CO4]

(b) What you understand from secondary electrons and why they are important in Scanning Electron Microscopy (SEM). What are the factor which influences the emission of secondary electron? [5] [CO4]

--END--

Roll no................

VI SEMESTER

B.Tech.

END TERM EXAMINATION   *May -2023*

EP306   **Microwave Engineering**

Time: 3 Hours   *Max. Marks : 40*

Note: Question 1 is compulsory and attempt any 4 from remaining questions. Assume suitable missing data, if any.

Q.1 a) Determine the real part of impedance Z_L given double stub transmission line in Fig 1. When impedance matching is achieved?   [2M][CO1]
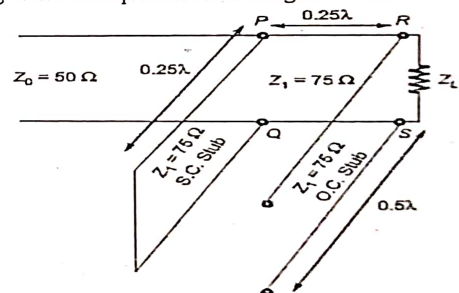
Fig 1. Double stub matching Transmission Line

b) Discuss the reason that the value of $\frac{B}{Y_0}$ for symmetrical capacitive window is half of that for an asymmetrical window for the same value of window insertion   [2M][CO2]

c) Prove that it is impossible to construct a perfectly matched lossless, reciprocal three-port junction.   [2M][CO3]

d) What are the limitations of conventional active devices at microwave frequencies?   [2M][CO4]

e) A single-pole switch is constructed using PIN diode in shunt configuration in a TEM transmission line having $Z_0 = 50 \ \Omega$ with the following parameters: $C_j = 0.02$ pF $R_f = 0.1 \ \Omega$ $R_r = 1 \ \Omega$. Calculate insertion losses in ON and OFF state at operating frequency of 2 GHz. Where L_p is negligible.   [2M][CO5]

f) Calculate the pinch-off voltage for a GaAs MESFET that has a channel height of 0.1 μm, a relative dielectric constant of $\varepsilon_r = 11.8$, and an electron concentration of $N_d = 1.8 \times 10^{-23}$ cm-3. [2M][CO5]

Q.2 a) Construct a 4-port anti-clockwise circulator (a device that transfers power from port (N+1) to port N) using two Hybrid Tee junctions and a 180^0 phase shifter and explain its working principle [3M] [CO3]

b) A symmetric directional coupler with infinite directivity and a forward attenuation of 20 dB is used to monitor the power delivered to a load Z_l as shown in Fig.2. Bolometer 1 introduces a VSWR of 2.0 or arm 4, bolometer 2 is matched to arm 3. If bolometer 1 reads 8 mW and bolometer 2 reads 2 mW, find (i) The amount of power dissipated in load (Z_l) (ii) The VSWR on arm 2. [4M] [CO3]
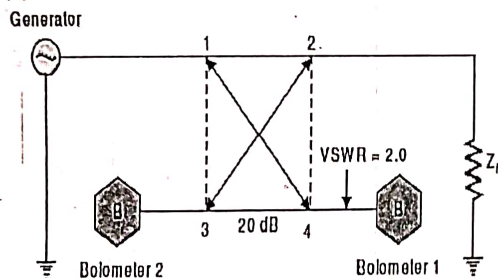
Fig. 2.

Q.3 a) Explain in detail bunching process & obtain expression for bunching parameter in a two cavity klystron [3M][CO4]
b) A reflex klystron is operated at 5 GHz with the following conditions: peak mode n=2, Anode voltage $V_0 = 300$ V, Repeller voltage $V_R = 500$ V cavity gap d = 2 mm, Beam current $I_0 = 20$ mA, Signal voltage $V_1 = 40$ V Determine: (i) Gap transit angle (ii) Optimum length of the drift region. iii) input power iv) efficiency [4M][CO4]

X'	0.655	0.734	2.20
$X'J_1(X')$	0.203	0.253	1.223

Q.4 a) With schematic diagram, explain the working of travelling wave tube [2M][CO4]

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]

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]
b) What is transferred electron effect? In which type of material, it is present. How the domain formation is taking place in Gunn devices and what are its various modes of operation? [2M][CO5]
c) Explain the construction of the GUNN diode using RWH theory. [3M] [CO5]

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. [3M] [CO5]
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]
c) Why is GaAS preferred over silicon for microwave circuit design [2M] [CO5]

************************END****************************

219

Roll. No........

B.TECH (EP)

VI SEMESTER

END SEMESTER EXAMINATION

May-2023

EP-308: Laser and Instrumentation

Time: 3:00 Hours

Max. Marks: 50

Note: Answer any Five questions

Assume suitable missing data, if any

Q1. (a) Describe essential components of a LASER.   [3][CO#1,2]

(b) Derive an expression (rate equations) for three-level laser and show the necessary condition for population inversion. Also, shows why a two-level laser is not feasible.   [7][CO#2]

Q2. (a) Describe the continuous and pulse lasers. Discuss one gas laser.   [5][CO#1,3]

(b) Describe and differentiate the collision and Doppler broadening of the laser system).   [5][CO#2]

Q3. (a) Describe linear and nonlinear optics. How to obtain the second harmonic generation (SHG)? Discuss the theory of SHG.   [5][CO#2]

(b) Describe the types of spectrometers with a schematic diagram and their applications in the scientific fields?   [5][CO#1,4]

Q4. (a) Explain the working principle and applications of photo-multiplayer tube (PMT).   [5][CO#3,5]

(b) Explain the working principle of conventional scanning electron microscopy (SEM) with the schematic diagram. What is the use of SEM?   [5][CO#3,4]

Q5. What is Raman Effect? Describe the working principle of Raman spectrometer. How Fourier transform infrared (FTIR) spectrometer is different from Raman spectroscopy. What is Rayleigh scattering?   [10][CO#1,3,4]

Q6. Write short notes on any Two of the following: [5×2=10][CO#1,3,4]
(a) X-ray diffractometer
(b) Raman effect, Stokes and Anti-Stokes shifts
(c) Charge-coupled device

B.Tech
May 2023

SIXTH SEMESTER
END SEMESTER EXAMINATION
EP314 : INSTRUMENTATION AND CONTROL
Max. Marks: 50

Time: 3 Hours

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

Q1a. What are capacitive transducers? What are their advantages and disadvantages?   [CO1]

b. Describe differential output and its advantages. Describe the various type of inductive transducer?   [CO1]

Q2 a. Explain the strain gauge and its working theory? What are their advantages and disadvantages?   [CO1]

b. Describe various static error coefficient in details?   [CO3]

Q3 a. What are the standard test signal employed for the time domain study? Describe in details time response of first order system, when subjected to different standard signal?   [CO3]

b. What is the difference between time and order system? Discuss the steady state error in details?   [CO3]

Q4 a. The block diagram shown below gives unity feedback closed loop control system.   [CO3]
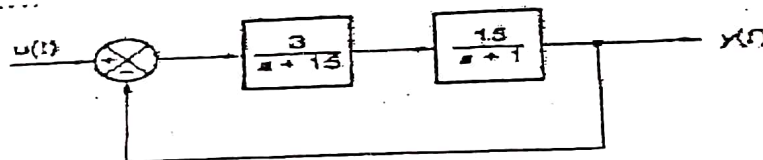
(i)   Find the type of the system.
(ii) Find the position error constant.
(iii) Find the steady state error (%) in the response of the system to the unit step unit.

b. Explain PID controller?   [CO3]

Q5 a. Check the stability of the system whose characteristics equation is given by $s^4+2s^3+6s^2+4s+1=0$ [CO4]

b. Determine system gain at S=-3+j3 to transfer function of

$$G(S)H(S) = \frac{k}{s(s+6)}$$ [CO4]

SIXTH & EIGHTH SEMESTER
B.Tech. & M.Sc.

END TERM EXAMINATION   May-2023

EP-316 Cosmology and Astrophysics

Time: 03:00 Hours   Max. Marks: 50

> **Note:** Answer all question by Selecting any two parts from each questions.
> All questions carry equal marks.
> Assume suitable missing data, if any.

Q.1[a] Describe the method of stellar parallax to determine stellar distances.   [5][CO4]

[b] You make two telescopes of same diameter. If one works at optical wavelength 453 nm and the other works at radio wavelength 1 cm; which has the better resolution and by what factor?   [5][CO3]

[c] How is the astronomical unit measured in modern astronomy, and to what accuracy?   [5][CO3]

Q.2[a] Describe the Horizon (alt-az) system of coordinates. Discuss its drawbacks.   [5][CO1]

[b] Describe the spectral classification scheme for stars: O, B, A, F, G, K, M. What are the characterstics effective temperatures for stars of each class?   [5][CO1]

[c] What are "apparent magnitude", "absolute magnitude" and "bolometric magnitude"?   [5][CO4]

Q.3[a] How does the CNO cycle work? $\qquad$ [5][CO1]

[b] Write down the basic equations of p-p chain that provides the Sun's nuclear power. How old is the Sun? [5][CO2]

[c] Describe the various evolutionary phases of a low-mass ($\sim 1M_\odot$) star and those of a high mass (e.g. $12M_\odot$) star. Show the corresponding evolutionary tracks on an HR diagram. [5][CO1]

Q.4[a] Explain the physics of 21 cm radio emissions from neutral hydrogen atoms. [5][CO2]

[b] Write down the Jeans equation for a disturbance propagating in a self-gravitating medium. What is the Jeans mass? [5][CO1]

[c] What evidence do galaxy rotation curves provide for dark matter? How are galaxy rotation curves measured? [5][CO2]

Q.5[a] What is a Cepheid variable? Explain the underlying stellar physics involved. What role do Cepheids play as distance indicators?

[5][CO4]

[b] (i) What is Cosmological Principle?
(ii) Why is the sky dark at night? [5][CO4]

[c] What are the Friedmann equations? How does the Universe expand if it is radiation dominated? [5][CO4]

Total No. of Pages:02

223 Roll No. ... .

EIGHTH SEMESTER

B.TECH. EP

END SEMESTER EXAMINATION *(MAY - 2023)*

EP-404 *ALTERNATIVE ENERGY STORAGE AND CONVERSION DEVICES*

Max. Marks: 40

Time: 3 Hours

Note: Answer *Any FIVE* questions. Question No. 1 is compulsory. Assume suitable missing data, if any.

[1x5]

1. Answer all parts of the question.
   (a). What is albedo? (CO1)
   (b). Explain angle of attack and solidity for wind energy (CO3)
   (c). Write elemental composition of wood biomass. (CO3)
   (d). Write open circuit voltage for Pb-acid and Ni-Cd batteries. (CO4)
   (e). What is the advantage of geothermal energy over other renewable energy resources? (CO1)

2(a). Explain 2-D and 3-D solar concentrator. Show that the maximum temperature obtained in 3-D solar concentrator is approximately 5900 K. (CO2) [4]

(b). A GaAs photodiode operating at 39 ^{0}C, is exposed to 5500 K black body radiation with a power density of 675 W/m^2. The open-circuit voltage of the device is 0.46 V. What is the efficiency of the photodiode when delivering energy to a 2-milliohm m^2 load? (φ_z =1.28x10^{21} photonsm^{-2}s^{-1}). (CO2) [3]

3(a). Explain photo-synthesis. Derive an expression for photo-synthesis efficiency of a plant leaf in terms of power density of light (P) and flux, φ, using stomatal conductance (V). (CO3) [4]

(b). Draw a flow chart and discuss the various steps of ethanol production from sugar cane with proper quantification. (CO3) [3]

1

224

4(a). Distinguish between Drag and lift type wind turbine. Show that the power of a wind turbine is proportional to the cube of the wind velocity: $P_D = \frac{16}{54} \rho v^3 A \eta$; where η is efficiency of wind turbine. A, swept area of the wind turbine. (CO3) [4]

(b). A wind turbine and its location details are given as;
Blade length (l) = 22 m, Average Island wind speed (v) = 10 m/sec, Air density (ρ) = 1.23 kg/m^3, Turbine efficiency rating (Ct) = 40%, Alternator/Generator efficiency rating (Ca) = 65%, time (T) = 1.1582 sec (it takes each rotor to make one revolution). Calculate: (i) the distance traveled (in feet) by the tip of each blade in one revolution and the revolutions per minute of the proposed turbine, (ii) Calculate the Tip Speed Ratio for the proposed turbine. (CO3) [3]

5(a). What are fuel cells? By drawing a suitable block diagram and cathode-anode cell reactions, describe the construction and working of SDC or YSZ type solid oxide fuel cells (SOFCs). (CO4) [4]

(b). Discuss the working process and efficiency of Pb-acid batteries with proper chemical reactions at cathode and anode. (CO4) [3]

6(a). Discuss about ocean waves as source of energy. Write the relation for phase and group velocities for deep and shallow water in terms of wavelength. Find out the approximate energy density of ocean wave of density of water is roughly 1000 kg/m^3 and the height of wave is ⟩35 meters. (CO5) [4]

(b). Discuss the production of electricity for any efficient hydropower plant by drawing a suitable diagram. Also write down the maximum power generated in MW and the efficiency of the plant. (CO5) [3]

7.0 Explain with suitable diagrams;
(a). Tidal Energy (CO5) [2.5]
(b). Anaerobic Digester (CO3) [2.5]
(c). Pyrheliometer (CO1) [2]

2

225   Roll No...........

EIGHT SEMESTER
B.Tech
END TERM EXAMINATION   MAY-2023
EP414   Space and Atmospheric Science-II
Time: 3:00 Hours   *Max. Marks: 50*

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

Q.1. What is a Radar? Describe different types of Radars and their applications in Atmospheric Sciences.   (10M) (CO 1)

Q.2. What is a wind profiler. Describe its applications in aviation, tropical cyclone, thunderstorm, environment and meteorology.
                                                    (10 M) (CO 2)

Q.3. What are trace gases? Explain various natural mechanisms and anthropogenic causes responsible for trace gases production. Explain the adverse effects of trace gases on human beings, animals and agriculture.   (10 M) (CO 2)

Q.4. Explain in detailed the mechanism of production of tropospheric Ozone. Write its effect on various things in troposphere. Explain the role of Ozone in stratosphere. Explain depletion of Ozone in stratosphere and discuss its consequences.   (10 M) (Co 3)

Q.5. What are aerosols and describe their sources and production mechanisms. Describe their effect on climate and human health.
                                                    (10 M) (Co 4)

Q.6. Describe clearly about multi wavelength solar radiometer and Lidar. Write their applications in Atmospheric Sciences.

                                                    (10 M) (Co 5)

Fourth Semester
B. Tech (EE)

End Semester Examination   May-2023

EE 202a   LINEAR INTEGRATED CIRCUIT

Time: 03 Hours   Maximum Marks: 40

Note: Question No. 1 is compulsory.
      Answer **FIVE** other questions from the rest
      Assume suitable value for missing data (if any).

1 [a] Derive an expression for the gain of the following amplifier circuit.
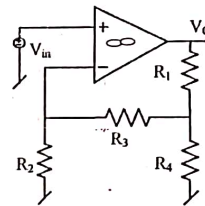
[CO3] [02]

[b] Draw the circuit diagram of a Schmitt trigger with non-inverting transfer characteristics. Also plot the transfer characteristics.   [CO3] [02]

[c] A current source is to supply current of 20 micro amperes to a load which is connected to ground. Draw the transistor based realization of the current source.   [CO4] [02]

[d] Realize a circuit using ideal operational amplifiers resistors/capacitors whose transfer function is given by $\frac{10}{s+20}$.   [CO3] [02]

[e] Draw a circuit using op-amps and resistors for which the transfer characteristics are given below.   [CO3] [02]

FOURTH SEMESTER   **B.Tech. (EE)**

END SEMESTER EXAMINATION   **May- 2023**
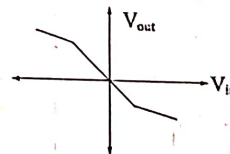
EE 204 DIGITAL CIRCUITS AND SYTEMS

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

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

1. [a] Express the following functions in a sum of minterms and a product of maxterms.   [5+5][CO1]

   $F(A, B, C, D)=D(\bar{A} + B) + \bar{B}D$

   [b] Obtain the simplified expressions in sum of products for the following Boolean functions using karnaugh map:

   (i) $F(A, B, C, D) = \Sigma(7, 13, 14, 15)$

   (ii) $F(x, y, z) = \bar{x}yz + x\bar{y}\bar{z} + xyz + xy\bar{z}$

2. [a] Implement the following functions using the don't-care conditions. Assume that both the normal and complement inputs are available.   [5+5[[CO2]

   $F(A, B, C, D) = A'B'C' + AB'D + A'B'CD'$
   $d(A, B, C, D) = ABC + AB'D'$
   With no more than two NOR gates.

   [b] Design a full adder circuit. Draw its logic diagram also.

3. [a] Implement the Boolean function: [5+5[[CO1&3]
   $$F = AB'CD' + A'BCD' + AB'C'D + A'BC'D$$
   With exclusive-OR and AND gates.

   [b] Design a combinational circuit that multiplies by 5 an input decimal digit represented in BCD. The output is also in BCD. Show that the outputs can be obtained from the input lines without using any logic gates.

4. [a]Implement the Boolean function F(A, B, C)=∑(1,3,4,5,6) with 4×1 multiplexer. Choose B and C as select lines. [5+5][CO3]

[b] Implement the Boolean functions of full subtractor circuit with ROM.

5. [a]Design a combinational circuit to check for even parity of four bits. A logic-1 output is required when the four bits do not constitute an even parity. [5+5][CO2&4]

[b]Design a counter with the following binary sequence: 0,1,2,3,4 and repeat. Use JK flip-flops.

6. [a] Explain the shift-left and shift-right register with the help of neat diagram. [5+5][CO5]

[b] Draw and explain a 4 bit register with parallel load using RS flip-flops.

7. [a] Derive the state table and state diagram of the sequential circuit of Fig.1.

[5+5][CO4]

[b] A sequential circuit has one input and one output. The state diagram is shown in Fig.2. Design the sequential circuit with T flip-flops.
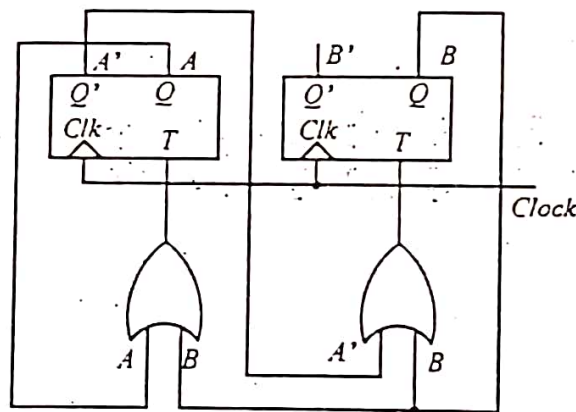

Fig.1
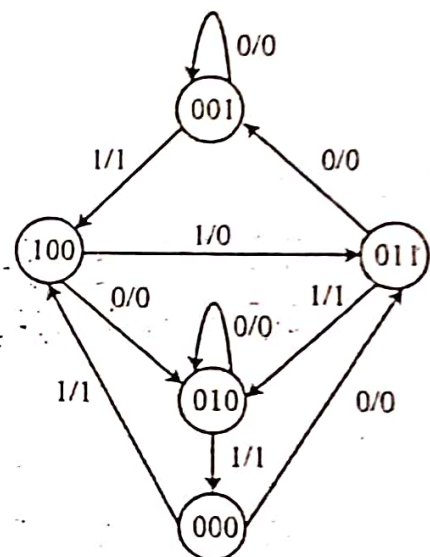
Fig.2

8. Write short notes on any two of the following. [5+5][CO6]
   [a] Features of VHDL
   [b] RTL and DTL circuits.
   [c] TTL circuits

A unity feedback control system has OLTF, $G(s)H(s) = \dfrac{k}{s^3 + 7s^2 + 10s}$. Sketch clearly the complete root locus diagram indicating the values of k at the intersection points of the imaginary axis of the root locus. [5] [CO4]

6. Find out the conditions for stability for the systems whose characteristics equations are given by $S^4 + 20S^3 + 224S^2 + 1240S + 2400 + K = 0$. Determine the values of K which will cause sustained oscillations, and find the frequency of oscillations. [5] [CO4]

7. (i) Prove that the zeros of $1 + G(s)H(s)$ are the poles of the closed-loop transfer function T(s), and the poles of $1 + G(s)H(s)$ are the poles of the open loop gain G(s)H(s). [2] [CO5]

(ii) Determine the transfer function of system having asymptotic amplitude frequency response as shown in figure below: [3] [CO5]
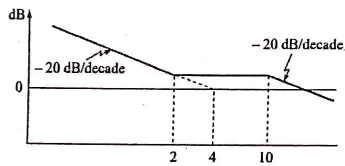
8.(i) State the Nyquist stability criterion and explain how the stability of close loop system is determined in case of right-hand poles existing in OLTF, G(s)H(s) [2] [CO5]

(ii) The OLTF of a feedback system is given by $G(s)H(s) = \dfrac{k}{s(s+1)(s+2)}$. Draw the polar plot of the OLTF and test the stability of the system, indicating the values of the phase margin, gain margin, gain crossover and phase cross over frequencies. [3] [CO5]

Total no. of Pages: 04   Roll no................

FOURTH SEMESTER
B.Tech. (EE)
END TERM EXAMINATION   May 2023
EE 206   CONTROL SYSTEMS

Time: 3:00 Hours   Max. Mark: 40

> Note: All questions are compulsory to answer and they are of equal marks.
> Assume suitable missing data, if any. Use Semi-log paper for Bode Plots and normal Graph paper for root locus diagram. The semi-log/graph paper(s) must include Name, Roll no., Date and Signature)

1. Answer the following questions: 5 (=0.5X10)

(i) Find the transfer function of the following block diagram.
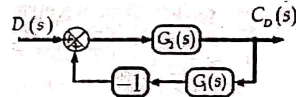
(ii) Test the stability of the system: $G(s) = (s+1)/(s^2 - s+3)$

(iii) Write the type and order of the system transfer function $G(s) = k(s+2)/(s+3)(s+4)$ with justification.

(iv) For the AC servo motor, draw the operating torque - speed characteristics and state the impact of low and high X/R ratio.

(v) Find the time domain response of
$$Y(s) = \frac{2s}{(s+1)(s+2)}$$

(vi) A gear trains is consisting of two gears with teeth of N1 (primary) and N2 (secondary). What is the impact on the speed and torque if $N_1/N_2 > 1$ and $N_1/N_2 < 1$ (with justification)?

(vii) From the Bode Plots as shown below, confirm/ justify whether the system is Stable or Unstable or Marginally stable
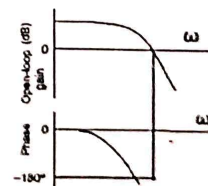
(viii) The characteristic equation of a control system is given as $1+ K(s+4)/s(s+7)(s2+2s+1)=0$. Find the real axis intercept for root locus asymptote.

(ix) There are 6 no. of poles and 4 no. of zeros in an OLTF G(s)H(s). How many root locus segments will terminate at infinity -Justify ?

(x) What will be the gain margin if the phase of the loop gain G(s)H (s) never reaches -180°. Justify the gain margin value indicated.

2. (i) For the following mechanical system, draw the Free Body diagram(s) and write the differential equations governing the system's behavior. Draw the relevant electrical diagrams on the force-voltage and force-current analogies. [3] [CO2]
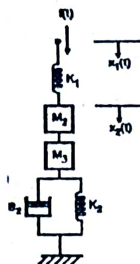
(ii) The Transfer function of a control system is given by $G(s) = \frac{1}{(1+ST)^2}$. Show that if the input is a step displacement the output will complete 98.26% of the step in 6T second for critical damping. [2] [CO3]

3. (i) Derive the transfer function for given system shown in the figure using Mason's gain formula: [3] [CO1]
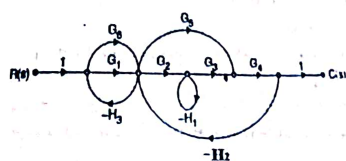
Page 2 of 4

(ii) The open loop transfer function of unity feedback control system is given by $G(s) = \frac{K}{S(1+TS)}$. By what factor the amplifier gain K should be multiplied so that the damping ratio is increased from 0.3 to 0.9. [2] [CO3]

4. Using the block reduction technique, determine the overall transfer function for the following system. [5] [CO1]
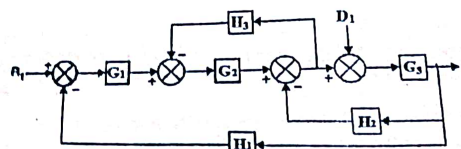
OR

Find the transfer function of the following armature controled D.C. motor and draw the block diagrams for the same. Assume suitable data, if any. [5] [CO2]
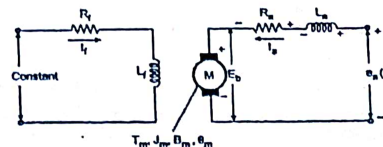
5. Draw the Bode Plots on the semi-log paper of the following transfer function G(S) with unity feedback control. [5] [CO5]

$$G(s) = \frac{(s+2)^2}{(s+1)^3(s+4)^2}$$

Give the observations on the stability of the system from the plots and clearly indicate the values of the phase margin, gain margin, phase and gain cross over frequencies. For phase plot, assume the values ω(rad/s) = 0.2,0.4,1,2,4,10,20,40,100,500.

OR

Page 3 of 4

Q.8 A three-phase, six poles, 4500 V,400 kVA, star-connected synchronous motor has a synchronous reactance of 12 Ω per phase and negligible resistance. The motor is initially operating at a load of 250 kW with the field current adjusted such that the armature current is minimum. The field current is now increased so that the armature current is 1.5 times the previous armature current without changing the load. With this field current, the load is reduced to 120 kW. Calculate new values of armature current and power factor.

[5][CO3]

Q.9 (a) Explain the demagnetization characteristic of permanent magnet (PM) materials. Classify types of PM materials used in electrical machines. [2.5][CO2]

(b) Differentiate between a switched reluctance motor and a synchronous reluctance motor. [2.5][CO4]

Q.10 Write short notes on any two of the following :

(a) Motoring and generating operation of switched reluctance machine [2.5][CO4]

(b) Armature reaction in the alternator [2.5][CO3]

(c) V – curves of synchronous motor [2.5][CO3]

(d) 120° conduction mode of BLDC motor [2.5][CO2]

Note :
1. All questions carry equal marks.
2. Q. 1 is compulsory.
3. Attempt a total of eight questions.
4. Assume suitable missing data, if any.

Q.1 Answer the following by opting for one out of four options. Justify your answer.

(i) For a 3 phase, 440 V, 50 Hz, 4 pole induction motor is to be run at 2000 rpm. Which of the following statement is true? [1][CO1]

(a) Voltage is greater than 440 V and frequency is greater than 50 Hz

(b) Voltage is equal to 440 V and frequency is greater than 50 Hz

(c) Voltage is greater than 440 V and frequency is equal to 50 Hz

(d) Voltage is less than 440 V and frequency is less than 50 Hz

(ii) A 230 V, 50 Hz, 6 pole, single phase induction machine is mechanically connected with a DC machine. The speed of the DC machine is adjusted to 1500 rpm. Single phase induction machine is connected to 230 V, 50 Hz supply. Which of the following statement is true : [1][CO1]

(a) Active power is drawn from the supply and reactive power is fed to the supply

(b) Active power is fed to the supply and reactive power is drawn from the supply

(c) Both active and reactive powers are fed to the supply

(d) Both active and reactive powers are drawn from the supply

(iii) In laboratory setup, a DC shunt motor is used as a prime mover for an alternator. The rated speed of the DC shunt motor is 1500 rpm. If the alternator has 6 poles, what is the frequency of induced emf in alternator? [1][CO3]

(a) 50 Hz   (b) 75 Hz   (c) 100 Hz   (d) 200 Hz

(iv) Which of the following is not a condition required to be satisfied during the synchronization process of an alternator? [1][CO3]

(a) The RMS line voltage of the incoming alternator must be equal to that of an infinite bus

(b) The phase sequence of the incoming alternator must be the same as that of the infinite bus

(c) The phase angles of the A phase of the incoming alternator must be equal to that of the infinite bus

(d) The frequency of the incoming alternator must be equal to that of an infinite bus

(v) For the positive slope region of the inductance profile in SRM, it works [1][CO4]

(a) Always in motoring mode

(b) Always in generating mode

(c) In motoring mode for positive current and generating mode for negative current

(d) In motoring mode for negative current and generating mode for positive current

Q.2 Why starters are needed for three phase induction motor? Explain the working of star – delta starter with a neat diagram. [5][CO1]

Q.3 A 3-phase, 460 V, 250 hp, 60 Hz, eight-pole wound-rotor induction motor controls the speed of a fan. The torque required for the fan varies as the square of the speed. At full load (250 hp) the motor slip is 0.03, with the slip rings short-circuited. The slip–torque slip is 0.03. with the slip rings short-circuited. The slip–torque relationship of the motor can be assumed to be linear from no load to full load. The resistance of each rotor phase is 0.02 ohms. Determine the value of resistance to be added to each rotor phase so that the fan runs at 600 rpm. [5][CO1]

Q.4 A single phase, 115 V, 1725 rpm, 60 Hz, four-pole, capacitor-start induction motor has the following equivalent circuit parameters for the main winding:

$$R_s = 2.2\,\Omega,\ R'_r = 3.5\,\Omega,\ X_s = 2.5\,\Omega,\ X'_r = 2.5\,\Omega,\ X_m = 60\,\Omega$$

The core loss at 115 V is 20 W, and the friction and windage loss is 15 W. The motor is connected to a 115 V, 60 Hz supply and runs at a slip of 0.04. While running, the starting winding remains disconnected. Determine the following :
(a) input current, (b) input power, (c) developed torque,
(d) efficiency, and (e) rotor copper loss. [5][CO1]

Q.5 Explain the following for an alternator connected to an infinite bus with the help of phasor diagram :
(a) effect of change of prime mover input
(b) effect of change of excitation   [5][CO3]

Q.6 A 3-phase 1 MVA, 3.6 kV, star connected synchronous generator gave the following relation between field current and open circuit line voltage for OCC and field current and short circuit armature current at synchronous speed:
$$V_{OC(line)} = -0.3643I_f^2 + 89.47I_f - 1487$$
$$I_f = (1.655 \times 10^{-5})V_{OC(line)}^2 - 0.073V_{OC(line)} + 138.8$$
$$I_a = 3I_f$$
Determine the synchronous reactance in Ω per phase at rated condition. Also find the voltage regulation when the machine is supplying full-load at rated voltage at (a) 0.8 pf lagging and (b) 0.8 pf leading. Neglect armature resistance. [5][CO3]

Q.7 Why synchronous motor is not self-starting in nature? Explain different methods to start a synchronous motor. Also, draw a phasor diagram for an under-excited synchronous motor. [5][CO3]

3

2

[b] Why impedance matching is required in transmission line? An open wire transmission line having characteristic impedance of 30 Ω is terminated by a resistive load of 50 Ω. Give arrangements for single stub and double stub matching. [6][CO4]

Q.6[a] Explain the following terms related to waveguides: -
  i) Guide wavelength
  ii) Phase velocity
  iii) Dominant Mode [6][CO5]

[b] Calculate the values of λ_g, V_g and Z_g for all possible modes of (3 x 2) cm rectangular waveguide for 20 GHz signal. [4][CO5]

Time: 3:00 Hours   Max. Marks: 50

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

Q.1[a] Find the gradient of a scalar function V where $V(x, y, z) = x^2y + e^z$. Calculate the magnitude of gradient at point P(1,5,-2). [4][CO1]

[b] Derive the Helmholtz equation for electric field & magnetic field from the Maxwell's equation. [6][CO1]

Q.2[a] The conductivity of sea water $\sigma = 3$ S/m and $\varepsilon_r = 50$. What is the range of EM wave (distance travel by EM wave) corresponds to 99% attenuation at 50 KHz and 50 MHz. [4][CO2]

[b] In free space ($x \leq 0$), a plane wave with $E = Cos(10^8 t - \beta x) a_y$ V/m is incident normally on a lossless medium ($\varepsilon_{r1} = 5$, $\mu_{r1} = 10$) in region $x \geq 0$. Determine electric and magnetic field components of transmitted and reflected wave. [6][CO2]

Q.3[a] In a Non-magnetic medium, $E = \widehat{a_z} 4 \sin(2\pi \times 10^7 t - 0.8x) V/m$. Calculate the average power carried by the wave and total power passing through 50 cm^2 area of plane $2x + y = 5$. [5][CO3]

[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 $E = 10 \sin(10 \pi \times 10^6 t - \beta x) a_z$ V/m. [5][CO3]

Q.4[a] Prove that for short circuit transmission line, distance between consecutive current maxima and current minima is $\lambda/4$. [4][CO4]

[b] Derive the formula of transmission coefficient and reflection coefficient of transmission line. Calculate reflection coefficient and VSWR of lossless transmission line if L= 0.5 µH/m, C = 50 pF/m, f = 50 MHz, Length = 100 m and $Z_L = (100 + j 50)$ Ω. [6][CO4]

Q.5[a] Prove that for rectangular waveguide wave propagation is possible only if $f \geq fc$. [4][CO5]

235

FOURTH SEMESTER

END-SEMESTER EXAMINATION

B.Tech.[AE]

(May-2023)

EE-272   Automotive Electrical and Electronics

Time: 03 Hour

Max. Marks:40

Q1. c) A certain control system has input r(t) and output c(t), if   02   [C01]
the input is passed through a block whose transfer
function is e^{-2s} and then applied to the system, then the
modified output will be.

d) A 4 Pole DC Machine has total armature ampere   03   [CO2]
conductor of 4500 and total flux per parallel path in the
machine is 0.14Wb. calculate the torque developed in
the machine.

Q2. c) Discuss the characteristic of SCR, clearly indicating   02   [CO3]
holding and latching current.

d) Explain the working of an 8/6 switched reluctance   03   [CO3]
motor.

Q3. c) What is third brush regulation and what are its   02   [CO2]
limitation.

d) For minimum exhaust dilution and high eficiency, the   03   [CO3
fuel ignition depends on the speed of rotation of the
engine. Discuss the remedial solution.

Q4. What is a transfer function. Derive the Transfer function of   05   [CO1]
a Armature controlled DC servomotor.

Q5. Explain the working of thyristor based Capacitor discharge   05   [CO3]
ignition circuit, clearly indicating direction of flow of
current.

Q6. For the given instruction
PUSH D

05   [CO4]

Find
d) Instruction word size
e) Addressing mode
f) Machine cycle
d) T- states required
e) Time required to execute if the clock frequency is
5MHz.

f) Draw timing diagram.   236

Q7. Draw a neat contiguous memory map for 8K RAM, 2K   05 [CO4]
ROM and 4K RWM memories in **SEQUENCE**, neatly
with their address range, also draw the decoding circuit.

Q8 Following sequence of instruction is executed by 8085 μp.   02 [CO4]
a)   MVI A,F0H
          ORA A
LOOP: INR A
          JNC LOOP
          HLT

How many times the loop will be executed. Justify.
b) What will be the content of PC, B, PSW after execution   03 [CO4]
of the given program.
          MVI A,2AH
          ADD A
          ORI AF
          INR A
          CMA

XXXXXXX

Total no. of pages: 07   237   Roll No.: ....

4th Semester

B.Tech.

END TERM EXAMINATION   MAY 2023

EE282a INSTRUMENTATION & PROCESS CONTROL

Time: 3 hours   Max. Marks: 40

> Note: Questions 1 & 2 are compulsory.
> There are internal choices in other questions.
> Assume suitable missing data, if any.

1. Mark the correct answers for all the questions which form the subparts of this question.   [10]

[a] Find peak time for unit step response of given transfer function $T(s) = 14.45/[(s^2+1.204s+2.829)(s+5)]$ [0.5] CO2

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

[b] If we have two transfer functions $G_1(s)$ and $G_2(s)$. By performing cascading and/or summing/differencing operations using these given transfer functions, one cannot realize a transfer function of the form.   [0.5] CO2

  i. $G_1(s)*G_2(s)$
  ii. $G_1(s)/G_2(s)$
  iii. $G_1(s)*([1/G_1(s)]+G_2(s))$
  iv. $G_1(s)*([1/G_1(s)]-G_2(s))$

[c] For input $x(t) = \sin(2t)$, find the amplitude and phase angle of $y(t)$, given that the impulse response has a transfer function $H(s) = s/(s-1)$.   [0.5] CO2

  i.   Amplitude = 1, phase = 0 degrees
  ii. Amplitude = $\sqrt{5}$, phase = -24.56 degrees
  iii. Amplitude = $2/\sqrt{5}$, phase = -26.56 degrees
  iv. Amplitude = $\sqrt{5}/2$, phase = -36.8 degrees

[d] 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.   [0.5] CO2 & CO4

  i.   2.25
  ii. 0.44
  iii. 5.5

iv. 0.88

[e] The transfer function of a system is given as $100/(s^2 + 20s+100)$. The system is: **[0.5] CO2**

  i.   an overdamped system
  ii. an underdamped system
  iii. a critically damped system
  iv. an unstable system

[f] Which of the following is incorrect?   **[0.5] CO1**
  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.

[g] The roots of the closed loop characteristics equation of system shown below   **[0.5] CO2**
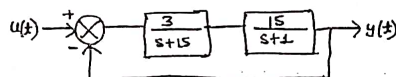
  i.   -1 and -15
  ii. 6 and 10
  iii. -4 and -15
  iv. -6 and -10

[h] To get an exponentially growing sinusoidal response from the output of the 2nd order system the location of its poles are ?   **[0.5] CO2**
  i.   Left of imaginary axis
  ii. Right of imaginary axis
  iii. On imaginary axis
  iv. Complex conjugate with negative real part

[i] In which type of system you will observe a steady state sinusoidal response (having constant magnitude and for all time period) in the output signal.   **[0.5] CO2**

  i.   Overdamped case
  ii. Undamped case
  iii. Underdamped case
  iv. Critically damped case

[j] If amplitude of input is 10 units and that of output is 30 units then the magnitude of transfer function is -   **[0.5] CO2**
  i.   1/3

ii. 3
iii. 1.5
iv. 2

[k] Real poles with zero imaginary part of transfer function   **[0.5] CO2**
  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

[l] 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.   **[0.5] CO1**
  i.   28 m/s
  ii. 56 m/s
  iii. 112 m/s
  iv. 14 m/s

[m] Match List-A (Block Diagram) with List-B (Transformed Block Diagram) and choose correct option: **[0.5] CO2**
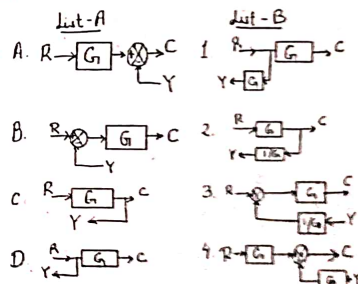
  i.   A-3; B-4; C-2; D-1
  ii. A-4; B-3; C-1; D-2
  iii. A-3; B-4; C-1; D-2
  iv. A-4; B-3; C-2; D-1

[n] In the below figure which consists of the poles (named as 1 and 2, that is 1 represent two poles of first system and 2 represents two poles of second system) of two second order systems. Which time domain specification among them will have the same value (corresponding to these poles locations)   **[0.5] CO2**
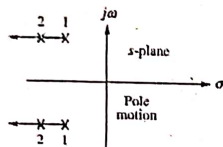
i. Peak time
ii. Percent overshoot
iii. Settling time
iv. Rise time

[o] The purpose of data manipulation element is to monitor and control the input data.

[0.5] CO1

i. True
ii. False

[p] Which of the following is incorrect? [0.5] CO1
i. Orifice plate can be used as a device to measure the flow rate.
ii. Turbine flow meters have a digital counter to show the output in discrete form.
iii. Ionization occurs when high speed electrons collide with atom.
iv. Optical fibers and amplifiers can be used as data transmission element.

[q] As the sensitivity of the ionization type vacuum gauge increases, how does the pressure value changes? [0.5] CO1
i. Increases
ii. Decreases
iii. Decreases then increases
iv. No effect

[r] The thermistor vacuum gauge works on the principle of self heating. Find the resistance (R_1) at temperature $T(=300K)$ if the resistance of the thermistor is known at temperature $T_2(=600K)$ and the value is 300 ohm(R_2). The beta constant is assumed to be equal to 1.

[0.5] CO1

i. 100 ohm
ii. 200 ohm
iii. 300 ohm
iv. 400 ohm

[s] For a given system characteristic equation, $s^5+15s^4+85s^3+225s^2+274s+120 = 0$, find how many roots of given equation lie on the line $s+1 = 0$? [0.5] CO4
i. 2
ii. 3
iii. 4
iv. 5

[t] Which of the following statement is true about integral part of controller.
[0.5] CO2
i. It produces steady state error
ii. It may produce overshoot
iii. Its action is of anticipatory type
iv. All of the above

2. 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.

[10] CO4
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.

Total Number Pages 3.   Roll No........................
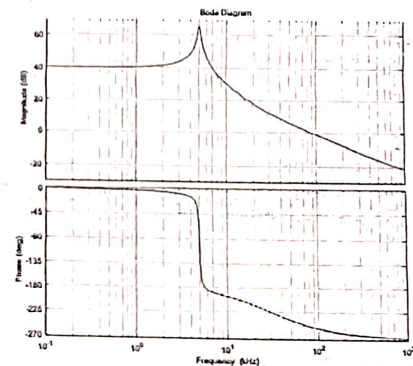
B.Tech. Electrical Engineering   *6th SEMESTER*
END SEMESTER EXAMINATION   *(May 2023)*

EE-302-Electrical Drives

Time: 3:00 Hours   *Maximum Marks:40*

Note: Q.1 is compulsory
Attempt other *four(4)* Questions from rest of the questions
Assume suitable missing data, if any
Attempt all parts of a question at one place (*Marks may not be awarded otherwise*)

1 Giving reasons by explaining (*very briefly*), why?

(a) Load equalization with flywheel is not suitable for *Electric Vehicle* requiring forward and reverse motion.

(b) The speed and current follow first order model during transients for small motor.

(c) For a traction load the requirement of torque falls sharply when it picks up speed, before starting rising again after critical speed to combat air resistance.

(d) Losses during starting can be reduced by employing soft staring techniques.

(e) Zero sequence braking in Induction machine is effective only upto ⅓ of synchronous speed.

(f) Slip energy recovery control is limited to small region near synchronous speed.

(g) Hybrid of DC dynamic braking and Self Excited braking is suitable for wide speed range of the operation of induction motors.

(h) DC drive fed from 3φ AC-DC converter is less de-rated when compared with the DC drive fed from 1φ AC-DC converter.   **1x8**

2 [a] Half hour rating of a motor is 100kW. Heating time constant is 80min and maximum efficiency occurs at 70% of full load. Determine the continuous rating of the motor   **2**

[b] A drive has following parameters:

$J=10$kg-m^2; $T=100-0.1N$ Nm (*where N is the speed in rpm*); $T_L=0.05N$ Nm; Initially the drive is operating in steady state. Now it is to be reversed, for which the motor characteristics changes to $T=-100-0.1N$ Nm. Assuming passive load connected the shaft, calculate the time for reversal. $N_{rev}=-0.95N_{final}$.   **2**

[c] An induction motor is driven by a six-step 3 phase IGBT inverter with DC link voltage of 200V. At normal full load operation, the motor current is 25A. The per phase stator resistance is 0.5Ω. The Fixed Width Modulation (*n number of pulses each with same duty during the conduction periods*) with switching frequency of 18kHz is used for the quasi square (*120° Conduction*)

waveform for realizing the DC dynamic braking with reduced effective DC voltage. Calculate the effective braking voltage impressed across the windings, number of pulses per half cycle per phase and duty ratio of FWM if a braking current of 3 times the rated current is assumed.   **4**

3 [a] A 200V DC separately excited motor is used to lift material. The motor has armature resistance of 1 Ω, and KΦ=3V sec. The load torque is 12Nm. The armature voltage of the motor is controlled by a single phase thyristorised full converter. The AC side voltage is 230V, 50Hz.

(i) Calculate the motor speed when the triggering angle is kept at 30° when the motor is lifting up the load.

(ii) Calculate the triggering angle required to lower the same load at the same speed.   **4**

[b] A 440V, 2 Pole, 50Hz, Y connected induction motor has an inductive reactance (x_1+x_2') of 4Ω; stator resistance of 0.2Ω; rotor resistance referred to stator=0.3Ω. This inverter fed motor is driving a constant torque load of 60Nm at a slip of 2.7%. Assume this torque also includes rotational components. Calculate:

(i) the maximum frequency of inverter that would not result in stalling of the motor.

(ii) the starting current under constant v/f drive with frequency at starting is reduced to 30Hz   **4**

4 [a] A DC separately excited motor has the following parameters:
Kϕ=3 V-sec; R_a=1 Ω; L_a=10mH, V_{rated}=600V.

The connected load to motor shaft is 20Nm. Total moment of inertia of the drive system is 6Nm sec^2. The motor operates at a steady state speed when the terminal voltage is at 500V. To increase the motor speed, the terminal voltage is increased to 600V, while the field remain constant. Neglect the viscous friction. Assume the steady state operating point corresponding to 95% of the final value. Calculate the time required to change the motor speed.   **3**

[b] A 440V, 6 pole, 50 Hz, 3phase, WRIM has a rated speed of 933.33Hz rpm at full load. The parameters of the machine are:
r_1=1Ω; r_2'=1 Ω; x_1=x_2'=2.5 Ω.

The inertia of the motor is 4Nm sec^2. It may be assumed that final slip at no load is 2%.

(i) Compute the starting time of motor at no load and at full voltage and rated frequency. If a starting resistance of 10 Ω is inserted in the rotor circuit compute the amended starting time.

(ii) If plugging is applied to stop the induction motor by reversing the sequence of terminal voltages, compute the magnitude of the terminal voltage of the motor that limits the stopping time to 15s. Draw the ω-T graph for induction motor for ABC and ACB sequence of excitation   **5**

5 [a] Derive the equation for DC link current in terms of slip, stator to rotor turns ratio, transformer turns ratio, triggering angle, DC link inductor resistance, and motor parameters by referring the equivalent circuit to rotor side.   **2**

[b] A three phase, 6 pole, Y connected, 440 V induction motor is driving a 300Nm constant torque load. Both stator to rotor turns ratio & transformer turns ratio is one and rotational losses are 1kW. The motor is driven by a slip energy recovery scheme (static scherbius drive). The triggering angle is adjusted to 120°. Ignore all core and copper losses. Calculate:

(i) Motor speed
(ii) Current in the DC link
(iii) Stator rms current   **3**

[c] A 440V, 50 Hz, 4 pole, 1420rpm, delta connected squirrel cage induction motor has following parameters: r_s=0.35Ω; r_r'=0.4 Ω; x_s=0.7Ω; x_r'=0.8 Ω. Motor is fed from a VSI and is operated with a constant V/f control up to 50Hz and at rated voltage above 50Hz. Calculate:

(i) Breakdown torque for motoring operation at 60Hz
(ii) Frequency for motoring operation at 750rpm at rated torque.   **3**

6 Write short notes on any *TWO* of the following.

[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.   **2x4**

— ♦ —

VIth SEMESTER

B.Tech. [EE]

END TERM EXAMINATION   **May-2023**

EE304   Power System Analysis

Time: 03:00 Hours   Max. Marks: 40

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

Q.1 Answer briefly:

(a) Fast Arc Quenching mechanism is important for efficient working of a circuit breaker. Justify the statement.

(b) Explain Short Circuit Capacity of a bus. What is its significance?

(c) What is an over current relay? Draw the various current-time characteristics of an overcurrent relay.

(d) How the fuel cost curve is derived from Heat Rate curve of a generating unit?   [2×4][CO3,4,5]

Q.2 Obtain i). Ybus matrix and ii). the load flow solution at the end of the first iteration of the power system network whose data is given below. Bus 2 is considered as PV bus whose magnitude is specified as 1.04 and Reactive Power limit is given as $0.25 < Q_2 < 1.0$ pu. Bus No. 3 and 4 are PQ buses.   [8][CO1]

Bus No.	P_i (pu)	Q_i (pu)	V_i
1	-	-	$1.04\angle0°$
2	0.5	-	1.04
3	-1.0	0.5	-
4	-0.3	-0.1	-

From Bus	To Bus	R (pu)	X (pu)
1	2	0.05	0.15
1	3	0.10	0.30
2	3	0.15	0.45
2	4	0.10	0.30
3	4	0.05	0.15

Q.3(a) What are the various constraints of Power System.   [3][CO2]

(b) A power system has two plants & the power is being dispatched economically with P_1= 150 MW & P_2= 275 MW. The loss coefficients are: B_{11}= 0.1×10^{-2} MW^{-1}

B_{12}= -0.1×10^{-2} MW^{-1}

B_{22}= 0.13×10^{-2} MW^{-1}

To raise the total load on the system by 1 MW will cost additional Rs 200 per hour. Find the Penalty factor for plant 1 and additional cost per hour to increase the output of Plant 1 by 1 MW.   [5][CO2]

Q.4(a) Two Generators rated 11kV, 5000 kVA having 5% reactance are interconnected by a transmission line of length 50 kms. The reactance of line is 0.4 ohms/phase/km. Generators are connected to the line through a step up transformer rated 11kV/33kV, 8000 kVA having 4% reactance. A three phase fault occurs at the middle of the transmission line. Calculate the fault MVA and current. Neglect load current.   [5][CO3]

(b) Write the steps for Z Bus building algorithm.   [3][CO3]

Q.5 (a) For a Single Line to Ground Fault in a three phase unloaded alternator derive the expression for fault current and voltage of healthy phases.   [3][CO4]

(b) Draw the sequence network for the network shown below whose data is as follows: [5][CO4]

G: 300 MVA, 20kV, X_d''=15 %, X_o''=5 %, Z_n=0.4 ohm.

M_1: 13.2 kV, 200 MVA, X_d''=20 %, X_o''=5 %, Z_n=0.5 ohm.

M_2: 13.2 kV, 100 MVA, X_d''=20 %, X_o''=5 %.

T_1: 230/20 kV, 300 MVA, X=10%.

T_2: Three single phase transformer rated 132/13.2 kV, 100 MVA, X=10%

Transmission line: 100 km, reactance=0.5 ohm/km, Z_o=$3Z_1$
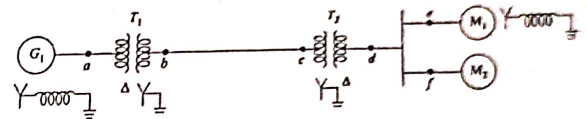
Q.6 (a) Rating of a relay is 5A and is set to 200%. If the current flowing through the relay is 100A, then calculate the PSM. For the given PSM, relay has operating time of 4 sec at TMS=1. Calculate operating time if the TMS is set to 0.2.   [3][CO5]

(b) Explain construction, working principle and operation of Circuit Breaker.   [5][CO5]

Q.7 Write short note on any two: [4×2][CO1,3,4]

(a) Use of symmetrical components in fault analysis.

(b) Formation of Jacobian matrix in load flow.

(c) Oscillogram of a 3-Phase Synchronous Machine under No Load Conditions in case of 3-Phase Fault.

FOURTH SEMESTER
B.TECH(EE)
END SEMESTER EXAMINATION   MAY-2023
EE306 MICROPROCESSORS AND MICROCONTROLLERS
APPLICATIONS
TIME:3HRS   MAX. MARKS:40

NOTE: QUESTION NO 1 IS COMPULSORY
ATTEMPT ANY FOUR QUESTION FROM REMAINING QUESTIONS

1. Answer the following questions in brief:
   (a) Why are program counter and stack pointer are 16-bit?   [CO1]
   (b) Explain the need of de-multiplexing the lower order   [CO1]
       address-data bus.
   (c) If the memory chip size is 256X1 bit then how many   [CO1]
       chips are required to makeup 1kilobyte of memory.
   (d) If 8085 adds two 8-bit data 87 H and 79H then specify
       the contents of accumulator and the status of S, Z and CY   [CO2]
       flags.
   (e) In the op-code fetch , what are the status signals asserted
       by 8085 to enable memory buffer.   [CO2]
   (f) Can an input port and output port have the same   [CO1]
       address?Justify
   (g) Which instruction is used to implement the interrupts   [CO2]
       RST 7.5, RST 6.5 and RST 5.5?
   (h) Write instruction to shift an 16-bit data one bit left.   [CO2]
   (i) Write control word of 8255in BSR mode to set and reset   [CO4]
       PC4.
   (j) What is difference between 8253 and 8254?   [CO3]
   (k)Explain the way in which flag register can be read through   [CO2]
       program instruction.
   (l) What is the minimum configuration in case of 8085?   [CO1]

                                                              [12X1]

2. (a) The memory address of last location of 1KX8 R/W
       memory and two ROM chips of size 8kX8 are 1FFF H ,   [3.5[CO1]
       FFFF H and 83FFH respectively. Find the starting
       address of these memory chips. Draw logic diagram of
       the memory interfacing of these memory chips using 3 to
       8 decoder to verify the address range.

   (b) For Fig-1 identify port A and port B as input or output   [3.5][CO1]
        port. What are the addresses of port A and Port B.
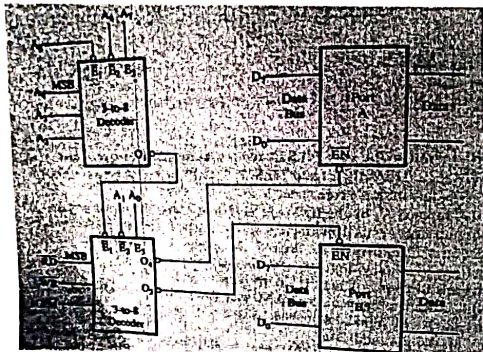
Fig-1

3. (a) Explain the steps with timing diagram for data flow when instruction MOV B, A with op-code 47H stored in memory location 2650H. **[3][CO2]**

(b) Differentiate between following instructions:
   (i)   CALL and RET instruction
   (ii) PUSH and POP instruction **[4][CO2]**

4. (a) Write an assembly language program to multiply two 8-bit hexadecimal numbers using booth's algorithm. **[3.5][CO2]**

(b) Write an assembly language program to generate a square wave with period of 400 microsecond. Use bit d_0 to output the square wave. Take clock frequency of processor as 2MHz and also show the delay calculation subroutine. **[3.5][CO2]**

5. (a) With wave form explain mode 2 operation of 8254 timer. Also introduce the effect of gate signal on output of the timer **[3][CO3]**

(b) Distinguish between
   (i)   Software and Hardware interrupts
   (ii) Mask able and non-mask able interrupts **[4][CO3]**

6. (a) Draw interfacing circuit to connect ADC 0809 to 8085 microprocessor through PPI 8255. Explain how this circuit can be extended for measurement of temperature. Write the instructions to monitor temperature continuously at Port B of 8255. **[3.5][CO4]**

(b) Draw microprocessor based interfacing circuit to measure phase angle between voltage and current flowing through inductive load when connected across single phase, 230 volt, 50 Hz ac supply. Write the instructions to display phase angle at Port A of 8255. **[3.5][CO4]**

7. Write short notes on **any two** of the following
   (a) USART IC 8251 **[CO3]**
   (b) 8051 microcontroller architecture **[CO5]**
   (c) Input output mode of 8279 **[CO3]**
   (d) Addressing modes of 8085 microprocessor **[CO2]**
   [3.5+3.5]

Total no. of Pages:03   Roll no...................

SIXTH SEMESTER
B.Tech. (EE)
END TERM EXAMINATION   **May 2023**

EE 316 ELECTRICAL ENERGY STORAGE SYSTEMS

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

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

1. Answer the following questions: 1x10
   (i)   A hydropower station has a head of 324 m and an average flow of 1370 m^3/sec. Calculate the maximum electricity generation (MW) to be available from the station, if the overall efficiency is 80%.
   (ii)   Write the names of the electrolytes used in various Fuel Cells.
   (iii) If the manufacturer of a 10 kWh battery recommends a maximum DoD of 80%, how much energy can be used without recharging.
   (iv)   Write the electrochemical reactions occurring at the anode and cathode of a Phosphoric acid fuel cell, Solid acid fuel cell and Alkaline fuel cell.
   (v)   Hydrogen fuel is promisingly going to be produced by using electrolysers on large scale. What are the technologies available and being explored?
   (vi)   Give the quantum of energy stored at 80% SOC in a rated 500 Ah capacity battery.
   (vii) A 100 Ah battery is discharged for 20 minutes at a current of 50 A. What is the DoD ?
   (viii) Arrange the specific power density values of FCs, Lithium-ion battery, Pb-acid battery and supercapacitors in the ascending order.
   (ix)   If the EDLC has capacitance C, and it is required to supply a constant power P for the time t during which the capacitor voltage decreases from V_{max} to V_{min}, find the expression for P.
   (x)   Give the type of electrolyte used in the alkaline fuel cell.

2.   Give a comparative features of Pb-acid, VRLA, Lithion-ion and Vanadium Redox flow Batteries with it electrochemical equations. Give four important application area of these batteries.   7

3. (i) State the different types of supercapacitors and their basic components including the types of electrodes, electrolytes, and separator. Explain how an electric double layer capacitor (EDLC) work with a diagram and why it is called double layer capacitance? Give the approximate dimension of the double layer thickness. What are the measures adopted to improve the performance of such a capacitor.   5

    (ii) Define Specific power density and specific energy density for EESS. Indicate the present range of these values for ultracapacitors, Lithium-ion and Pb-acid batteries   3

4. Give classification of Fuel cells(FC) and state the basic components of FC and their distinct roles. Explain the basic operating principle of the solid oxide fuel cell (SOFC) with its diagram. What is the difference between the Fuel cell and batteries? What are the advantages and disadvantages of Fuel cells.   5

5. Give a clear sketch of Pump hydroelectric storage system indicating the functioning of the major components. State the advantages and disadvantages of pumped hydro energy storage plants. What are the principal differences between fixed speed and adjustable speed PHES plants and which type will be more beneficial and why?
                                          6

OR

Explain the various types of hydropower generators used in the fixed speed and adjustable speed Pump hydro storage plants . Explain the application of DFIG in variable speed PHES plants with a circuit layout. Why PHES plants are very significant in the context of present and future power scenario.   6

6. (i) Draw the equivalent electric circuit model of a supercapacitor and derive the dynamic capacitor voltage equation across the capacitor connected by DC-DC converter.   4

    (ii) A 5.5 volt, 1.5 farad ultracapacitor is required as an energy storage backup device for an electronic circuit. If the ultracapacitor is to be made from individual 2.75v, 0.5F cells, calculate the number of cells required and the layout of the array.   4

7. What are the basic types of battery Cell Balancing? Explain the mechanisms of passive and active cell balancing with the relevant electrical circuits. How to find the cell balancing time in a battery pack ?   6

OR

Write short notes on any two.   2x3
    (i) Metal –Air Battery and its present status and potential
    (ii) Green Hydrogen Economy and its impact on decarbonization.
    (iii) SMES
    (iv) Battery Energy management system and its benefits

6th and 8th SEMESTER

B.Tech.

END TERM EXAMINATION   *May-2023*

EE 320   VLSI Design

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

Note:
If necessary, make appropriate assumptions and approximations and state them
You must solve all the questions and their parts in the serial order

---

Q.1 Attempt any five questions: **(1X5)**
   a) For Worst case of 2 input NAND rise time, how many p-MOSFETs are conducting?   **[CO2]**
   b) Define Electrical Effort?   **[CO2]**
   c) The two types of switching speed analysis for CMOS logic circuits are transient analysis and Parametric analysis. (True/False) **[CO1]**
   d) Determine the bias state for the conditions in figure (Fig.1) below if Vth = 0.4 V.   **[CO1]**
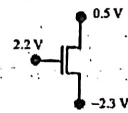
Fig.1

   e) Logic optimization aims at _____ of silicon area. **[CO1]**
   f) Draw a stick diagram of CMOS inverter.   **[CO3]**

Q2. Attempt any five questions: **(3X5)**
   a) Explain Latchup in CMOS.   **[CO1]**
   b) Explain body effect in CMOS circuits. What is the design guideline as a consequence of body effect?   **[CO1]**

c) Explain the read and write operation of 3T DRAM cell. **[CO4]**
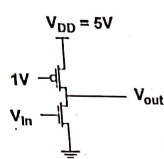
Fig. 2

d) What is the output of the above circuit (Fig. 2) if a rising step input is applied at Vin terminal? Explain briefly. **[CO3]**

e) What logic equations do the following schematics implement in Fig.3? **[CO3]**
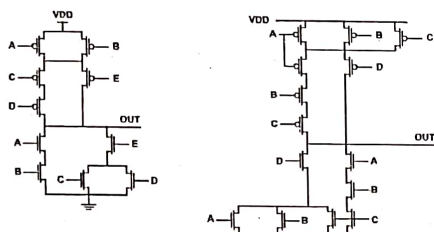
Fig.3

f) What is the output function of the following circuit? **[CO3]**
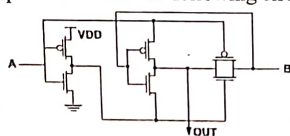
Fig.4

Q3. Attempt any two questions: **2X5**

a) What is NOR flash memory and how is it different from NAND? **[CO4]**

b) Explain simplified BiCMOS inverter and how is it different from conventional BiCMOS inverter? **[CO5]**

c) Design a 3-2 Fork with input capacitance Cin = 10 and total output capacitance Cout = 200. What is the total dealy of the fork? **[CO2]**

Q4. Attempt any one question: **1X5**

I. The PMOS transistor has Vth = -0.4V, W/L= 10, L=45nm and Tox = 2nm. **[CO1], [CO2]**
   a) What should be the minimum Vg for the device to conduct?
   b) Obtain expressions in terms of Vg and Vd for subthreshold, triode and saturation regions of operation.
   c) Do you prefer short channel device or long channel device for high performance applications? Justify.

II. A DRAM has a storage capacitor Cs = 80fF. The capacitor voltage Vmax = 2.5V. the leakage current of the cell is 5nA. Calculate the following values (Given q = 1.6 * 10^{-19} C) **[CO4]**
   a) The time it takes to discharge the capacitor to 0.5V.
   b) The amount of electron can be stored on Cs.
   c) Assuming that Vs = 2.5V, what is the maximum bit-line capacitance Cbit that will provide a logic high output to be read with at least 0.5V on the bit line?

Q5. Consider a standard 6T SRAM cell. Due to some variations, transistors in a single cell may have different threshold volatges than that of what was desifgned for. Assume that the cell is designed for VDD = 1V, Vthn =0.3V and Vthp=-0.3V. Consdier that due to variations, a change of ± 30mv in threshold voltage can happen. Determine the threshold volatges of all the transistors for worst case write operation.
5 [CO4]
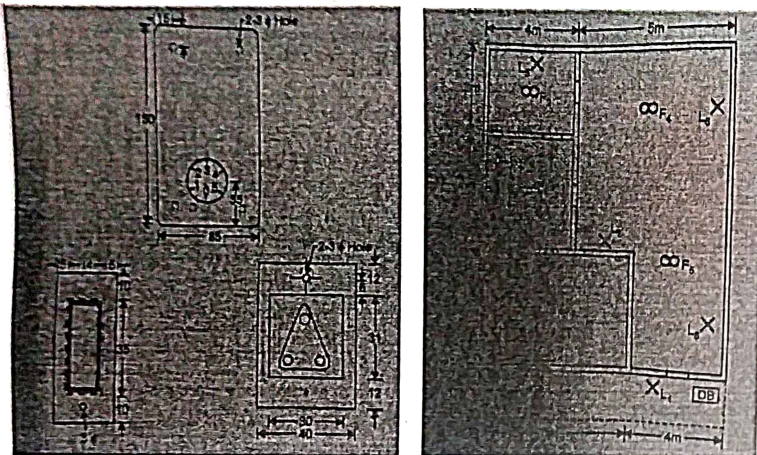
Dimensions of tumbler switch,
5 A socket and Fan regulator

Sample Plan of a 2 BHK flat.
Redraw as per the question description.

TABLE 4.1: Current ratings of copper conductor single core cables (VIR, PVC or polythene insulated including tough rubber, PVC or lead sheathed)

Size of Conductor		Two cables d.c. or single-phase a.c.		Three or Four cables balanced three-phase a.c.	
Nominal area (mm²)	Number and dia of wire (mm)	Current rating (amps.)	Approximate length of run for one volt drop (m)	Current ratings (amps.)	Approximate length of run for one volt drop (m)
1.0	1/1.12	5	4.9	5	5.8
1.5	3/.737	10	3.0	10	3.7
2.5	3/1.06	15	3.4	13	4.3
4.0	7/.737	20	3.7	15	5.8

Total no. of Pages: 04   Roll no............
                        Sixth Semester
                           B.Tech.
End Term Examination   May-2023
EE324   DESIGN, ESTIMATION & COSTING OF INDUSTRIAL
               ELECTRICAL SYSTEM
Time: 3:00 Hrs   Max. Marks: 50

Note: Attempt all questions.
      Assume suitable missing data, if any.
      Use colour pens for illustrations / wiring diagrams

Q.1[a] Explain the term Class-I and Class-II equipment.   [1][CO2]

[b] Explain the difference between IS:732 and IS:2274. [1][CO2]

[c] Declared standard single phase and three phase distribution voltage in Delhi?   [1][CO1]

[d] Draw the standard symbols for group of fluorescent lamp, fuse, fan regulator, bracket fan, socket outlet 5 A, wall-mounted lamp.   [2] [CO1]

Q.2(a)   Explain colour coding used in 3-phase 4 wire system with earthing.. Draw a simple diagram showing single phase installation having separate energy-meters for light and power loads.   [3][CO3]

Q.2[b]   Explain the term "service connection" as applied to residential installations. Explain the terms "grid" and "public lamp" as specified in Indian Electricity Act, 2003.   [2][CO2]

Q.3   A two-BHK dwelling unit is to be provided with electric wiring. The load requirements are as follows:

Location	Light points	Fan Points	5A Socket outlet	15A Socket outlet	AC *	Door bell
Bedroom 1	2	1	1	1	1 Ton	----
Bedroom 2	2	1	1	1	1 Ton	----
Drawing room	3	2	1	1	1.5 ton	1
Kitchen	1	1 (Exhaust)	1	1		----
Toilet (2 No.'s)	1	1 (fresh air fan)	1	----		----
Balcony (1 No.)	1	1	1	----		----
Front corridor	1	-----	----	----		----

*Each AC can be supplied from the power circuit. Suitable considerations to be taken. 3-star rated 1 ton AC consumes 1174 W and 1.5 ton consumes 1761 W.

Decide the number of sub-circuits required for the above installation as per Indian Electricity rule.

Show the details of connection diagram of the distribution board.

Design the switch board for the drawing-dining room. Relevant dimensions are given in the figure at the last.
                                                        [5][CO3 & 4]

Q.4   For Q3 above, sketch the plan of the above flat showing the position of various electrical points. A sample plan is given below. Modify and redraw the same to accommodate all locations given in above table in Q4. Assume the toilets to be of 1.5m x 2.1 m each, kitchen of 2m x 3m. internal corridor can be assumed for sake of symmetry.

Assuming floor to ceiling height as 3 m, DB at a height of 1.5 m from ground, SB at 1.3 m from ground, height of batten and light brackets at 0.5 m from the ceiling, 15 A socket at 0.2 m from the ground, find the length of the wiring required. Also determine the size of various copper conductors required along with proposed wiring diagram. Take appropriate allowances for wastage of conductors and earth wire. Use conduit wiring.

Prepare the broad schedule of material required. Small consumables can be left out. No costing to de done for the material. Determine the labour cost only, assuming the daily labour rate of Rs. 750/- and Rs. 650/- for wireman and helper respectively.   [10] [CO4 & 5]

Q.5 [a]   Explain various classes of insulation, motors, and MCB's based on temperature and current rating as applicable.   [4] [CO5]

[b]   Explain the broad features of NBC 2016. What is covered in vol 1 and 2.   [3] [CO1, 2, 3, 4]

Q. 6 Explain the difference between MCB & MCCB. Enlist the various types of conductors used in overhead distribution line. What are the essential accessories required for conductor installation.
                                                        [4] [CO7]

Q.7 Prepare an estimate of material and quantity for providing an overhead industrial service connection to a flour mill of 25 HP. The flour mill is located at 100 meters from the nearest pole. A 3-phase 4 wire 400/230 V supply is to be provided. The connection is to be provided up to the energy meter. Draw the sketch also.   [4][CO6]

Q.8 [a] Enlist the various types of substations. Explain the H-pole mounted outdoor station with the help of single line diagram and a sketch depicting all the equipment's used.   [5][CO8]
    [b] Estimate the main material requirement for a 1100 m, 415/230 V three-phase line with four wires in vertical configuration. The lines emanate from a substation to feed a load of 30 kW. Take the span between the two poles as 50 m. The conductor used is ACSR 6/1 x 2.59 mm.   [5] [CO7]

EVEN SEMESTER
END TERM EXAMINATION

B.Tech. (EE)
MAY-2023

EE-328   Deep Learning with Artificial Neural Networks

Time: 3:00 Hours

Max. Marks: 40

Note: Answer ANY FIVE questions and all carries equal marks. Write the ANSWERS IN A SEQUENCE. Assume any data if missing and clearly mention the assumption.

Q(1) (a) Find the global minimum of $f(x, y) = x^2 + y^2$. What is the type of optimization?

(b) 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 $\frac{x^2 + y^2}{4} = 1$

[4+4=8M][CO1]

Q(2) (a) Find the maximum or minimum of a univariate function:
$$f(x) = 3x^4 - 4x^3 - 12x^2 + 9 , -\infty < x < \infty$$
(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 $y > 0$

4+4=8M][CO1]

(3) (a) Write the mathematical expression and pseudo code for the following activation functions used in deep neural networks:
(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

(b) Explain the process of pseudo code to train the neural network with the sigmoid activation function at the output node using the cross entropy driven back-propagation algorithm.

[4+4=8M][CO2]

Q(4) Perform a complete forward and backward sweep of a feedforward network using the backpropagation algorithm for an input pattern of [0.1 0.9] with a target output of 0.9 and 2-2-1 architecture (i.e. two input, two hidden and one output unit) with weights first layer

is $\begin{bmatrix} 0.1 & 0.1 \\ -0.2 & -0.1 \\ 0.1 & 0.3 \end{bmatrix}$ and for second layer is $\begin{bmatrix} 0.2 \\ 0.2 \\ 0.3 \end{bmatrix}$ [8M][CO3]

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]

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]

****

EE-332 WIRELESS SENSOR NETWORKS

Time: 03 Hours   *Max. Marks: 50*

Note: Question No. 1 is compulsory. Attempt any three questions from Q2 to Q5.

Q1. a) Describe one application where infrastructure-free wireless sensor networks can be deployed. [2] CO1

b) Elaborate on the method for communication with peers outside immediate communication range. [2] CO1

c) List the characteristics that are desirable in a WSN. [2] CO2

d) Describe the different sources of mobility in WSN. [2] CO2

e) Mention four quality of service metrics in WSN. [2] CO1

f) What is network half-life in WSN? [2] CO1

g) Elaborate on data centric networking. [2] CO3

h) Explain the difference between analog modulation and digital keying. [2] CO3

i) What is meant by a frequency selective channel. [2] CO3

j) What is delay spread in wireless channels. [2] CO2

Q2. Explain the working of a (4, 3) error detecting and correcting code with example. [10] CO4

1

Q3.   Describe the standard ARQ protocols that are used in WSN.   [10]
       CO2

Q4.   Describe the Reference Broadcast Synchronization scheme for [10]
       receivers within a single broadcast domain with timing diagram CO5
       and appropriate equations.

                              OR

       Describe the LTS- Network wide Synchronization scheme with [10]
       timing diagram and appropriate equations.   CO5

Q5.   A source emits four messages randomly with probabilities [10]
       0.5.0.3, 0.1, 0.1. Messages are generated randomly .   CO4

       a) What is source entropy?
       b) Obtain a compact binary code and determine the average code
           word length and efficiency of code.

                         XXXXXXXXXXX

                              2

_VI / VIII____SEMESTER   **B.Tech.**

END TERM EXAMINATION   *May-2023*

COURSE CODE :EE-422 COURSE TITLE:HVDC Transmission

Time: 03:00 Hours   Max. Marks: 40

> **Note :** Attempt any five questions out of six.
> Assume suitable missing data, if any.

Q.1a Discuss the major equipment installed in HVDC switchyard and their importance. Draw a suitable diagram.   [4][CO#1]

Q.1b Relate the power transmission capabilities of ac transmission systems vs HVDC systems. Draw cost curve vs transmission length of HVDC system.   [4][CO#1]

Q.2a Compare the equivalent circuit/s of HVDC rectifier vs HVDC inverter.   [4][CO#2]

Q.2b A three phase bridge inverter has commutation reactance of 10 Ω, the current and the voltage at the DC side are 950A and 245kV respectively. If the ac line voltage is 325kV, calculate the extinction angle and the overlap angle.   [4][CO#2]

Q.3a Discuss briefly the control modes for HVDC highlighting their characteristics.   [4][CO#3]

Q.3b What is Mode ambiguity and how is it overcome. List the additional controls with which inverter is equipped   [4][CO#3]

Q.4a Discuss need of filters and different configurations of filters employed for HVDC applications   [4][CO#4]

Q.4b A double tuned filter is designed for HVDC switchyard. If the values selected are C1=1.39µF, L1=12.38mH, C2=6.11 µF and L2=54.78mH find the two frequencies for which this filter is designed. [4][CO#4]

258

Q.5a A monopolar HVDC link operates at 500kV, 1000MW (at inverter end). Rci=Rcr=12Ω. The resistance of the link is 10Ω. Assume steady state operation at $\alpha=18^0$ and $\gamma=18^0$. Find the following:

(i) Inverter ideal no load voltage

(ii) reactive power demand at inverter end

(iii) power factor at inverter end

(iv)overlap angle at inverter end [4][CO#2]

Q.5b In the problem above, compute the following at the rectifier end:

(i) Vdr and fundamental component of line current

(ii) Discuss in which control mode the system will work under normal mode of operation [2+2][CO#3]

Q.6 Write short notes on any two:

(i) Reactive power compensation in HVDC systems

(ii) Main Objectives of HVDC control

(iii) Double bridge configuration [4x2][CO#1,3,4]

EIGHTH SEMESTER   B.Tech.[EE]

END-SEMESTER EXAMINATION   (May-2023)

EE-446   DATA COMMUNICATION & COMPUTER NETWORKS

Time: 03 Hours   *Max. Marks:50*

Note: Question No. 1 is compulsory. Attempt any three questions from Q2 to Q5.

Q1. a) A digitized voice channel, is made by digitizing a 4-kHz **[2]** bandwidth analog voice signal. We need to sample the signal at **CO1** twice the highest frequency. We assume that each sample requires 8 bits. What is the required bit rate?

   b) We need to send 265 kbps over a noiseless channel with a **[2]** bandwidth of 20 kHz. How many signal levels do we need? **CO1**

   c) A network with bandwidth of 10 Mbps can pass only an average **[2]** of 12,000 frames per minute with each frame carrying an **CO2** average of 10,000 bits. What is the throughput of this network?

   d) What are the propagation time and the transmission time for a 5- **[2]** Mbyte message (an image) if the bandwidth of the network is 1 **CO2** Mbps? Assume that the distance between the sender and the receiver is 12,000 km and that light travels at 2.4×108 m/s.

   e) Compare and contrast a circuit-switched network and a packet- **[2]** switched network. **CO3**

   f) Calculate the Hamming distance between the code words : **[2]** (10101, 11110) **CO5**

   g) How does a single-bit error differ from a burst error? **[2]** **CO2**

1

h) What is the difference between a unicast, multicast, and broadcast address? **[2]** CO3

i) What are the advantages of dividing an Ethernet LAN with a bridge? **[2]** CO4

j) 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]** CO5

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. **[10]** CO2

a) 01010101

b) 00000000

c) 11111111

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

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.

2

OR

In Figure 1 a switch (router) in a datagram network is shown. Find the output port for packets with the following destination addresses: **[10]** CO4

Packet 1: 7176
Packet 2: 1233
Packet 3: 8766
Packet 4: 9144

Destination address	Output port
1233	3
1456	2
3255	1
4470	4
7176	2
8766	3
9144	2
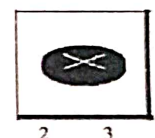
Fig.1: A switch with port address

Q4 Explain byte stuffing and bit stuffing with example. **[10]** CO4

Q5. Write a short-note on any two: **[10]** CO3

a) Evolution of Ethernet
b) Block Codes
c) Go-Back N ARQ
d) OSI Model

XXXXXXXXXXX

3

VI & VIII Semester
B.TECH

Note: All the questions are compulsory.

Q1) A.) Suppose the probability of a bank making a mistake in processing a deposit is 0.0003. If 10,000 deposits (n) are audited, what is the probability that more than 6 mistakes were made in processing deposits?   [4][CO1]

B.) Explain the classification of Data based on a.) type of Data & b.) the level of measurement with suitable examples?   [6] [CO2]

Q2) A.) The owner of a large equipment rental company wants to make a quick estimate of the average number of days, a piece of ditchdigging equipment is rented out per person per time. The company has records of all rentals, but the amount of time required to conduct an audit of all accounts would be prohibitive. The owner decides to take a random sample of rental invoices. 14 different rentals of ditchdiggers are selected randomly from the files, yielding the following data. He uses these data to construct a 95% confidence interval to estimate the average number of days that a ditchdigger is rented and assumes that the number of days per rental is normally distributed in the population.
     [Refer Table]

          3 1 3 2 5 1 2 1 4 2 1 3 1 1   [5] [CO3]

B.) According to a report, the average cost of bariatric (weight loss) surgery is about $22,500. You think this information is incorrect. You randomly select 30 bariatric surgery patients and find that the average cost for their surgeries is about $21,545 with a standard deviation of $3015. Is there enough evidence to support your claim at $\alpha = 0.05$? Use a P- value. [Refer Table]   [5] [CO3]

Q3) A.) In real-world data, tuples with missing values for some attributes are a common occurrence. Describe various methods for handling this problem.
          [5] [CO4]

B.) We have the following data (in increasing order) for the attribute age: 13, 15, 16, 16, 19, 20, 20, 21, 22, 22, 25, 25, 25, 25, 30, 33, 33, 35, 35, 35, 35, 36, 40, 45, 46, 52, 70. Using the following data for age: [5] [CO4]

(i) Use min- max normalization to transform the value **35** for *age* onto the range [0.0,1.0].

(ii) Use z-score normalization to transform the value **35** for *age*.

Q4) A.) Suppose we have a data set of 100 points whose first few rows are shown below, and that we'd like to predict $\vec{y}$ from $\vec{v}$ and $\vec{w}$. Suppose we create a design matrix X whose first column is $\vec{v}$, second column is $\vec{w}$, and third column $\vec{u}$ is a new feature $u_i = |v_i|$. The resulting model is $\hat{y}_i = \beta_1 v_i + \beta_2 w_i + \beta_3 u_i$. The top row is row 1, e.g. $y_1 = 4$.

y	v	w
4	-30	1
6	-40	2
5	20	3

[7] [CO5]
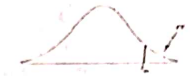
a) For the data above, suppose we arbitrarily pick $\vec{\beta} = [0.1, 12, 0.2]^T$. What is $\hat{y}_1$? [2]

b) For the data above, let $\vec{e}$ be the residual vector if $\vec{\beta} = [0.1, 12, 0.2]^T$. What is $|e_1|$? [2]

c) Suppose that $\vec{e} \cdot \vec{e} = 9$. What is the MSE? [3]

B.) Suppose that you have m = 14 training examples with n = 3 features. The normal equation is $0 = (X^TX)^{-1}X^Ty$. For the given values of m and n, what are the dimensions of 0, X, and y? Show the calculations. [3] [CO5]

Q5) A.) Given the following dataset: {0, 2, 4, 6, 24, 26}, initialize the k-means clustering algorithm with 2 cluster centres $c_1 = 3$ and $c_2 = 4$. What are the values of c1 and c2 after the 1st and 2nd iterations of k-means? Draw a box around your answer. [5] [CO5]

B.) Explain the effects of outliers and initial seed points on the convergence of k-means clustering algorithm with suitable examples? [5] [CO5]

Reference: You may refer the following table (**Table 1 & Table 2**) for **Question 2.**

[Table 1]

[Table 2]

263

VI and VIII SEMESTER

B.Tech.

END TERM EXAMINATION

May-2023

EE450 Cloud Computing Fundamentals

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) Explain in detail about the benefits and challenges of cloud adoption.

(b) Consider that the peak demand for an organization is 200 units. The demand as a function of time is expressed as

$$D(t) = 40(2 + 3e^{-t})$$

Where t is the time units. The baseline unit cost is 100, the cloud unit cost is 250. In this situation, is cloud cheaper than an on-premise enterprise for a period of 170 time units? Validate the answer with necessary calculations. [6+4] [CO1]

Q.2 (a) Define Edge Location.

(b) Explain in detail about the working of content delivery networks.

(c) Explain how cloud storage is offered by IaaS providers and SaaS providers. [1+6+3] [CO2]

Q.3 (a) Define Hypervisor.

(b) Explain in detail about the types of hypervisors. Give suitable examples for the types of hypervisors with respect to bare metal server and hosted server.

(c) Describe the role of dispatcher, allocator, and interpreter in a hypervisor. [1+6+3] [CO3]

Q.4 (a) Define Webservice. 264

(b) Describe service-oriented architecture and explain about Find-Bind-Execute Paradigm.

(C) Write short notes on REST and SOAP.   [2+4+4] [CO4]

Q.5 Describe any four of the following terms:

(a) Runtime

(b) Middleware

(c) Virtualization

(d) Machine Image

(e) Cloud Monitoring   [4×2.5] [CO4]

Q.6. (a) Explain the need for cloud security.

(b) Briefly explain about the encryption at rest, encryption in transit and encryption in use.

(c) What is multifactor authentication?

(d) A policy in JSON format is created as shown below by the root user. Explain each line of script with respect to the access for an IAM user.

```
{
    "Version": "2022-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": ["s3:PutObject"],
            "Resource": "*",
        }]
}
```

[3+3+1+3] [CO5]

II/IV SEMESTER

B.Tech

END TERM EXAMINATION   *May-2023*

FEC6 Corporate Social Responsibility

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 Discuss with example Ethical Relative am Ethical absolutism

[10 Marks]

Q.2 Differentiate between Belief, Values, Attitude, and Behaviour

[10 Marks]

Q.3 Explain Egoism and Utilitarianism related to the theory of ethics

[10 Marks]

Q.4 Differentiate between Stockholders and Stakeholders CSR Model

[10 Marks]

Q.5 Discuss types and nature of social responsibilities

[10 Marks]

Q.6 As a student, how can you contribute to society?

[10 Marks]

FEC-7   INTRODUCTION TO ENVIRONMENTAL SCIENCES

Maximum Marks: 50

Duration: 2 Hours

Note: Answer ANY TWO PARTS from each question.
All questions are compulsory and carry equal marks.   Marks CO#
Assume suitable missing data, if any.

Q. 1 Attempt ANY TWO of the following

a. Define pollutants and enlist any three water pollutants.   5   CO1
b. Compare the concepts of equality and equitability for the   5   CO1
   sustainable distribution of natural resources.
c. Summarize physical and socio-economic environment.   5   CO1

Q. 2 Attempt ANY TWO of the following

a. Analyze the functional aspects of marine ecosystem.   5   CO2
b. Analyze the effects of an unscientific landfill on the   5   CO2
   environment.
c. Illustrate and explain oxygen cycle using a labelled disgram.   5   CO2

Q. 3 Attempt ANY TWO of the following

a. Apply scientific methods to address eutrophication of lakes.   5   CO3
b. Relate climate change with the consumption of goods.   5   CO3
c. Apply scientific methods to control the release of pollutants   5   CO3
   from industrial chimneys.

Q. 4 Attempt ANY TWO of the following

a. Evaluate the role of an individual in the conservation of   5   CO4
   natural resources.
b. Appraise the role of water in maintaining the energy cycle in   5   CO4
   nature with examples.
c. Defend the role of the branch of your Bachelor's Degree   5   CO4
   Program in the protection of the environment.

Q.5 Attempt ANY TWO of the following

a. Suggest scientific ways to prevent forest fires.   5   CO5
b. Develop a methodology to protect endangered and endemic.   5   CO5
   species of animals in India.
c. Develop a solution to noise pollution on highways.   5   CO5

IV Semester

B.Tech.

End Term Exam　　　　　　　　　　　　May 2023

FEC 9　　　　　Spoken Skills

Max. Marks: 50　　　　　　　　　Time: 2 Hour

Note: Answer all questions accordingly.

Q1. Attempt any *two* short notes (100-150 words)　　10M [CO2]

　a. Importance of Audience

　b. 'Neutral' accent

　c. Individual Barriers in spoken skills

Q2. Mention different types of 'Register' in spoken skills with example. Explain any two.　　　　　　　　　　　　10M[CO3]

Q3. Present your views as a part of a debate on given topic. 10M[CO3]

　　Artificial Intelligence is a big boon for mankind (200-250 words)

OR

Internet content should be brought under censorship

Q4. Elaborate on advantages of spoken skills over writing skills.
　　　　　　　　　　　　　　　　　　　　10M [CO2]

Q5 List key points one must consider while:

a) preparing a power-point presentation

b) delivering a power-point presentation　　　　　　10M[CO5]

4th Semester
B.Tech.
END TERM EXAMINATION   *May. 2023*
FEC 10   Communication Skills
Time: 3.00 Hours   Max. Marks: 50

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

1. Define communication as a bi-polar process. Explain the salient features of communication.   (CO1) (10)

2. Discuss the major barriers to communication.   (CO1) (10)

3. Write a note on Language, technology and communication.   (CO2) (10)

4. Do as directed: (CO2) (10)
   a) Make one word each with the prefix, 'dis' and the suffix, 'ful'.
   b) The ball fell on the ground. (Rectify the error.)
   c) Karan said to me, "Please help the poor." (Change into indirect speech.)
   d) Accept, Except (Distinguish the meaning through sentences.)
   e) Bring out the meaning of 'look after' in your sentence.

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

6. Distinguish between group discussion and debate.   (CO3) (10)

7. Explain the major types of writing with example.   (CO4) (10)

8. Discuss *Animal Farm* as a political allegory.   (CO5) (10)

4th Semester

B.Tech

End Term Examination   May-2023

FEC 11   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 any one of the following.   (CO1)(10)
   (a) Five aspects of verbal communication
   (b) Barriers to communication

2. Discuss different Leadership styles.   (CO2) (10)

3. Write a paragraph on India in G-20 Group.   (CO3) (10)

4. Give arguments for a GD on startups v/s govt. jobs.

                                                            (CO4) (10)

5. write a resume with cover letter for applying in an MNC for the
   position of a project officer (Imagine details).   (CO5) (10)

4th Semester
B.Tech

END TERM EXAMINATION   May-2023

FEC 12   Business Communication and Presentation Skills

Time: 2Hours   M.M.50

Note: Answer any 4 questions

Q1. You are an analyst at a consulting firm and have been asked to prepare a report analyzing the market trends of a particular industry for a client. What are the key elements that you should include in your report to make it effective and informative for the client? Additionally, what are some strategies you could use to effectively communicate the findings of your report to the client, particularly if they have limited knowledge of the industry.   10 (CO1,2)

Q2. Assume that you are an office manager and have been asked to draft a letter of complaint to a vendor regarding a delay in delivery of a critical product. What are the key elements that you should include in the letter to ensure that the vendor understands the severity of the issue and takes immediate action to rectify it? Additionally, what tone should you adopt in the letter to convey your dissatisfaction without damaging the business relationship with the vendor?   10 (CO3,4)

Q4. Explain the ways that you can use to tailor your communication style to different audiences in a business setting?   10 (CO3)

Q5. What are some common communication barriers that can arise in a business environment, and how can you overcome them? 10 (CO4)

Q6. You are a marketing manager and have been tasked with creating a presentation to pitch a new product to the company's executives. What are some key elements that you should include in your presentation to effectively convey the product's features, benefits, and potential impact on the company's bottom line? Additionally, what are some strategies you could use to make the presentation visually appealing, engaging, and memorable for the executives?   10 (CO1,2)

4th Semester
B.Tech.

END TERM EXAMINATION   *May. 2023*

FEC 14   Appreciation of Short Stories

Time: 3.00 Hours   Max. Marks: 50

Note: Answer All the questions. Internal Choices are given for each question.
      All questions carry equal marks.
      Assume suitable missing data, if any.

---

1. What are the elements of short story? Explain.   (C01) (10)

OR

   "Short stories contain great philosophies of life." Comment.   (CO1) (10)

2. Evaluate the professionalism of the doctor in "The Use of Force".
                                                          (CO2) (10)

OR

   Write a note on the 'ethics of force' with reference to the story, "The Use of Force".   (CO2) (10)

3. Justify the title of the story, "The Catbird Seat."   (CO3) (10)

OR

   Who plays a negative role, Mr. Martin or Mrs. Barrows in the story, "The Catbird Seat"? Discuss.   (CO3) (10)

4. Write a note one the tone of the story, "Wet Saturday".   (CO4) (10)

OR

   Sketch the character of Mr. Princey in the story, "Wet Saturday".
                                                          (CO4) (10)

5. Bring out the major thematic concerns of the story, "In Another Country".
                                                          (CO5) (10)

OR

   Critically analyze the conversation between the narrator and the major in the story, "In Another Country".   (CO5) (10)

4th Semester

B.Tech

End Term Examination   May-2023

FEC 15   Appreciation of Prose and Poetry

Max. Marks: 50   Time: 2 hours

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

1. Bacon mentions three types of men in his essay 'Of Studies'. Critically describe the essay and the men.   (CO1)

2. Discuss the contribution of Joseph Addison to the literary world.   (CO2)

3. Bring out the irony in Chaucer's The General Prologue- the Prioress.   (CO3)

4. Critically comment on the writing style of Virginia Woolf with reference to her essay 'The Death of the Moth.'   (CO5)

5. How does the poem's (The Emperor of Ice-Cream) whimsical tone impact its meaning?   (CO3)

6. Explain the elements of irony in the poem 'The Last Duchess.'   (CO2)

7. Write short note on two of the following: (CO1)
   a) Dramatic Monologue
   b) Iambic pentameter
   c) Refrain (Poetic device)
   d) Sonnet

4th Semester

B.Tech

End Term Examination   May-2023

FEC 16   Appreciation of Fiction

Time: 2 Hours   Max. Marks: 50

> Note: Read instructions carefully and answer accordingly.

Q1. Discuss the theme of death in both the novels.   (10) (CO-1)

Q2. Explain the myth of Resurrection of Jesus Christ in 'The Man Who Died'.   (10) (CO-3)

Q3. Write a critical summary of 'The Man Who Died'.   (10) (CO-2)

Q4. How Praskovya Fedorovna handles her personal loss?
                                                   (10) (CO-4)

Q5. Write short notes on two of the following:
a) Genre of Fiction
b) Gerasim
c) D.H Lawrence   (10) (CO-4)

4th Semester
B.Tech

END-TERM EXAMINATION   May-2023
FEC18   FINANCIAL STATEMENTS ANALYSIS
Time: 2 Hours   Max. Marks:50

Note:1. Attempt any five questions.
     2. All questions carry equal marks.

Question 1: Explain the following accounting principles and concepts with examples: [CO1]

(i)   Matching principle
(ii)   Historical cost principle
(iii) Materiality principle
(iv)   Dual aspect concept
(v)   Business entity concept

Question 2: Identify the heads (asset, liability, equity, income, and expense) under which the following items will be shown in financial statements: [CO1]

S.no.	Particulars	S.no.	Particulars
1	Debentures	11	Balances with banks
2	Capital reserve	12	Stores and spares
3	Bills Payable	13	Unclaimed dividend
4	Sundry creditors	14	General reserve
5	Mortgage loan	15	Trademark
6	Patents	16	Advance tax
7	Loose tools	17	Bank overdraft
8	Goodwill	18	Rental income
9	Bonds	19	Audit fee
10	Building	20	Wages

Question 3: Explain any three techniques of financial statements analysis. Also, state its limitations.   [CO2]

Question 4: Following is the summarised Balance Sheet and Statement of Profit and Loss of Mona Ltd. as on 31-3-2022. [CO2]

Balance Sheet as on 31-3-2022

Particular	Rs.	Particular	Rs.
Equity shares of Rs. 10 each	10,00,000	Fixed Assets	20,00,000
10% preference shares of Rs. 100 each	4,00,000	Investments	2,00,000
Reserves and Surplus	7,00,000	Closing stock	2,00,000
15% Debentures	5,00,000	Sundry debtors	4,60,000
Sundry creditors	2,40,000	Bills receivables	60,000
Bank Overdraft	1,60,000	Cash at bank	60,000
		Preliminary expenses	20,000
	30,00,000		30,00,000

Statement of Profit and Loss for the year ending on 31-3-2022:

Particular	Rs.
Sales (25% Cash sales)	Rs. 80,00,000
Less: Cost of goods sold	Rs. 56,00,000
Gross Profit	Rs. 24,00,000
Net profit (Before interest and tax 50%)	Rs. 9,00,000

Calculate the following ratios:
(1) Rate of Return on Capital Employed
(2) Proprietary Ratio
(3) Debt-Equity
(4) Debtors Ratio (365 days of the year.)
(5) Rate of Return on Shareholders' Funds

Question 5: From the following Balance Sheet of Y Ltd., prepare Comparative Balance Sheet: [CO1,2]

Particulars	Note No.	31st March, 2019 (₹)	31st March, 2018 (₹)
I. EQUITY AND LIABILITIES			
1. Shareholders' Funds			
(a) Share Capital		25,00,000	25,00,000
(b) Reserves and Surplus		6,00,000	5,00,000
2. Non-Current Liabilities			
Long-term Borrowings		15,00,000	15,00,000
3. Current Liabilities			
(a) Short-term Borrowings		2,40,000	2,25,000
(b) Trade Payables		2,25,000	2,00,000
(c) Other Current Liabilities		55,000	50,000
(d) Short-term Provisions		30,000	25,000
Total		51,50,000	50,00,000
II. ASSETS			
1. Non-Current Assets			
(a) Fixed Assets—Tangible Assets		36,00,000	30,00,000
(b) Non-current Investments		5,00,000	5,00,000
2. Current Assets			
(a) Inventories		5,50,000	7,50,000
(b) Trade Receivables		3,00,000	5,00,000
(c) Cash and Cash Equivalents		1,75,000	1,50,000
(d) Other Current Assets		25,000	1,00,000
Total		51,50,000	50,00,000

Question 6: What purpose does a cash flow statement serve to the stakeholders of a corporate body? State the objectives and limitations of cash flow statements. [CO3]

1st Semester
B.Tech.

EndTerm Examination   May-2023
FEC25 Universal Human Value(self & Family)
Total Marks-50   Time-2 Hrs

Note:- Total Five Questions.
       All are compulsory.
       Marks indicated in the questions.

---

1.   (a) Identify TWO activities related with yourself which you are doing under competition, and describe them. Suggest ways to convert them into excellence'.   [CO5][5]
       (b) What is your responsibility towards the following and how would you fulfill it: (i) Health of your body (ii) Hostel wing (iii) Studies (iv) Facilities you use (water, electricity, computers) (v) Nature around you.   [CO4][5]

2.   Choose ANY TWO advertisements ('ads'). For each ad, answer the following:
       (a) Give a short description of the ad.
       (b) Is the ad describing the qualities of the product, or trying to take advantage of your temptations and insecurities? Explain how.
       (c) What underlying beliefs does it end up planting in its viewers? Analyze and discuss in depth.
       (d) What belief has it planted or reinforced in you? How are you coping with it?   [CO3][2.5X4=10]

3.   (a) What is meaning of prosperity? How can you say that you are prosperous   [CO1][4]
       (b) What is the role of education sanskar? Define and clarify.   [CO2][3]
       (c) What are risk factors of peer pressure? Explain 3 points to handle peer pressure.   [CO2][3]

4.   (a) Mention four noble truths of Buddha & the eight fold path. What is nirvana ? Where did Buddha achieve nirvana?   [CO1][4]
       (b) Explain the correct sequence in which four goals of human society Should exist. Explain the five basic system of a human society.   [CO3][6]

5.   (a) What do you mean by decentralization? What are its benefits-   [CO2][3.5]
       (b) What do you mean by swaraj? Who coined the term?   [CO2][3.5]
       (c) How can one apply idea of swaraj in their life ?   [CO5][3]

--------00000----------

FEC 27 PROFESSIONAL ETHICS & HUMAN VALUES

Time: 2:00 Hours   Max. Marks: 50

Attempt any five questions (5 X 10 = 50 marks)

Q.1. What is computer ethics? Explain the major ethical issues and challenges in the field of computer ethics and what are the steps that can be taken in order to resolve these issues?   (CO#7 & CO#1)

Q.2. What is 'professionalism'? Explain the four major characteristics and four responsibilities of a professional that distinguishes a professional from any other human being.   (CO#1 & CO#3)

Q.3. Explain the different roles played by engineers and what are the ethical obligations of an engineer?   (CO#3 & CO#4)

Q.4. Explain in detail the three major ethical theories: Utilitarianism, Deontology and Virtue Ethics. How these three ethical theories help us to be ethical? (CO#6 & CO#8)

Q.5. What are the rights of professionals in additions to that of a citizen? Elaborate in detail the concept and purpose of IPR and Whistle Blowing.   (CO#1 & CO#6)

Q.6. Explain the concept of risk benefit analysis in the assessment of safety and risk regarding engineering product? What are the principles and strategies involved in Risk Management?   (CO#4 & CO#5)

Q.7. What is the aim of engineering ethics in relation to society? What are the ethical issues that engineers faces while making different kinds of engineering products?   (CO#2 & CO#3)

-END-

4th Semester

B.Tech

END TERM EXAMINATION   May-2023

FEC-28 Emotional Intelligence

Time: 02 hours   Max. Marks: 50

> Note:Attempt any five questions.
> All questions carry equal marks.
> Illustrate your answers with suitable examples and incidents.

Q.1 What is Marshmallow test, why is it called impulse control test? How is it related with the concept of emotional intelligence? What implications can be drawn about the personality traits of an individual by this test?   [10] [CO#1, 4]

Q.2 State three display rules as given by Daniel Goleman? Why these rules are considered as an important aspect of social competence? Illustrate any practical situation in which you have applied these rules to become fit in a particular social environment.   [10] [CO#1, 5]

Q.3 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] [CO#1, 4]

Q.4 Present a flow chart of the evolution of brain of human being? Which parts are responsible for our emotional behaviour and how they started to grew gradually?   [10] [CO#1, 3]

Q.5 How can Emotional intelligence help in resolving any conflict in a professional environment? Explain with suitable examples.

[10] [CO#1, 3, 6]

Q.6 What do you understand by the terms empathy and sympathy? Why is it said that behaviour of molesters and rapists lack empathy? Take any such incident from news and explain why morality cannot be defined without empathy.

[10] [CO#4, 6]

Q.7 How the behaviour of youth gets affected emotionally (positively and/or negatively) by social media? Which components of self regulation can help us to regulate our behaviour in an intelligent manner?

[10] [CO#1, 4, 6]

c. Either I do no do my homework or I do not sleep well if I watch late show. (H, S, L)

d. If X's passing the examination implies that he is lucky then he must not have worked hard. (E, L, H)

e. He will get the job if and only if he qualifies the test. (J, T)

f. She was waiting for her mother at the bus stop whereas the mother was waiting for her at metro station. (B, M)

g. She was angry still she kept quit. (A, Q)

Q.6. Use truth table method to determine the logical status (tautologous, contingent or self-contradictory) of the following expression: (5 Marks) (CO#5 & CO#7)

$$p \supset [(q \vee r) \supset \sim (\sim p \vee \sim r)]$$

Q.7. Test the validity/invalidity of the following using truth table method: (5 Marks) (CO# 7 & CO# 8)

$$p \vee (q \supset \sim r)$$

$$(\sim p \supset \sim q) \quad / \text{Therefore} \quad (p \supset r)$$

Q.8. Symbolize the following arguments and determine the validity/invalidity by truth table method: (6 Marks) (CO#4 & CO#8)

If the doctor knew that the speed limit is fifty kilometers per hours, then he would not have been driving at sixty. He was driving at sixty kilometers per hour and was caught by the traffic police. Hence either the doctor did not know the speed limit is fifty kilometers per hour, or he was not caught by the traffic police. (F, S, C)

-END-

VIII. Arrange the following sentences.   (4)

   Example: ほん/ です。/ は/ これ

          → これは ほん です。

   1. がくせい/ は/ です/ あなた/ か。

   2. かぎ/ です。/ の/ は/ それ/ にほん

   3. ほん/ か。/ の/ は/です/ だれ/ あれ

   4. あの/ の / すずき/ です。/ かた/ おんな/ は/ せんせい

III. Translate into English or Hindi. (5)

1. このびょういんは　あたらしいです。

2. わたしはアメリカじんではありません。インドじんです。

3. これはがくせいのつくえです。それもがくせいのつくえです。

4. それは　にほんの　とけい　ですか。

5. ここは　にほんごのきょうしつです。

IV. Translate into Japanese (5)

1. I am Japanese language student.

2. That old building is a library.

3. Who is that person? That person is Mr.Tanaka.

4. Is that Japanese newspaper?

5. This room is big. That room is small.

V. Write the Stoke order of following Kanjis. (5)

Example: 木 (ki) 一 十 オ 木
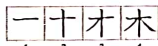
1. 四 (yon)

2. 日 (nichi)

3. 万 (man)

4. 百 (hyaku)

5. 山 (yama)

VI. Find the correct adjective. (6)

（あかい、ちいさい、しろい、たかい、やすい、ふるい、くろい、
あかるい、くらい、おおきい、あおい ）

1. white
2. dark
3. black
4. blue
5. red
6. bright

VII. Write the Answer of following questions. (10)

1. あれは　じてんしゃ　ですか。

いいえ、＿＿＿＿＿＿＿＿＿＿＿＿＿＿。

2. それは　あなたの　かばん　ですか。

はい、＿＿＿＿＿＿＿＿＿＿＿＿＿。

3. あなたは　イギリスのがくせいですか。

いいえ、＿＿＿＿＿＿＿＿＿＿＿＿＿。

4. にほんのテレビは　たかい　ですか。

いいえ、＿＿＿＿＿＿＿＿＿＿＿＿＿。

5. あなたの　へやは　あかるい　ですか、くらい　ですか。

Roll No. ......

IV Semester
B.Tech
END SEMESTER EXAMINATION   MAY-2023
FEC40 GERMAN
Time: 2:00 Hours
                                    Maximum Marks :50

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

1a)Welches Wort Passt nicht? (which word in not fitting)   (CO1)(2)
  1. Der Flughafen – der Bahnhof – das Auto – die Bushaltestelle
  2. Die Nudeln - Das Wasser- die Pizza– der Burger
  3. Das Cafe – das Restaurant – die Bank – Die Kantine
  4. Das Buch- die Universität – die Klasse – der Club

b)   Bilden Sie die Sätze? (Form the sentences)   (CO2)(2)
  1. Geht / mir/ gut /es/ sehr.
  2. 9.30 / Das Meeting / um / Uhr / beginnt.
  3. die deutsche Klasse/ Dienstag/ wir/ am/ haben.
  4. fahren / morgen/ Universität/ wir / zur.

2a)Lesen Sie den Text und markieren Sie die Sätze richtig oder falsch?
                                                        (CO2) (5)
Martin ist Programmierer und arbeitet gern am Computer. Er kommt aus
Liechtenstein und wohnt in Berlin. Seit zwei Jahren arbeitet er bei Google.
Er ist verheiratet und hat ein Kind. Seine Frau Olivia kommt aus
Deutschland und ist Ingenieurin von Beruf. Im Moment arbeitet sie nicht,
denn ihr Kind ist nur zwei Monate alt. Ihr Hobby ist malen. Sie malt sehr
gern. Martin geht am Wochenende ins Fitnessstudio. Er spricht Deutsch und
auch Englisch. Seine Frau kann nur Deutsch. Am Sonntag kocht sie nicht.
Martin geht mit seiner Familie ins Restaurant.

                                   Richtig   falsch
(i)Martin wohnt in Deutschland.
(ii)Er ist ledig.
(iii)Olivia spricht nur eine Sprache.
(iv)Das Kind ist sehr klein.
(v)Am Sonntag kocht Olivia einen Fisch.

2b) Ergänzen Sie die geeigneten Verben in der richtigen Form: (Fill the suitable verb in the right form) (CO5) (8)

geben, helfen, sprechen, danken, passen, schmecken, sehen, haben

1. Wir _____ dem Professor für den Unterricht.
2. Ich _____ gut Englisch und ein bisschen Deutsch.
3. Ich finde die Adresse nicht. Können Sie mir _____?
4. Die Jacke ist klein. Sie _____ mir nicht.
5. Wir _____ heute abend einen Film.
6. Heute _____ ich ein Meeting.
7. Das Essen in der Kantine _____ mir nicht.
8. Können Sie uns die Information _____?

3a) Bilden Sie die Fragen? (CO4) (5)

Wo, was, wie viele, wen, wie

1. Die Frau kommt mit dem Auto.
   _____ kommt die Frau?

2. Es gibt 60 Studenten Online.
   _____ Studenten sind da?

3. Das Café ist gegenüber der DTU.
   _____ ist das Café?

4. Paula spricht ihren Vater am Telefon.
   _____ spricht Paula am Telefon?

5. Ich will einen Tee trinken?
   _____ möchten Sie?

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

1. Europa ist sehr teuer.
2. Ich kaufe meiner Mutter ein Parfüm.
3. Darf ich herein kommen.
4. Das Neue Auto von Mercedes gefällt mir sehr.
5. Wie geht es Ihnen?
6. Heute abend sehen wir einen Film im Kino.
7. Mein Bruder hat einen BMW.
8. Sie heiraten. Wir gratulieren Ihnen.
9. Heute abend treffe ich meine Freunde im Cafe.
10. Kann ich mit dir sprechen.

4a) Präpositionen: (CO3) (5)

mit, für, ohne, nach, durch

1. Wir gehen _____ den Park.
2. Morgen fahren wir _____ Jaipur.
3. Ich trinke Tee _____ Zucker.
4. Martin, fährst du ____ der Metro?
5. Ich habe eine Information _____ Sie.

b) Ergänzen Sie die richtige Personalpronomen: (CO4)(8)

1. Es geht _____ sehr gut.
   1.ich   2.mir   3. Sie
2. Wo ist der Direktor. Kommt _____ heute oder nicht?
   1.er   2.sie   3. du
3. Frau Maria ist sehr schön, aber _____ ist nicht competent.
   1.Sie   2.sie   3. ich
4. Mein Chef kommt heute nicht ins Büro. Ich spreche _ am Telefon.
   1.er   2.ihn   3. ich
5. Studenten, können Sie _____ hören.
   1.ich   2.mich   3.du
6. Paul, was machst _____ in der Kantine?
   1.dich   2.du   3.ich
7. Morgen haben wir einen Test. _____ muss lernen.
   1. ich   2.mich   3.mir
8. Wir sprechen kein Englisch. Können Sie ____ helfen?
   1.wir   2.uns   3.ich

c) Ergänzen Sie die Modalverben: (CO4)(5)

1. Ich bin im Kino. Ich _____ hier Popcorn essen. (Kann / muss)
2. Wir sind an der Universität. Man ____ hier nicht rauchen. (möchte/darf)
3. Ich _____ Delhi. (möchte/ mag)
4. Ich _____ Deutsch. (soll / kann)
5. Ich bin krank. Ich _____ Medikament nehmen. (mag/ muss)

5a) Schreiben Sie 10 Sätze über Ihre Universität? (CO5) (5)
Oder
9b) Schreiben Sie Ihren Tagesablauf? (write 10 sentences about your daily routine)?
....

END TERM EXAMINATION   May-2023

COURSE CODE: FEC 45
COURSE TITLE: ENGINEERING EXPLORATION

Max. Time: 02:00 Hours   Max. Marks: 40

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

Q1.   Discuss the concept of problem space in engineering. Provide an example of an engineering problem and explain how it can be approached using the engineering design process.?   [CO2] [8M]

Q2.   Define a mechanism and explain the role of linkages in mechanical systems.   [CO3] [6M]

Q3.   Describe the engineering design process and its various stages. Explain the importance of multidisciplinary aspects while working on engineering design projects.   [CO2, CO3] [8M]

Q4.   Introduce the Arduino platform and the Arduino IDE. Explain the process of connecting and controlling an LED using Arduino.
                                                               [CO4, CO5] [6M]

Q5.   Explain the process of 3D printing technology, including the steps involved and materials used. Discuss the advantages and limitations of this technology.   [CO4] [6M]

Q6.   Explain   the importance of teamwork in successful project management. Discuss strategies for effective team communication and collaboration and describe how software tools like Microsoft Excel and Gantt Project can be used to support project management tasks.   [CO5] [6M]

SEMESTER- 4th

B.Tech.

END TERM EXAMINATION   *May-2023*

FEC46   TECHNICAL COMMUNICATION

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

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

Q.1 Discuss. the importance of effective communication in social, political and global context.   [10] [CO 1]

Q.2 What do you mean by interview skills? Discuss some interview skills which are required at the time of interview ?   [10] [CO 2]

Q.3 Write a C.V for the post of executive engineer in ABC Company ?
                                                              [10] [CO 1]

Q.4 What do you understand by Report Writing ? Explain different types of report writing in business communication?   [10] [CO 3]

Q.5 The topic given to you in a GD session is "Are examinations a useful way of assessing one's knowledge".   [5+5] [CO 2]

     a) Give suitable reasons to be agree or disagree with the topic.
     b) Give your suggestions and recommendations on the topic.

Q. 6 Which of the elements are essential for an effective presentation at your work place ?   [10] [CO 4]

Q.7 Write a short note on **any two** of the following: [5+5][CO 2]
     a) SOP
     b) Memorandum (Memo)
     c) Effective Speaking Skills
     d) Effective Listening Skills

B.Tech

End Sem Examination   **May-2023**

FEC 47 Value Driven Leadership

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

Attempt any FOUR questions. All questions carry equal marks. Assume suitable missing data, if any.

Question 1. Discuss the concept of Corporate Governance. Explain the various parameters to judge the Corporate Governance of an organization. **(12.5 Marks)**

Question 2. Thomas Donaldson Ethical Algorithm is a tool to evaluate whether to enter a host country. Discuss the various steps involved that should be followed by an MNC using the algorithm. **(12.5 Marks)**

Question 3. Explaining the shareholders' and stakeholders' approach, evaluate which approach is beneficial in the long-term success of an organization. **(12.5 Marks)**

Question 4. What are the main criteria for evaluating corporate social performance according to Archie Carroll? **(12.5 Marks)**

Question 5. Elucidate the types of Social Capital? How does Social Capital affect the economy? **(12.5 Marks)**

Question 6. What would be the consequences if technology is used without taking human values into consideration? **(12.5 Marks)**

289

B. TECH. (Forth Semester)

END TERM EXAMINATION   May – 2023

FEC 48 INTRIDUCTION TO BIOLOGICAL SCIENCES

Max. Marks - 50

Time – 2:00 hour

Note: All the three questions are compulsory.
1) Question 1 is fill in the blanks. Each blank carry half mark.
2) Question 2 is short answer type questions. Each question carry 3 marks. Attempt any 7 questions.
3) Question 3 is long answer type questions. Each question carry 5 marks. Attempt any 4 questions.

Que1:   Fill   in   the   blanks
(9)(CO#1)
1) --------------- is the organelle that bear specific pigments in plant cells which imparts specific colors to the plants
2) In eukaryotic cells ----------- is capable of digesting carbohydrates, proteins, lipids and nucleic acids as hydrolytic enzymes are present there
3) Lymphocytes begin their life in ....
4) An .... is any substance that can spark an immune response
5) ....immunity is borrowed from another source.
6) Natural running water ecosystem is known as ....
7) .... is the zone of junction or transition area between two biomes
8) .... consists of dead plant remains like leaves, bark, flowers and dead remains of animals, including fecal matter
9) ...., a boundary between troposphere and stratosphere, marked in most places by a temperature inversion
10) .... pH is the range of acid rain
11) Based on the source of their nutrition or food, organisms occupy a specific place in the food chain that is known as their ....
12) ....layer of the atmosphere contains the ozone layer?
13) .... is defined as the capacity of an organism to resist or defend itself from the development of a disease
14) .... is a tool to help us avoid particle pollution.
15) In the case of biodegradable organics, the COD is normally in the range of .... times the BOD.

16) .... is the process by which humus is further degraded by some microbes and release of inorganic nutrients

17) Amount of energy .... (decreases/increases) at successive trophic level

18) Greenhouse effect increases the Earth's temperature at around .... degree Celsius than it would otherwise be.

(21)(CO#

Ques2: Short answer type questions. Answer any 7 questions.
2,3,4)

1) What is the role of bioethics in healthcare sector?

2) Define the given terms
   a) Acute disease, b) Chronic disease, c) Metabolic disease

3) Explain whether virus is living or non-living organism.

4) Where lymphocytes begin their life? Differentiate between B lymphocytes and T lymphocytes.

5) What is the difference between cell mediated and humoral immunity?

6) Describe the three types of immune system disorders.

7) Differentiate between biological oxygen demand and chemical oxygen demand.

8) How do you mitigate pollution using phytoremediation, rhizoremediation and composting

9) What is particulate matter? Explain the types of particulate matter and associated diseases.

Ques3: Long answer type questions. Attempt any 5 questions. (20)(CO#2,4)

1) Explain any five basic life processes of a living being.

2) What are white blood cells? Write down the four places where white blood cells are stored in our body.

3) How will you explain immunity? How will you explain different types of innate immunity?

4) Explain the six levels of organization in ecology.

5) What is ecological succession? How organisms respond to abiotic factors?

6) Explain the reasons of biodiversity depletion.

FEC 49   Sketching and Rendering

Time: 02:00 Hours _____ Marks: 50

Material requirement – Answer paper and A3 cartridge paper 1 sheets

PART A

Q1. Attempt all multiple-choice questions which carry 1 mark each.

[CO-1] Marks 10

1) What is the primary difference between H and B pencils?

   a) The hardness of the lead   b) The thickness of the lead
   c) The color of the lead   d) The softness of the lead

2) Which type of pencil is better for shading and creating dark tones?

   a) H pencil   b) B pencil   c) HB pencil   d) F pencil

3) What is the meaning of "H" in H pencils?

   a) Heavy   b) Hard   c) High   d) Hybrid

4) Which of the following is not a common grade of H pencil?

   a) H   b) 2H   c) 4H   d) 6B

5) Which type of pencil is best for sketching in perspective drawing?

   a) Mechanical pencil   b) Graphite pencil   c) Colored pencil

   d) Charcoal pencil

6) What is the purpose of a 2H pencil in perspective drawing?

   a) To create light shading   b) To create dark shading

   c) To create outlines   d) To create fine details

7) Who is famous for painting surreal landscapes and melting clocks?

   a) Claude Monet   b) Vincent van Gogh   c) Salvador Dali
   d) Michelangelo

8) Who is known for his realistic portraits and is considered one of the greatest painters in the world?

  a) Pablo Picasso   b) Leonardo da Vinci   c) Vincent van Gogh
  d) Salvador Dali

9) Which artist is known for his use of bold colors and cubist style?

  a) Michelangelo   b) Claude Monet   c) Pablo Picasso
  d) Vincent van Gogh

10) Name the Indian artist who was known for his paintings on Horses.

  a) Amrita Sher-Gil   b) Raja Ravi Verma   c) M F Husain
  d) Jamini Roy

PART B

Q2. Write a brief description of any five artists from the list, along with visual representation of their famous works?   [CO-2] Marks 10

  i. MF Hussain
  ii. Vincent Vang Gogh
  iii. Amrita shergill
  iv. Salvador Dali
  v. Raja Ravi Verma
  vi. Jamini roy
  vii. Leo Nardo Da Vinci

Q3. Draw a Potted plant with flowers. Size: Height 8".   [CO-3] Marks 15

Create a detailed sketch of a potted plant with flowers, showcasing shading, proportion, and attention to detail.

Materials: Cartridge paper A3, Pencil / Color

Q4. Shade the given image and transform it into a 3D representation by applying shading and rendering.   [CO-4] Marks 15

---x----------------------------

Total no. of Pages: 01 293 Roll No...............

IV SEMESTER
B.Tech.
END SEMESTER EXAMINATION   MAY, 2023
FEC50 Tinkering & Elements of Design
Time: 02:00 Hours   Max. Marks: 50
Material provided – Answer paper and A3 cartridge paper 2 sheets

PART- 1

Q1. Define the Product life Cycle. Draw the life cycle chart mentioning all the parameters. [Max 200 Words]   [CO-2] [6 Marks]

Q2. How do you define Lateral thinking? How creative problem-solving i: different from lateral thinking?   [CO-4] [8 Marks]

Q3. List down the 5 DIY instruments/products with respect to your field o specialization.   [CO-3] [5 Marks]

Q4. What is Craftsmanship? State an example with reference to an: product.(Max 400 Words)   [CO-2] (6 marks)

PART- 2

Q5. Draw and render the below shown image on A3 size drawing paper i portrait position. Try to bring out the 3D look by rendering and keeping in min perspective with light to dark tones. Drawing size: 10" x 10"
                                        [CO-1][10 Marks]
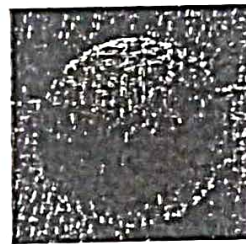
Q6. Draw a picture on A3 size drawing paper of your Study room in one poir perspective with items - chair, study table, ceiling fan, wall hanging, Amiral door & window. Try to bring out the 3D look by rendering with pencil, keepin in mind light and dark tones to create the pictur:
                                        [CO-2] [15 Marks]

Vanishing Point

----------------X---------------

294

Roll no ....

B.Tech.

END TERM SEMESTER EXAMINATION - May, 2023

FEC -53 COMMUNICATIVE HINDI

Max Marks: 50

Time: 02 Hours.

Attempt any FIVE questions.

कोई **पांच** प्रश्न कीजिए ।

प्रश्न-1 हिंदी वर्णमाला लिखिए ।   10 (CO1)

Question 1: Write Hindi alphabets.

प्रश्न-2 अपना परिचय दस (10) पंक्तियों में लिखिए ।   10 (CO3)

Question 2: Write your introduction in ten lines.

प्रश्न -3 शरीर के किन्हीं दस (10) अंगो के नाम लिखिए ।   10 (CO2)

Question 3: Write any ten parts of the Body name.

प्रश्न- 4 किन्हीं दस (10) भारतीय त्योहारों के नाम लिखिए ।   10 (CO5)

Question 4: Write any ten Indian festivals names.

प्रश्न-5 एक से पचास (1-50) तक हिंदी शब्दों में गिनती लिखिए ।   10 (CO3)

Question 5: Write counting from One to Fifty in Hindi.

प्रश्न-6 सप्ताह के दिनों के नाम हिंदी में लिखिए ।   10 (CO3)

Question 6: Write names of days in a week in Hindi.

प्रश्न-7 किन्हीं दस (10) पशुओं के नाम हिंदी में लिखिए ।   10 (CO3)

Question 7: Write any ten animals names in Hindi.

प्रश्न-8 संज्ञा और सर्वनाम को अलग-अलग वर्गों में विभाजित कीजिए ।   10 (CO4)

Question 8: Differentiate between the Noun and Pronoun and allocate under correct heading.

कानपुर (Kanpur), आप (Aap),

गाय (Gaay), सच्चाई (Sachchai),

सीता (Sita), कैसे (Kaise)

बाइबिल (Bible), उधर (Udhar)

यहाँ (Yahan), हाथी (Haathi)

1st Semester
B.Tech.

End Term Examination   May-2023

FEC54   Negotiation & Leadership

Total Marks-50   Time-2Hrs

Note:- Total Five Questions.
        All are compulsory.
        Marks indicated in the questions.

1   a. What are characteristics of a collaborative negotiation strategy? How to be
           successful with collaborative negotiation.?   [CO1][6]
        b. What are obstacle in achieving good collaboration?   [CO2][4]

2   a. What is complex negotiation and what are techniques to deal with complex
           negotiation?.   [CO1][4]
        b. What are hofstede's cultural dimension?.   [CO2][3]
        c. How to deal with people of difficult behavior?.   [CO5][3]

3.   a. List out ingredients of difficult conversation .Explain the tools for
           effectively engaging in difficult conversation.   [CO1][6]
        b. How you can prepare for a difficult conversation .   [CO5][4]

4.   a. What are four major obstacle in most of the negotiations?.   [CO3][4]
        b. What are common mistakes in negotiation? .   [CO2][3]
        c. How can you change what seems like a win-lose to win –win(or if other
           party does not play by rules)?.   [CO5][3]

5.   a. Why negotiation is an important skill to develop ?. What are three
           dimensions of negotiation explain?.   [CO2][5]
        b. What is value discovery in negotiation & How do we discover it?.   [CO3][5]

-----------00000-----------

4th Semester

B.Tech

End Term Examination   May-2023

FEC 56   Universal Human Values

Time: 2 Hours   Max. Marks: 50

Note: Read instructions carefully and answer accordingly.

Q1. Write a resume for volunteership with cover letter for a national NGO
(Assume necessary detail).   (CO1) (10)

Q2. Write a paragraph on Role of India in G-20.   (CO 2) (10)

Q3. Discuss Trust and understanding of harmony with examples. (CO3) (10)

Q4. Give arguments for a G.D on what is important for continuous
happiness.   (CO4) (10)

Q5. What is true respect with seven values.   (CO5) (10)

18. Aside from the simple practices of heartfulness, all that is really required is our _____ and _____ to look at ourselves honestly. (discipline and confidence, attention and willingness, sharpness and courage, humility and simplicity).
CO-1

19. The magic of _____ and _____ instead of reacting can make the most dramatic and profound change in us.(reacting and responding, pausing and accepting, liking and disliking, pausing and relaxing).
CO-1

20. Anger can arise for many reasons, _____. (failed plans, unfulfilled desires and rejected or neglected expectations, discord and insults, all the above, none of the above).
CO-2

OR

Anger leads to an uncontrollable flow of energy through _____,__,and _____.(emotion, suggestion and intention, emotion, thought and action, action , guilt and emotion,)
CO-2

FEC57 Leadership Mastery through Self Management

Time: 2hours   Max. Marks :50

PART A – 30 Marks (Short Questions)

1. What is situational awareness? What are the benefits associated with situational awareness in professional life? How to improve situational awareness?   CO-2, (3 Marks)

2. Explain how mental cleaning helps to achieve good meditation?
CO-1, (2 Marks)

OR

Is stress good or bad? Are there Heartfulness techniques that help you in this?   CO-2, (2 Marks)

3. What is spot cleaning? How do you do spot cleaning?
CO-1, (3 Marks)

4. Hearftfulness meditation emphasizes meditating on the heart. Why?   CO-1, (3 Marks)

5. What is 'Power of Suggestion?' How is a Suggestion to be given? Give an example   CO-4, (5 Marks)

6. Explain what are Eustress and Disstress and give examples.
CO-2, (4 Marks)

7. Accepted norm is "Some level of Stress is required to get work done." Give one example when a) Stress is put at maximum to get ordinary work done, b) when too low to get the correct performance, c) Being informed well in advance and still stress develops to complete a defined task
CO-2, (3 Marks)

OR

What is the power of Pause? How does it work in tricky or complex situations?   CO-4,(3 Marks)

8. Explain the Heartfulness detox technique for the removal of Fear and Anger   CO-5, (4 Marks)

9. Difference between Reaction and Response. Give examples.

CO-4, (3 Marks)

Part B – 20 Marks (Fill up the blanks)

1. Regarding the power of suggestion, the _____ is always most effective. (subtle, forceful, relaxed)

CO- 5

2. While doing cleaning, if you try to remove a specific thing by force, you will actually _____ its effect. (deepen, lighten, remove totally)

CO-1

3. While doing cleaning the suggestion has to be given _____ (prayerfully, tenderly, forcefully, lightly, prayerfully and tenderly)

CO-1

4. Throughout our daily activities, we continuously suppose things with the voice inside our head, even if we do not voice them aloud. These thinking patterns are _____. (likes, dislikes, likes and dislikes, reaction and response)

CO-5

5. Witnessing your thoughts arising, and allowing them to flow through you, gently and subtly, is _____ (heartfulness, mindfulness, stillness, selflessness)

CO-1

6. Anger results later on in feelings of _____ and _____, with the resulting loss of self-esteem. (guilt and shame, guilt and unhappiness, shame and sadness)

CO- 5

7. Anger and rage do not allow _____. (clear thinking, confidence, happiness, sadness)

CO-5

8. By becoming fully aware of your own anger and developing a greater understanding, you can use your anger as a _____ for self-growth and self-transformation. (Catalyst, force, suggestion, intent)

CO-5

9. Anger expresses in the way we _____ and _____. (react and response, speak and behave, give suggestion and intent,)

CO-5

10. To observe the tone of your conversation and let it flow evenly, we need to _____. (remove any rise and fall in the pitch, sharpness or roughness, remove any anger, being content, remove the self consciousness and awareness).

CO-5

11. Fear arises out of the perception of _____ or _____. (joy or lightness, cheerfulness or happiness, danger or separation).

CO-5

12. The emotion fear is wired into our _____, so everyone is affected by this emotion. (brain, autonomic nervous system, sympathetic nervous system, prefrontal cortex,)

CO-4

OR

By developing _____ and _____ we learn how to deal with fear effectively.(subtlety and lightness, sharpness and cheerfulness, clarity of thought and a courageous heart, love and affection).

CO-4

13. Fear arises first in the energy field of the _____. (heart, mind, abdomen, heart-mind)

CO-5

OR

_____ is the antidote to fear.(confidence, compassion, courage, calmness)

CO-5

14. Our inability to deal with situations well and solve problems leads to accumulated effects of _____. (sadness, happiness, lightness , stress, fear).

CO-4

15. To relieve stress then and there, breath in and out through your _____.(right nostril, left nostril, breath in and out through the left and right respectively).

CO-4

16. Cleaning the mind of its excessive _____ and _____ restores and rejuvenates the mind. (thoughts and actions, intentions and thoughts, suggestions and intentions, thoughts and worries).

CO-2

17. To restore positivity, we do _____.(cleaning, inner connect, meditation)

CO-3

B.Tech. END SEMESTER EXAMINATION

FEC-58: SCIENCE AND PRACTICE OF HAPPINESS

Time: 2.00 Hours   *Max. Marks:50*

Section A: MCQ   [1 mark each, attempt all of them]

Q.1. Science has proven that mindfulness can

     a. Cure any disease

     b. Increases the amygdala

     c. Produces chemicals for happiness   [CO1]

Q.2 Which is the happiness hormone?

     a. Serotonin

     b. Cortisol

     d. Testosterone   [CO1]

Q. 3. Hedonic happiness is derived from

     a. Pleasure

     b. Sadness

     c. Sorry

     d. None of the above   [CO1]

Q.4. Chakra in our body are the, according to yogic system of knowledge are;

     a. Energy centers

     b. Internal organs

     c. Nervous system   [CO2]

Q.5. Which is the reward chemical/ hormone

     a. Oxytocin

     b. Dopamine   [CO2]

     c. Endorphine   d. none

Q.19 According to Fredickson, prime indicator of flourishing is

     a. Money

     b. Fame   [CO5]

     c. Positive Emotions

Q.20 According to yogic philosophy, the Kosha (Sheath) of vision is called

     a. Annamaya Kosha

     b. Anandmaya Kosha

     c. Vigyanmaya Kosha   [CO5]

Section B: Short Answer Questions (5 marks each, answer any 4)

Q.1. Define Happiness. Describe five signs of Happiness. [CO1]

Q.2. How to cultivate happiness.   [CO2]

Q.3. What is meaning of Chakra. Give the name of chakras. [CO3]

Q.4. What are positive emotions? Give ways in which we can build positive emotions.   [CO4]

Q.5. Write a note on Panchkosh.   [CO5]

Section C: Long Answer Questions (10 marks each, answer any 1)

Q.1. Write a note on yogic science of happiness with reference to Ashtanga yoga.   [CO5]

Q. 2. Explain an opponent-process theory of emotions.   [CO3]

Q.6 Research says that having meaning or purpose of life
    a. is guided by personal values
    b. influences greater life satisfaction
    c. results in fewer health problems   [CO2]
    d. All of the above

Q.7 According to yogic philosophy, the Kosha (Sheath) of Bliss is called
    a. Annamaya Kosha
    b. Anandmaya Kosha
    c. Vigyanmaya Kosha   [CO3]

Q.8 Which is the strongest predictor of happiness?
    a. Good social relationship
    b. Having huge amount of money
    c. Doing foreign visit   [CO3]

Q.9 What makes the people happier?
    a. Regular exercises
    b. Eating fast food
    c. See the movies   [CO3]

Q.10 Primary emotions are to the _____ pathway as secondary emotions are to the _____ pathway.
    a.mild,intense
    b.hard,soft
    c.fast,slow
    d. pleasant, unpleasant   [CO3]

Q.11 The phenomenon of misattribution of arousal (e.g. thinking you are in love when really you are just scared) is best explained by which theory of emotion?
    a. the James-Lange theory
    b. the two-factor theory
    c. the Cannon-Bard theory
    d. the wishful thinking theory   [CO3]

Q.12 Who developed the James-Lange theory of emotion?
    a. William James and James Lange
    b. William James and Carl Lange
    c. Carl James and Thomas Lange
    d. Carl James and William Lange   [CO3]

Q.13 Precaution regarding yoga asana is?
    a. Should be performed after having lunch
    b. Should be performed empty stomach
    c.Should be performed before sleeping   [CO4]

Q.14 How we can cultivate Happiness?
    a. Persue our intrinsic goals
    b. Pursue our negative thoughts
    c. By wasting our time   [CO4]

Q.15 Optimism refer to
    a. Hopefulness and positive thinking
    b. Beauty and happiness
    c. Patience
    d. Wisdom   [CO4]

Q.16, 50% of our happiness is due to genetics
    a. True
    b. False   [CO2]

Q.17 which Chakra is known as throat chakra?
    a.Ajna Chakra
    b.Vishuddha Chakra
    c.Anahata Chakra   [CO2]

Q.18 Which of the following statements is true
    a. In small quantities, stress is good
    b. Too much stress is harmful
    c.All stress is bad
    d.Only '1' & '2' are right   [CO5]

Total no. of Pages: 03   Roll no..............

SIXTH SEMESTER

B.Tech

END TERM EXAMINATION   May-2023

HU-302   Engineering Economics

Time: 03:00 Hours   Max. Marks: 50

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

1.1 Discuss role of engineering and technology in achieving [5][CO#3]
Sustainable Development Goal 2030.

1.2 a. The value of a machine depreciates from Rs. 16560 to [2.5+2.5=5]
Rs. 6245 in 6 years. What is the annual rate of [CO# 1]
depreciation?

b. A company hardware company purchases computer
screen at a cost of Rs. 4500/screen. In case the company
makes it, the fixed and variable cost would be Rs.
40,00,00/- and Rs. 2000/ screen respectively Should the
manufacturer make or buy the screen, if the annual
demand is of 1500 computers?

2.1 Write five salient features of the Indian economy.   [5][CO# 1]

2.2 A person deposits Rs. 200 at the end of every month for 5 [5][CO#2]
years in a saving bank account that pays interest @ 4% p.a.
compounded monthly. Find the amount in his account at
the end of 5 years.

3.1 What do you mean by Fiscal Policy? How companies can [2.5+2.5=5]
be encouraged to opt for green technology through using [CO#1and3]
Fiscal Policy. Discuss.

3.2 A company has to replace a machine in the production line [5][CO#2]
after 11 years at the cost of Rs. 60,00,000/-. It plans to
deposit an equal amount at the end of every year for 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 the next 11
years.

4.1 What do you mean by Labour Intensive and Capital [5][CO#1] Intensive production process? Discuss with example.

4.2 A machine costs a company Rs. 10,000 and its expected [5][CO#2] life is 5 years. Alternatively, the machine can be obtained by leasing at the annual rent of Rs. 2500. If the rate of interest is 12% per annum, find which alternative is preferable to the company?

5.1 You are CEO of an Oligopolistic company. What are the [5][CO#3] factors you should consider while deciding price of your product.

5.2 Prepare a cost sheet showing the total cost and per tonne [5][CO# 2] cost of paper manufactured by ABC paper mills Ltd. for the month of March 2023. There are 26 working days in the month. Also find the profit earned by the company. The details are as under:

Direct Raw Material	Paper pulp	6000 tons @ Rs. 900/ton
Direct Labour Cost	Skilled workers	280@783.00/day
	Semi Skilled	300@ 712.00/ day
	Unskilled	470@646.00/ day
Direct Expenses	Equipment hire charges	Rs. 12000/ day
	Dyes	Rs. 650 per tonne of raw material input
Overheads	Variable	@ 50% of Direct Wages
	Fixed	Rs. 270000/month
Administrative overheads		12% of factory or work cost
Selling and Distribution overheads		20% of the prime cost
Profit		10% of the total cost

6.1 Discuss Business cycle. How engineers can help to bring [2.5+2.5=5] the country back to the normal situation? Discuss [CO#1and3]

6.2 Two years ago, a machine was purchased at a cost of Rs. [5] [CO#2] 4,00,000 to be useful for ten years. Its salvage value at the end of its life is Rs. 60,000. The annual maintenance cost is Rs. 60,000. The market value of the present machine is Rs. 3,20,000. Now a new machine to cater to the need of the present machine is available at Rs. 3,80,000 to be useful for eight years. Its annual maintenance cost is Rs.

45,000. The salvage value of the of the new machine is Rs. 40,000/- Using an interest rate of 11%, find whether it is worth replacing the present machine with new machine?

7.1 Discuss socio-economic factors which need to be [5][CO#3] considered while deciding foreign location of your company.

7.2 What amount of money saved today will yield Rs. 40,000 [5][CO#2] in the third year and Rs. 55,000/- after five years at the 12% rate of interest compounded annually.

6th & 8th SEMESTER
B.Tech.

END TERM EXAMINATION   May-2023
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 do you understand Barter System. Explain the various types of
Money.   [5+5] [CO 1]

Q.2 What are different types of Bank. Discuss major functions of
Commercial Bank.   [5+5] [CO 2]

Q.3 Distinguish between Monetary Policy and Fiscal Policy. Discuss
different tools of Monetary Policy.   [5+5] [CO 2]

Q.4 Explain the term structure of Interest rates in India. What are the
factors determining the Rate of Interest.   [5+5] [CO 3]

Q.5 What is the role of financial market in an economy. What are the
factors responsible for financial crisis in an economy.
                                                    [5+5] [CO 3]

Q.6 What are the different functions of Central Bank in an Economy.
                                                    [10] [CO 2]

Q.7 Write a short note on **Any Two**   [5+5] [CO 2&3]
    a) SEBI
    b) Moral Hazard
    c) Asymmetric Information

END TERM EXAMINATION   May-2023

HU-308   Mathematical Economics

Time: 03:00 Hours   Max. Marks: 50

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

1.1 Compare and Contrast following: [6] [CO#1]
 a. Stock Dimension and Flow Dimension of economic variable
 b. Static and Dynamic Equilibrium

1.2 Determine the increase in income by an additional investment of Rs. 80 crores if the marginal propensity to consume is 0.8.   [4] [CO#1]

2.1 How you can use Matrix Algebra to solve problems of business? Discuss   [6] [CO# 3]

2.2 The prices, in rupees per unit, of three commodities X, Y, and Z are x, y, and z respectively. A purchases 4 units of Z and sells 3 units of X and 5 units of Y. B purchases 3 units of Y and sells 2 units of X and 1 unit of Z. C purchases 1 unit of X and sells 4 units of Y and 6 units of Z. In the process A, B, and C earn Rs. 6000, 5000 and 13000 respectively. Using Cramer's rule, find the price of the thee commodities.   [4] [CO#2]

3. Discuss mathematically, Demographic transition theory and Malthusian theory of population growth model. Draw suitable graph also and derive equation.   [6+4=] [CO#3]

4.1 Discuss significance of assumption in economic model? [6]
Whether economic model is able to portray a real world [CO#1+3]
situation.

4.2 A monopolist firm has the following total cost and demand [4]
functions [CO#2]

TC $=20+2x+3x^2$; x= 50-p where x and p is quantity and price

Find the values of p and x that maximise profit.

5.1 Discuss application of differential equation in taking [6]
business decisions. [CO#3]

5.2 MRS$= +\frac{dy}{dx} = -\frac{A}{B}\frac{y+b}{x+a}$ is the Marginal Rate of Substitution of [4]
good y for good x, show that one from of individual's utility [CO# 1]
function is u= $(x+a)^A(y+b)^B$ where a, b, A and B are
constants.

6.1 Discuss difference between consumer's and producer's [6]
surplus [CO#2]

6.2 Find the consumer's surplus and producer's surplus under [4]
pure competition for demand function $p = \frac{8}{x+1} - 2$ and [CO#2]
supply function $p = \frac{1}{2}(x+3)$, where p is price and is
quantity.

7.1 Discuss application of Integration in taking business [6]
decisions. [CO#3]

7.2 The purchase price of a washing machine is Rs. 75,000. The [4]
rate of cost repair is given by C= $6,000\left(1 - e^{-\frac{1}{2}t}\right)$, where t [CO#2]
represents years of use since purchase. Find the cumulative
repair cost at the end of 5 years. Also find the equation to
give the time, in years, at which the cumulative repair cost
equals purchase price of the washing machine

VI/VIIISEMESTER

B.Tech

END TERM EXAMINATION   **May-2023**

HU 310 - INTERNATIONAL ECONOMICS

Time: 03:00 Hours   Max. Marks: 50

Note : Attempt all questions from part A
        Attempt any 3 questions from Part B
        All questions carry equal marks.
        Assume suitable missing data, if any.

PART A

Q.1   State True or False with reason:

1. Global blaze and Vasudhaiva kutumbakam are same.

2. ESG parameters of sustainability is Economic, Social and Governance.

3. Smile Curve involves a swing in the share of value added in manufactured exports that is generated in the manufacturing sector itself instead of, for example, in the pre- and post-fabrication stages.

4. KOF Globalization index is a measurement of the projection in the world of 150 countries based on three dimensions: Economic, Political and Soft.

5. Porter diamond model is given by Michael Porter.

                                    [5*1= 5][CO 1,2,3,4,5]

PART B

Forty years ago, Starbucks was a single store in Seattle's Pike Place Market selling premium-roasted coffee. Today, it is a global roaster and retailer of coffee, with more than 28,000 stores in 76 countries. Starbucks set out on its current course in the 1980s when the company's director of marketing, Howard Schultz, came back from a trip to Italy enchanted with the Italian coffeehouse experience. Schultz, who later became CEO, persuaded the

company's owners to experiment with the coffeehouse format— and the Starbucks experience was born. The strategy was to sell the company's own premium roasted coffee and freshly brewed espresso-style coffee beverages, along with a variety of pastries, coffee accessories, teas, and other products, in a tastefully designed coffeehouse setting. From the outset, the company focused on selling "a third place experience," rather than just the coffee. The formula led to spectacular success in the United States, where Starbucks went from obscurity to one of the best known brands in the country in a decade. Thanks to Starbucks, coffee stores became places for relaxation, chatting with friends, reading the newspaper, holding business meetings, or (more recently) browsing the web. In 1995, with 700 stores across the United States, Starbucks began exploring foreign opportunities. The first target market was Japan. The company established a joint venture with a local retailer, Sazaby Inc. Each company held a 50 percent stake in the venture: Starbucks Coffee of Japan. Starbucks initially invested $10 million in this venture, its first foreign direct investment. The Starbucks format was then licensed to the venture, which was charged with taking over responsibility for growing Starbucks' presence in Japan. To make sure the Japanese operations replicated the "Starbucks experience" in North America, Starbucks transferred some employees to the Japanese operation. The joint venture agreement required all Japanese store managers and employees to attend training classes similar to those given to U.S. employees. The agreement also required that stores adhere to the design parameters established in the United States. In 2001, the company introduced a stock option plan for all Japanese employees, making it the first company in Japan to do so. Skeptics doubted that Starbucks would be able to replicate its North American success overseas, but by the end of 2018 Starbucks' had some 1,286 stores and a profitable business in Japan. Along the way, in 2015, Starbucks acquired Starbucks Coffee of Japan, making the stores wholly owned as opposed to licensed. After Japan, the company embarked on an aggressive foreign investment program. In 1998, it purchased Seattle Coffee, a British coffee chain with 60 retail stores, for $84 million. An American couple, originally from Seattle, had started Seattle Coffee with the intention of establishing a Starbucks-like chain in Britain. By 2018, Starbucks had almost 1,000 stores in the United Kingdom. In the late 1990s, Starbucks also opened stores in Taiwan, China, Singapore, Thailand, New Zealand, South Korea,

and Malaysia. Asia, Starbucks' most common strategy was to license its format to a local operator or joint venture partner in return for initial licensing fees and royalties on store revenues. As in Japan, Starbucks insisted on an intensive employee-training program and strict specifications regarding the format and layout of the store. China has developed into Starbucks' fastest-growing market and is now second only to the United States in terms of store count and revenues. Although China has historically been a nation of tea drinkers, the third-place coffee culture pioneered by Starbucks has gained significant traction in the nation's large cities where wealthy and middle-class customers will pay $5 for a cup of coffee. As with many other nations, Starbucks originally entered China by setting up a joint venture with a local company and licensing its format to that entity. That changed in 2018 when Starbucks bought out its East China venture partner in order to attain greater control over its growth strategy. According to Belinda Wong, CEO of Starbucks' China operations, "Full ownership will give us the opportunity to fully leverage the company's robust business infrastructure to deliver an elevated coffee, in-store third place experience and digital innovation to our customers, and further strengthen the career development opportunities for our people." The company now aims to have 6,000 wholly owned stores in China by the end of 2022, up from 3,500 at the end of fiscal 2018.

Q.2 Construct a strategy diamond for starbucks.   [15] [CO 1]

Q.3 What drove Starbucks to start expanding internationally? Is this strategy in the best interests of its company's shareholders?
                    [15] [CO 2]

Q.4 Where did the original idea for the Starbucks' format come from? What lessons for international business can be learnt from this?
                    [15] [CO 3]

Q.5 What drove Starbucks to shift from a joint venture strategy in China to run the operation through a wholly owned subsidiary? What are the benefits here? What are the potential risks and costs? Do you think this was the correct decision?   [15] [CO 4]

END TERM EXAMINATION   May-2023

HU 312 - MICRO ECONOMICS

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

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

Q.1

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Q	TFC	TVC	P	MC	TC	ATC	AVC	AFC	TR	Profit
0	$10	$0	$60							
1	$10	$10	$60							
2	$10	$15	$60							
3	$10	$20	$60							
4	$10	$30	$60							
5	$10	$50	$60							
6	$10	$80	$60							

where, Q: Quantity produced and sold

TFC: Total Fixed Cost

TVC: Total Variable Cost

P: Price

MC: Marginal Cost

TC: Total Cost

ATC: Average Total Cost

AVC: Average Variable Cost

AFC: Average Fixed Cost

TR: Total Revenue

Calculate the missing blanks and plot the relationship between Average total cost, average variable cost and Marginal Cost. Also plot Average fixed cost.   [10] [CO 1]

Q.2 In 2010, Americans smoked 315 billion cigarettes, or 15.75 billion packs of cigarettes. The average retail price (including taxes) was about $5.00 per pack. Statistical studies have shown that the price elasticity of demand is 0.4, and the price elasticity of supply is 0.5.

a. Using this information, derive linear demand and supply curves for the cigarette market.

In 1998, Americans smoked 23.5 billion packs cigarettes, and the retail price was about $2.00 per pack. The decline in cigarette consumption from 1998 to 2010 was due in part to greater public awareness of the health hazards from smoking, but was also due in part to the increase in price. Suppose that the entire decline was due to the increase in price. What could you deduce from that about the price elasticity of demand?   [10] [CO 1]

Q.3

Explain using suitable diagrams the determination of profit maximization level of output and profit for a firm. Also suggest the quantities where the firm experiences minimum, maximum and zero profits.   [10] [CO 2]

Q. 4

You are an employer seeking to fill a vacant position on an assembly line. Are you more concerned with the average product of labor or the marginal product of labor for the last person hired? If you observe that your average product is just beginning to decline, should you hire any more workers? What does this situation imply about the marginal product of your last worker hired?   [10] [CO 2]

Q. 5

What is the social cost of monopoly. Why is there a social cost to monopoly power? Why will a monopolist's output increase if the government forces it to lower its price? Explain using diagram.   [10] [CO 3]

Q 6. Find the profit maximizing output level for the given TR and TC functions

$TR(Q) = 45 Q - 0.5 Q2$

$TC(Q) = 2+ 57Q - 8 Q2 + Q3$ [10] [CO 3]

Ques 7:

i.   A supply curve reveals-
A.   the quantity of output consumers are willing to purchase at each possible market price.
B.   the difference between quantity demanded and quantity supplied at each price.
C.   the maximum level of output an industry can produce, regardless of price.
D.   the quantity of output that producers are willing to produce and sell at each possible market price.

ii.   Assume that steak and potatoes are complements. When the price of steak goes up, the demand curve for potatoes-
A. shifts to the left.
B. shifts to the right.
C. remains constant.
D. shifts to the right initially and then returns to its original position.

iii.   You are analyzing the demand for good X. Which of the following will result in a shift to the right of the demand curve for X?

A. A decrease in the price of X
B. An increase in the price of a good that is a complement to good X
C. An increase in the price of a good that is a substitute for X
D. Increase in the price of X

iv.   The price of good A goes up. As a result, the demand for good B shifts to the left. From this we can infer that
A. good A is used to produce good B.
B. good B is used to produce good A.
C. goods A and B are substitutes.
D. goods A and B are complements.

v.   Suppose biochemists discover an enzyme that can double the amount of ethanol that may be derived from a given amount of biomass. Based on this technological development, we expect the
A. supply curve for ethanol to shift leftward.
B. supply curve for ethanol to shift rightward.
C. demand curve for ethanol to shift leftward.
D. demand curve for ethanol to shift rightward.   [10] [CO 4]

311 Roll no...............

6th and 8th - SEMESTER

B.Tech.

END TERM EXAMINATION May-2023

HU-314 Rhetoric and Public Speaking

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 How can 7 C's of communication be effective in terms of writing and speaking ?
[10] [CO 1,2]

Q.2 Elaborate any 5 reasons of stage fear/ anxiety. Write four ways in which stage fear can be managed better.
[10] [CO 2,3]

Q.3 Explain how storytelling can be instrumental for good presentations. Write 5 techniques of storytelling that can be utilised for effective presentations.
[10] [CO 3]

Q.4 What techniques of rhetoric can be used by a communications division of a marketing department to influence potential customers. Give one example each of rhetorical persuasion achieved in: a) any TV advertisement seen by you b) any Government initiative or public awareness campaign.
[10] [CO 4,2]

P.T.O

Q. 5 Discuss in detail the importance of body language in public speaking?
[10] [CO 5,1]

Q.6 Analyse any one of these iconic speeches given by a) Swami Vivekananda's Chicago Speech, 1893 ; or b) Martin Luther King's "I have a Dream", 1963
[10] [CO 4,5]

Q.7 Write a short note on any two of the following: [5+5] [CO4,5]
a) Etiquettes required for a brief telephonic interview
b) Art of Rhetoric as proposed by Aristotle
c) Logical fallacy in communication

313

VI/VIII Semester

B. Tech

End-Term Examination   May-2023
          HU 316   Theatre and Stagecraft

Time: 3 hours   Total Marks: 50

> Note: All questions are compulsory

1. How will you use stage props correctly? Explain.   (10) (CO 1)

2. What is the unity of time, place, and action? Are they applicable to all plays? Explain.   (10) (CO 4)

3. What are the different types of theatres/stages? Describe them.   (10) (CO 2)

4. How relevant is Shakespeare today? Describe by shedding light on *The Merchant of Venice*.   (10) (CO 3)

5. What is Alienation Effect? Explain in detail how it is employed by theatre practitioners in their performances?   (10) (CO 4)

Or

Write short notes on the following:

   a. Freytag's Pyramid

   b. Tragedy

Total no. of Pages : 01

Roll no............

6th & 8th Semester

B.Tech.

END TERM EXAMINATION

May. 2023

HU 318   Professional Writing Skills

Time: 3.00 Hours

Max. Marks: 50

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

Q1. Explain the importance of formal language in professional communication. (CO1) (10)

Q 2. Write a Resume for the post of Executive Engineer in an MNC. (CO2) (10)

Q 3. Give your opinion on a GD on 'G-20 in India: Opportunities and Challenges'. (CO2) (10)

Q 4. Write short notes on the following: (CO3) (10)

   a) Netiquettes
   b) Communication at the workplace

Q 5, Write a paragraph on **any one** of the following topics: (CO3) (10)

   a) Role of technology in professional life
   b) Universal human values

Total No. of Pages:01

Roll no ....

VI/VIII Semester

B.Tech.

END TERM EXAMINATION

May-2023

HU404   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 major functions of Public Finance. Explain different instruments to perform these functions?   (5+5), [CO-1]

Q.2. What are the principal reasons for market failures to produce efficient outcomes? Discuss the role of government in making it possible for markets to work at all.   (5+5), [CO-2]

Q.3. What do you understand by optimal income taxation? In this context explain the linear and non-linear income taxation.   (4+6), [CO-3]

Q.4. Discuss the proposed benefits and concerns regarding Goods and Services Tax (GST) in India.   (10), [CO-4]

Q.5. Discuss the salient features of the 15th Finance Commission Report of India.   (10), [CO-4]

Q.6. Briefly explain the key issues in managing fiscal data in India.   (10), [CO-4]

Q.7. Write short notes on any two of the following:

(i) Pure and Impure Public Goods

(ii) Coase Theorem

(iii) Incidence of Taxation

(5+5) [CO-2, 3, 4]

Total no. of Pages:1   316   Roll no ....

6th & 8th SEMESTER
B.Tech.   May-2023

END TERM EXAMINATION

HU410   Language and Social Media

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   Explain the reasons and motivation of Code-mixing and Code-Switching.   [10] [CO 1]

Q.2   Discuss the challenges posed by the language on social media?   [10] [CO 4]

Q.3   Why emojis and emoticons have become an integral part of communication on social media   [10] [CO 2]

Q.4   What do you understand by Alpha-Numeric Characteristics. Discuss its advantages and disadvantages in detail.   [10] [CO 4]

Q.5   Write a short note on **Any Two** of the following   [5+5] [CO 3]
     a) Facebook
     b) Twitter
     c) WhatsApp

3/7

Roll no ....

SEMESTER- 6th & 8th

B.Tech.

END TERM EXAMINATION   May-2023

HU- 412   Adaptation and Translation

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 A professional translator is a most significant asset in his/her
     company. Discuss in detail.

                              Or

On the basis of your understanding draw significant differences and
similarities between Shakespeare's *Othello* and Vishal Bhardwaj's
Omkara.   [10] [CO2,3]

Q.2 Transcreation can play a role of creative tool in the expansion of
     any business specially in the field of advertisement and marketing.
     Comment.

                              Or

Write short notes on any two of the following.
     1. Handkerchief versus Waistband
     2. Shakespeare in Bollywood
     3. Ambiguity in Translation
     4. Problems and Challenges faced in Transcreation

                                             [10] [CO3,4]

Q.3 What is the importance of adaptation and translation for engineers in the age of globalisation.

Or

What do you understand by Audio-Visual Translation? What are the different types? Distinguish between any two of them with suitable examples.   [10] [CO2]

Q.4 How does the use of adaptation and translation enable engineers to overcome linguistic and cultural barriers at their workplaces?

Or

What are the issues and challenges of adapting a literary work into screenplay?   [10] [CO1,4]

Q.5 What are the different forms of Translations? Elaborate in detail on any two of them with suitable examples.

Or

Gillian Wright made sure to keep cultural context in mind while translating *Raag Darbari*. Comment.

[10] [CO2,3]

4th SEMESTER

B.Tech.

END TERM EXAMINATION   May-2023

IT202   DATABASE MANAGEMENT SYSTEMS

Time: 03:00 Hours   Max. Marks: 40

Note: All questions are compulsory. Internal choice is indicated by OR
Assume suitable missing data, if any.

Q.1   Answer the following questions: [2×6=12]

a) What are the different components of DBMS?   [CO1]

b) Why should NULL values be avoided in RDBMS?   [CO2]

c) What is the dependency preservation property in database
normalization?   [CO3]

d) Explain sparse and dense indexing.   [CO4]

e) Example of cascadeless schedule and strict schedule. [CO5]

f) Which variant of 2PL ensures no deadlock and how?   [CO6]

Q.2   a) Convert the following ER diagram to relational schema with
proper justification.   [4][CO2]
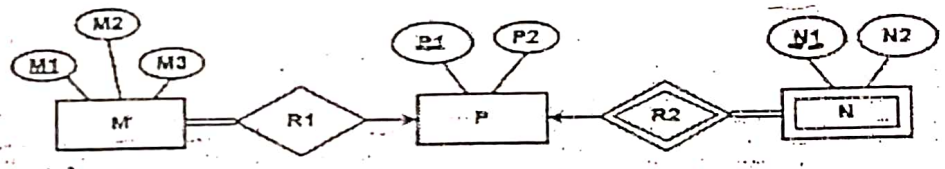
b) What are views? Write the SQL statement for creating a view.
What are the conditions for creating updatable views?   [3][CO1]

Q.3   a) Suppose we decompose a given relation R(A, B, C, D, E) into: [4][CO3]
R1(A, B, C)
R2(A, D, E)

Show that this decomposition is a lossless decomposition if the
following set of functional dependencies hold:

A→BC, CD→E, B→D, E→A

OR

320

a) Check the equivalence of two given set of functional dependency with proper explanation for R(A,B,C,D,E,H) : [4][CO3]

$F=\{A \rightarrow C, AC \rightarrow D, E \rightarrow AD, E \rightarrow H\}$ and $G=\{A \rightarrow DC, E \rightarrow A\}$

b) Create a B+Tree of order 4 for the following data: 12, 14, 1, 11, 10, 5, 6, 7, 15, 20, 28, 23, 24, 27. [3][CO4]

OR

b) Suppose that we have an ordered file with $r = 600,000$ records stored on a disk with block size $B = 2,048$ bytes. File records are of fixed size and are unspanned with record length $R = 200$ bytes. How many block accesses would be required approximately while performing a binary search on the data file? [3][CO4]

Q.4 a) Explain the following with suitable examples: [4][CO5]
   i) Lost Update problem   iii) Unrepeatable Read problem
   ii) Temporary Update problem   iv) Incorrect Summary problem

OR

a) Consider the schedules S1 and S2 consisting of 3 transactions. Draw the precedence graphs for S1 and S2, and state whether each schedule is conflict serializable or not. If a schedule is serializable, write down the equivalent serial schedule(s). [4][CO5]

S_1: $r_1(X)$; $r_2(Z)$; $r_1(Z)$; $r_3(X)$; $r_3(Y)$; $w_1(X)$; $w_3(Y)$; $r_2(Y)$; $w_2(Z)$; $w_2(Y)$;

S_2: $r_1(X)$; $r_2(Z)$; $r_3(X)$; $r_1(Z)$; $r_2(Y)$; $r_3(Y)$; $w_1(X)$; $w_2(Z)$; $w_3(Y)$; $w_2(Y)$;

b) Explain different buffer management strategies. [3][CO4]

Q.5 a) Explain 2 Phase Locking protocol in detail. [4][CO6]

b) What are the various Timestamp-based deadlock prevention algorithms? Explain. [3][CO6]

4th SEMESTER

B. Tech. (IT, IT-Minor all registered branches)

END SEMESTER EXAMINATION   May -2023

IT204: Operating System

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

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

Q.1 [A] Define the role of Modern Operating Systems. Discuss the different types of Operating Systems in Details.   [4] [CO1]

[B] How System Calls help users to interact with computer hardware. Discuss at least four system call related Process control and File management.   [4] [CO1]

Q.2 [A]. Consider the following set of processes with their arrival time and burst time.

Processes	P_0	P_1	P_2	P_3
Arrival Time	0	5	6	3
Burst Time (in ms.)	8	9	12	5

Use the SRTF with preemption and Round Robin (RR) CPU scheduling algorithm and find the average turnaround time. Assume that the time quantum for the RR algorithm is 4 ms.   [4] [CO2]

[B]. Write an algorithm to solve Dining-Philosophers synchronization problem. Also differentiate Monitors and Semaphores used to solve process synchronization problem.   [4] [CO2]

Q.3 [A] Three concurrent processes X, Y, and Z execute three different code segments that access and update certain shared variables. Process X executes the P operation (i.e., wait) on semaphores a, b and c; process Y executes the P operation on semaphores b, c and d; process Z executes the P operation on semaphores c, d, and a before entering the respective code segments. After completing the execution of its code segment, each process invokes the V operation (i.e., signal) on its three semaphores. All semaphores are binary semaphores initialized to one. Find the deadlock free order of invoking the P operations by the processes. **[4] [CO3]**

[B] Differentiate Deadlock and Starvation with suitable example. **[2] [CO3]**

[C] Discuss different types File Sharing Systems in details. **[2] [CO5]**

Q.4 [A] Define the Belady's Anomaly problem and justify that FIFO page replacement algorithm faces this problem with a suitable example (reference string). **[4] [CO4]**

[B] Consider a paging system that uses a 1-level page table residing in main memory and a TLB for address translation. Each main memory access takes 80 ns and TLB lookup takes 15 ns. Each page transfer to/from the disk takes 4000 ns. Assume that the TLB hit ratio is 85%, page fault rate is 10%. Calculate the Effective Access Time. **[4] [CO4]**

Q.5 [A] Suppose the following disk request sequence (track numbers) for a disk with 100 tracks is given: 35, 30, 80, 15, 55, 70, 90, 25, 78. Assume that the initial position of the R/W head is on track 50. Find the total head movement by the R/W head when the Shortest Seek Time First (SSTF) algorithm and SCAN (Elevator) algorithm used (assuming that SCAN algorithm moves towards 100 when it starts execution). **[4] [CO5]**

[B] Write short note on following case studies: **[2+2] [CO5]**
- Memory Management techniques used in UNIX/Windows/iOS Operating System.
- CPU scheduling algorithms used in Linux/Windows/Android Operating System.

3. Asynchronous serial transmission with one stop bit.

(c) Draw a memory interfacing diagram with CPU having following configuration: [4] [CO4]
    4 RAMs of size of each chip is128 x 8
    1 ROM of size of each chip is 512 x 8

OR

A digital computer has a memory unit of 64K x 16 and a cache memory of 1K words. The cache uses direct mapping with a block size of four words:

1. How many bits are there in the tag, index, block, and word fields of the address format?
2. How many bits are there in each word of cache, and how are they divided into functions? Include a valid bit.
3. How many blocks can the cache accommodate?

••••••••••••••••••••••••••••••••••••••End••

END TERM EXAMINATION   May-2023

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#]
Q.1	(a) Explain with the help of one stage circuit diagram that can perform AND, OR, XOR and Complement operations.	[4] [CO1]

(b) The 8-bit registers AR, BR, CR, and DR initially have the following values: [3] [CO1]
    AR = 11110010
    BR = 11111111
    CR = 10111001
    DR = 11101010
Determine the 8-bit values in each register after the execution of the following sequence of micro-operations:

1. AR ← AR + BR; Add BR to AR
2. CR ← CR ^ DR, BR ← BR + 1; AND DR to CR, increment BR
3. AR ← AR – CR; Subtract CR from AR

(c) An 8-bit register contains the binary value 10011100. What is the register value after an arithmetic shift right? Starting from the initial number 10011100, determine the register [3] [CO1]

value after an arithmetic shift left, and state whether there is an overflow or not.

Q.2   (a) The content of PC in the basic computer is 3AF (all numbers are shown in hexadecimal). The content of AC is 7EC3. The content of memory at address 3AF is 932E. The content of memory at address 32E is 09AC. The content of memory at address 9AC is 8B9F.   [3] [CO2]
1. What is the instruction that will be fetched and executed next?
2. Show the binary operation that will be performed in the AC when the instruction is executed.
3. Give the contents of registers PC, AR, DR, AC, and IR in hexadecimal and the values of E, I, and the sequence counter SC in binary at the end of the instruction cycle.

  (b) Write the symbolic micro program for fetch routine. Also show its binary micro program.   [2] [CO3]

  (c) Draw the instruction flowchart diagram and highlight the path followed by the system for the execution of ISZ instruction through timing sequences.   [5] [CO2]

Q3.   (a) Convert the following symbolic micro-operations to register transfer statements and to binary format: [3] [CO3]
1. READ, INCPC
2. ACTDR, DRTAC
3. ARTPC, DRTAC, WRITE

  (b) Show how a 9-bit micro-operation field in a microinstruction can be divided into subfields to specify 46 micro-operations. How many micro-operations can be specified in one microinstruction?   [3] [CO3]

  (c) A computer has 16 registers, an ALU (arithmetic logic unit) with 32 operations, and   [4] [CO3]

  a shifter with eight operations, all connected to a common bus system.
1. Formulate a control word for a micro-operation.
2. Specify the number of bits in each field of the control word and give a general encoding scheme.
3. Show the bits of the control word that specify the micro-operation $R4 \rightarrow R5 + R6$.

Q4.   (a) A two-word instruction is stored in memory at an address designated by the symbol W. The address field of the instruction (stored at W + 1) is designated by the symbol Y. The operand used during the execution of the instruction is stored at an address symbolized by Z. An index register contains the value X. State how Z is calculated from the other addresses if the addressing mode of the instruction is: [2] [CO4]
1. Direct
2. Indirect
3. Relative
4. Indexed

  (b) Show the step-by-step multiplication process using Booth algorithm when the following binary numbers are multiplied. Assume 5-bit registers that hold signed numbers. The multiplicand in both cases is +15:   [4+4] [CO4]
1. (+15) x (+13)
2. (+15) x (-13)

Q5.   (a) What is the difference between isolated I/O and memory-mapped I/O? What are the advantages and disadvantages of each?   [3] [CO1]

  (b) How many characters per second can be transmitted over a 1200-baud line in each of the following modes? (Assume a character code of eight bits.)   [3] [CO3]
1. Synchronous serial transmission.
2. Asynchronous serial transmission with two stop bits.

(b) Explain prefix codes and their advantages. Give Huffman algorithm for the same and obtain prefix codes for the following instance and analyze complexity of Huffman algorithm.

(5) [CO 4]

Character	a	b	c	D	E	f	g	H
No of occurrences (in thousands)	5	1	2	3	6	8	11	9

Total No. of Pages: 4

Roll No...............

4TH SEMESTER
[B.TECH. – IT]
END TERM EXAMINATION   MAY- 2023
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)[CO 1]

   i.   Prove that the solution is $O(n^2)$ for $T(n) = T(n-1) + n$
        (substitution method)
   ii. $T(n) = 4T(n/2) + n^2$ (master method)

b) Explain the divide and conquer strategy in MERGE SORT algorithm and write the pseudocode for the same.   (5) [CO 2]

Q2
a) Explain Bellman-Ford algorithm for solving single-source shortest path problem and apply it on the given graph?   (5) [CO 4]
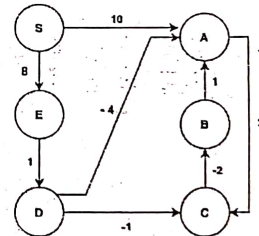
b) Write an algorithm for longest common Subsequence problem using dynamic programming techniques and use it to solve for the following X and Y subsequences. X= [A,B,C,B,D,A,B], Y=[B,D,C,A,B,A]. Use the algorithm to construct the tables *(c and b)* for calculating the **length** as well as the **path** of the longest common subsequence. (5) [CO 3]

Q3
(a) Define backtracking phenomenon? Draw the state space for the 4- queen problem by applying backtracking? Explain the various constraints with examples. (5) [CO 5]

OR

(a) The problem statement says that a maze in the form of N*N binary matrix of blocks is given where source block (starting point) is the top left most block i.e., maze[0][0] and destination block (ending point) is bottom rightmost block i.e., maze[N-1][N-1]. A rat begins to move from start point and has to reach the destination but it can move only in 2 directions - forward and down. Additionally, the maze matrix has certain dead ends defined. The value 0 means the cell is a dead-end and 1 means the cell can be used as path to move from source to destination. Write an algorithm and solve the given problem using your algorithm with all intermediate steps. (5) [CO 5]

Rat in a Maze Problem
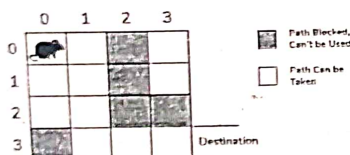
(b) Explain the greedy approach for finding an optimal solution and how is it different from the dynamic approach? Show the difference with the help of an example. (5) [CO 4]

Q4
a) Solve the Travelling Salesman Problem having the following cost matrix using Dynamic approach. 0 represents no path. (5)[CO 3]

$$\begin{array}{c} & \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{array}{c} A \\ B \\ C \\ D \end{array} & \begin{bmatrix} 0 & 5 & 2 & 3 \\ 4 & 0 & 2 & 3 \\ 4 & 2 & 0 & 3 \\ 7 & 4 & 8 & 0 \end{bmatrix} \end{array}$$

(b) A thief enters a house for robbing it. He can carry a maximal weight of 5 kg into his bag. There are 4 items in the house with the following weights and values. What items should the thief take if they either take the item completely or leave it completely? Solve the given problem using branch-and-bound approach and build a state-space tree for your solution. (5)[CO 6]

ITEM	Weight (kg)	Value ($)
Mirror	2	3
Silver nugget	3	4
Painting	4	5
Painting	5	6

Q5
(a) Write short notes:- (5) [CO 7]

i) Vertex cover problem
ii) P, NP, NP complete classes

(b) Give the Rabin Karp algorithm for string matching. Assume the working modulo q=11, how many spurious hits does the algorithm encounter in the text T=3141592653589793 when looking for the pattern P=26. (5)[CO 7]

OR

_Sixth__ SEMESTER   **B.Tech [IT]**

END SEMESTER EXAMINATION   *May-2023*

IT-302   COMPILER DESIGN

Time: 3:00 Hours   Max. Marks : 40

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

Q.1 Describe the tools of Lex and Yacc that are used to automate the phases of a compiler.   (10) [CO1]

Q. 2 a) Explain the problem of left recursion for LL(1) parsers, and how can it be removed. Demonstrate by removing the left recursion in the grammar: $A \to Ad$, $A \to Aabc$, $A \to x$, $A \to y$ (5) [CO3]

b) For the grammar $E \to E+T$, $E \to yT$, $T \to xE$ predict the contents of the cells (T,x), (T,y), (E, x) and (E, y) in the LL(1) parsing table.   (5) [CO3]

Q.3 For the following 3-address code:

$$a=b+c$$
$$t1=a$$
$$b=t1+c$$
$$d=b+c$$

a) Write the SDD for constructing this 3-address code assuming a suitable grammar of your own choice.

b) Construct a suitable parse tree (assume a suitable test string) which will generate this 3-address code. Show the detailed construction of the given 3-address code at all nodes of this tree upto the root node.   (4+6) [CO5]

Q.4 For the following 3-address code:

$$a=b+c$$
$$t1=a$$
$$b=t1+c$$
$$d=b+c$$

a) Store the code in a quadruple storage structure.
b) Construct the DAG for this code.
c) Optimize the DAG if possible, showing all steps in detail.
d) Write the final 3-address code obtained.
                    (2+3+4+1) [CO6]

Q.5 Write short notes on:
a) SLR(1) vs LR(0) parsers   (5) [CO4]
b) Canonical vs LALR parsers   (5) [CO4]

328

6th SEMESTER

B.Tech.

END TERM EXAMINATION

May-2023

IT-304 SOFTWARE ENGINEERING

Max. Marks: 50

Time: 03:00 Hours

Note: All questions are compulsory
Internal choices are indicated by OR.
Assume suitable missing data, if any.

Q.1 Answer the following questions:

[2 x 7 = 14]

a) Discuss a few software failures. [CO1]

b) Why requirements are difficult to uncover? [CO2]

c) Distinguish between verification and validation. [CO6]

d) What is configuration management? What are the different activities associated with configuration management? [CO6]

e) Differentiate between structured and unstructured maintenance. [CO5]

f) What is Reverse Engineering? How is it different from Software Re-engineering? [CO5]

g) List some software metrics for size estimation. [CO3]

Q.2 a) Illustrate with the help of suitable example when to use iterative enhancement model. Explain the phases of model in detail. Explain how iterative enhancement model is different from incremental model. [5][CO1]

b) What do you mean by cohesion? Explain types of cohesion with example. [4][CO2]

Q.3 a) What is risk? Explain the Risk Management Activities. [3][CO3]

b) Compute the function point value for a project with the following information domain characteristics. [3][CO3]

Number of user inputs = 30

Number of user outputs = 42

Number of user enquiries = 08

Number of files = 07

Number of external interfaces = 6

Assume that all complexity adjustment values are moderate.

c) What is DFD? Draw and explain Level 0 and Level 1 DFD for hospital management.

[3][CO2]

Q.4 a) Explain ISO 9000. Compare ISO 9000 to CMM.   [5][CO4]

OR

What are the uses of reliability studies? How can one use software reliability measures to monitor the operational performance of software?

[5][CO4]

b)   Assume that a program will experience 300 failures in infinite time. It has now experienced 150. The initial failure intensity was 40 failure/CPU hr.

[4][CO4]

i) Determine the current failure intensity.

ii) Find the decrement of failure intensity per failure.

iii) Calculate the failures experienced and failure intensity after 40 and 150 CPU hrs. of execution.

iv) Compute addition failures and additional execution time required to reach the failure intensity objective of 10 failures/CPU hr.

Q.5 a) Explain the maintenance process in detail.   [5][CO5]

OR

Define software maintenance. Explain various maintenance models.

[5][CO5]

b) Differentiate between alpha testing and beta testing. Explain the terms bugs, fault and failure.

[4][CO6]

OR

Discuss the limitations of testing. Why do we say that complete testing is impossible?

[4][CO6]

Sixth SEMESTER

B.Tech (All)

END TERM EXAMINATION

May-2023

IT-306   ARTIFICAL INTELLIGENCE &EXPERT SYSTEMS

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

Note: Attempt total FIVE Questions.
   Question 1 is compulsory.
   Assume suitable missing data, if any.

Question No. 1   [2x6=12]

a) List the problem characteristics for the water jug problem.   (CO1)

b) Explain the effect of overestimation and underestimation with respect to A* algorithm.   (CO2)

c) Translate these sentences into predicate logic: (CO3)

   i) Everyone loves everyone except himself.
   ii) If anyone cheats, everyone suffers.

d) Briefly explain some data types in prolog programming language?   (CO4)

e) What is fuzzification? List various components of "Fuzzy Logic System   (CO5)

f) What is expert system? List its component?   (CO6)

Question No. 2   [5+2=7]

a) Given a 3×3 board with 8 tiles (every tile has one number from 1 to 8) and one empty space. The objective is to place the numbers on tiles to match the final configuration using the empty space. We can slide four adjacent (left, right, above, and below) tiles into the empty space. Find most cost-effective path to reach the final state from initial state using A* algorithm.   (CO2)
NOTE: Consider g (n) = depth of the node, h (n) = number of misplaced titles at that instant.

2	8	3		1	2	3
1	6	4		8		4
7		5		7	6	5
Initial State				Final State		

b) Consider a biometric system involving face recognition, fingerprint identification and speech recognition that has been installed for the students in the university. Identify the agent and the environment in this particular case create the PEAS description for this case.   (CO1)

Question No. 3   [7x1=7]

a) Apply RESOLUTION showing all the detailed steps (convert entire knowledge base to FOL) to solve for validity of the test sentence: Apple is fruit, given the knowledge base: (CO3)

   i.   Apple is not a vegetable.
   ii. Vegetable is not a fruit.
   iii. Fruits are red in color
   iv. Apple is Red in color

Question No. 4   [7x1=7]

Suppose a genetic algorithm uses chromosomes of the form $x = pqrstuvw$ 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: $F(x) = (p + q) - (r + s) + (t + u) - (v + w)$, and let the initial population consist of four individuals with the following chromosomes: (CO5)

$$X_1 = 6 5 4 1 3 5 3 2$$
$$X_2 = 8 7 1 2 6 6 0 1$$
$$X_3 = 2 3 9 2 1 2 8 5$$
$$X_4 = 4 1 8 5 2 0 9 4$$

a) Evaluate the fitness of each individual, arrange them in order with the fittest first and the least fit last.

b) Perform following cross over:
   i)   Cross the fittest two individuals using one–point crossover at the middle point.

330.

ii) Cross the third and fourth fittest individuals using a two-point crossover (point's q and u).

iii) Evaluate the fitness of the new population resulted after above crossovers. Has the overall fitness improved?

Question No. 5   [7x1=7]

Perform forward and backward pass on the given network. Assume that actual output is 0.5, learning rate is 1 and neurons have sigmoid activation functions. Also report the error value.   (CO5)
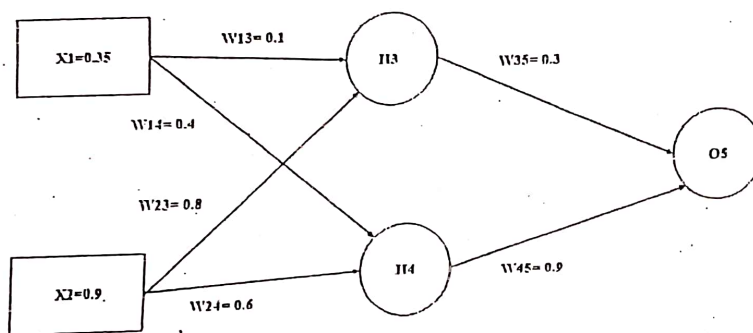
Question No. 6   [4+3=7]

a) Outline the various phases of NLP with suitable example.   (CO6)

b) Using constraint satisfaction procedure solves the given crypt-arithmetic problem.   (CO3)

```
    P  O  T  A  T  O
+   T  O  M  A  T  O
   P  U  M  P  K  I  N
```

VI/VIII-SEMESTER
B. Tech.

END TERM EXAMINATION   May-2023
IT312   Cyber Forensic

Time: 3 Hours   Max. Marks: 40

Note: All questions are compulsory.

Q. 1 a) Explain Intellectual property crimes and cyber vandalism   [4] #CO1
         with case study.
       b) What are the advantages and disadvantages of spyware   [4] #CO1
         and adware?

Q. 2 a) Explain the Hop-to-hop delivery with Diagram.   [4] #CO2
       b) Discuss the relationship of layers and addresses in   [4] #CO3
         TCP/IP?

Q. 3 a) Develop computer forensic investigation procedure for   [4] #CO2
         "Cryptojacking".
       b) Design a digital crime scene for remote access to a   [4] #CO3
         webcam.

Q. 4 a) What is the need of analyzing network traffic?   [4] #CO4
       b) What is meant by cyber defamation? Illustrate with an
         example.   [4] #CO4

Q. 5 a) What is volatile evidence? How is it useful in computer   [4] #CO5
         forensic investigation?
       b) What are computer forensic tools? Explain the method and   [4] #CO5
         tools for capturing volatile data.

335   Roll No...........

SIXTH/EIGHTH SEMESTER
B.TECH. [ALL]
May- 2023

END TERM EXAMINATION
IT316 HIGH-SPEED NETWORKS

Max. Marks: 50

Time: 3:00 Hours

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

Q.1[a] Explain the effect of congestion on a network and network performance with graphical representation? How do Explicit and Implicit congestion notification alleviate congestion?
[b] Using Traffic shaping as an example show how Traffic management techniques achieve consistent network performance.   [CO 2] (5+5=10)

Q.2[a] The Internet uses OSPF as the interior routing protocol. Justify the given statement.
[b] Compare header fields and features to prove how is IPv6 is an improvement over IPv4?   [CO 6] (5+5=10)

Q.3[a] What are the various Traffic and congestion related attributes in ATM, how do they contribute to the Traffic management framework?
[b] ATM defines traffic control function to avoid congestion conditions and/or to minimize congestion effects. Explain.   [CO 3](5+5=10)

Q.4[a] Draw the general depiction of the implementation architecture for Integrated Service Architecture within a router, and then explain each component.
[b] What are goals of Random Early Detection, explain how the RED algorithm achieves these goals.   [CO 4](5+5=10)

Q.5[a] What are the key characteristics of Distributed Services, how does contribute to better efficiency and ease of deployment?
[b] Explain the working of Border Gateway Protocol.   [CO 4](5+5=10)

Q.6[a] Explain the Resource Reservation Protocol RSVP, Goals and Characteristics.
[b] RTP along with RTCP provides most suitable soft real time communication over Transport layer protocols? Justify[CO 5](5+5=10)

Q.7   Write Short notes on :
        a] TCP over ATM
        b] Queuing analysis of server queues
                    [CO 5](5+5=10)

MID SEMESTER EXAMINATION   May-2023
IT-324a DEEP LEARNING

Time: 03 Hours   *Max. Marks: 40*

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

Question No. 1   (2x4=8)

a) What are the applications of Deep Learning?   [CO1]

b) What are the problems of RNN and LSTM?   [CO3]

c) Find $\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial f}{\partial z}$ and $\frac{\partial f}{\partial q}$ for $x = 73, y = 19$ and $z = 87$. The operations are multiplication and addition.   [CO2]
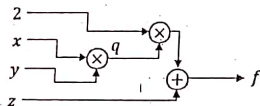
d) A neural network has only two convolutional layers. There are 128 kernels of size 5×5 with $stride = 1$ and $padding = 1$ in the first convolutional layer. The second convolutional layer has 16 kernels of size 7×7 with $stride = 2$ and $padding = 1$. The input images are in CMYK color space having shape $4 \times 128 \times 128$. Find the total number of weights in this neural network. Assume there are no biases.   [CO2]

Question No. 2   (4x2=8)

a) Explain Autoencoder and elaborate the different types of autoencoders.   [CO4]

b) Explain self-attention and write down the steps to calculate it. Explain the working principles of Transformers and its role in language modelling?   [CO4]

Question No. 3

a) Which problem is solved by regularization? Explain the various regularization techniques.   [CO2]

b) Explain the different types of deep learning optimizers. Mention their strengths and weaknesses.   [CO3]

c) Briefly explain some activation functions.   [CO1]

d) Briefly describe and compare the various deep learning frameworks.   [CO2]

Question No. 4   (4x2=8)

a) Find the True Positive Rate (TPR) and False Positive Rate (FPR) for the given true labels y and prediction probabilities $\hat{y}$ at thresholds = $[0.0, 0.2, 0.4, 0.6, 0.8, 1.0]$. Also plot the ROC curve for the given prediction values.   [CO3]

True Labels (y)	1	1	1	0	1	0	1	0	0	1
Prediction Probabilities($\hat{y}$)	0.57	0.45	0.81	0.9	0.15	0.37	0.93	0.71	0.59	0.92

b) The following is defined with respect to any three-dimensional input matrix of shape $a \times b \times c$. 'Dimension number' is the order in which dimensions occur. So a is dimension 0, b is dimension 1 and c is dimension 2. 'Permute' function changes the order of matrix dimension. Permute $(0,2,1)$ changes the matrix shape from $a \times b \times c$ to $a \times c \times b$. 'Z-Pool' operation performs MaxPooling across the first dimension of input. So, a matrix of shape $a \times b \times c$ becomes $1 \times b \times c$ after Z-Pool operation. 'MUL' operation is element-wise multiplication of two matrices across the first dimension. For example 'MUL' operation on two matrices of size $a \times b \times c$ and $1 \times b \times c$ gives output of shape $a \times b \times c$. 'ADD' operation performs element wise addition of matrices of same size. In the diagram given below, the input has a shape of $24 \times 64 \times 32$. Determine the shape of matrices at points A, B, C, D, E, F, G, H, I, J, K.   [CO4]

124 × 64 × 32

| Permute (1,0,2) | Permute (2,0,1) |

C | G

| Z-Pool | Z-Pool | Z-Pool |

A | D | H

| Mul | Mul | Mul |

E | I

B

| Permute (1,0,2) | Permute (1,2,0) |

F | J

Add

K
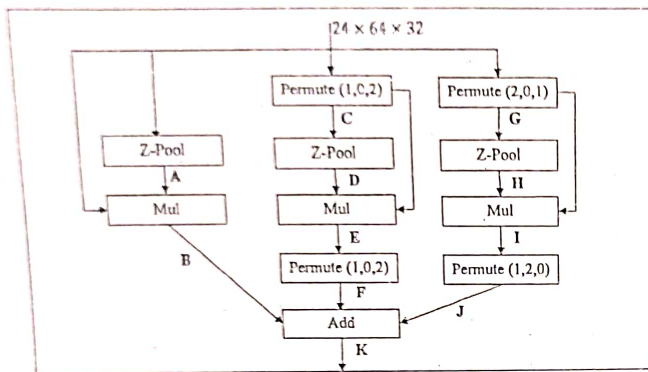
configurations, find the value of variables A, B, C and D: [CO3]

Kernel size: 11 x 11
No. of Kernels: A
Stride=1
Padding=B

Kernel size: C x C
No. of Kernels: 32
Stride=2
Padding=0

Kernel size: D x D
Stride=4

64 x 224 x 224   32 x 108 x 108   32 x 27 x 27

224
224

Input Image   Convolution 1   Convolution 2   Max Pooling
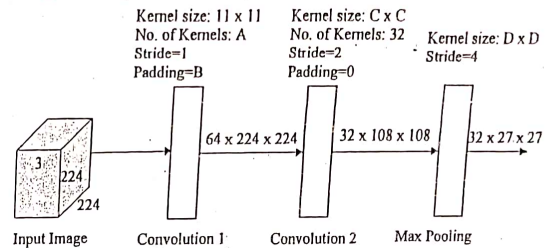
Note: CO means Course Outcome

Question No. 5   (4x2=8)

a) Consider the given neural network and answer the following questions. Given: Inputs = [1,2,3]. True label = [5]. Error = $\frac{1}{2}(prediction - true\ label)^2$. Initial values of weights w_1 to w_8 are [0.3, 0.1, 0.5, 0.1, 0.6, 0.2, 0.7, 0.3]. Weight updation rule is $w_{i,new} = w_{i,old} - \propto \frac{\partial(error)}{\partial w_i}$. Take $\propto = 0.01$. Assume there are no activation functions and biases. Answers should be specified upto 2 decimal places.   [CO2]

i) Calculate the prediction value and error value of the neural network in the first forward pass.

ii) Calculate the new values for all weights w_1 to w_8 after applying backpropagation algorithm once.
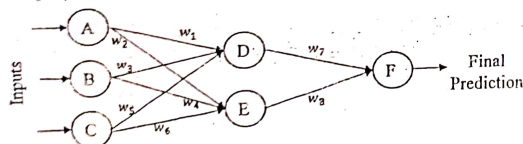
b) The neural network drawn below contains two convolutional and one max pool layer. The shape of a matrix is in the form *channel × height × width*. The size of input image is 3 × 224 × 224. Based on the given

6th SEMESTER

B.Tech.

END TERM EXAMINATION

May-2023

IT-328   Ethical Hacking

Max. Marks: 40

Time: 3 Hours

Note: All questions are compulsory, internal choice is available in Q 4 and Q 5.
Assume suitable missing data, if any.

Q.1 Answer the following questions in brief:
  i.   What is the job of an Ethical Hacker?
  ii.   What is Traceroute? How does it operate?
  iii. What is ARP Poisoning?
  iv.   Discuss the role of Patch Management in Web applications security.
  v.   What can be done on a wireless laptop to increase security when connecting to any WLAN? Give any two suggestions.
                                              [5x2][CO1,CO2,CO3,CO4,CO5]

Q.2 a. What are the different phases in Ethical Hacking? Explain each in detail, alongwith their place in the hacking timeline.   [5][CO1]

   b. Explain the different types of scanning, and give a few countermeasures employed by a security administrator against Port-scans on their network.   [5][CO2]

Q.3 a. What are the different types of attacks a hacker may use to identify a password and gain further access to a system? As an Ethical Hacker, what guidelines and precautions you can suggest to the organisation under scrutiny to decrease the effectiveness of malicious password-cracking attempts?   [5][CO3]

b. i) What are the most common purposes of an SQL injection attack?

[2.5][CO4]

ii) What are the different ways of detecting and/or preventing Denial of Service attacks? [2.5][CO5]

Q.4 a. What are the most common web application threats that exist on a web server? Give countermeasures for each of them and explain any two types of authentications supported by web applications.

OR

b. What steps are involved in Session Hijacking? How can an Ethical Hacker defend against it? Explain the significance of Sequence numbers in session hijacking. [5][CO4]

Q.5 a. What is WEP and what makes it crackable? What are the vulnerabilities that are taken advantage of by Wireless sniffers? Explain in detail.

OR

b. Explain different Wireless Hacking techniques and give different ways of increasing security to a home wireless network. [5][CO5]

8th SEMESTER

B.Tech (IT)

END TERM EXAMINATION   May-2023

IT 404   Big Data Analytics

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) An electric firm manufactures light bulbs that have life, before burn out that is normally distributed with mean is 800 hrs. and a S.D of 40 hrs. Find the probability that a bulb burns i) more than 834 hrs. ii) between 778 and 834 hrs.
Given that $P(Z<-0.85)=0.1977$; $P(0<Z<.85)=0.3023$; $P(-0.55<Z<0)=0.2088$; $P(Z<0.85) = 0.8023$.   [4][CO1]

b) Discuss challenges under Big Data. How Big Data Analytics can be useful in the development of smart cities.   [4][CO1]

Q.2 a)What is Hadoop used for? List some industrial usage of Hadoop.
                                                        [4][CO3]

b) Suppose there is a file having size of 514MB is stored in the Hadoop (Hadoop 2.x) by using the default size-configuration of block and also by default replication-factor. Then, how many blocks will be created in total and what will be the size of each block? How Much Memory Does a Name node Need?   [4][CO3]

Q.3 a) Explain YARN and its elements. How it is useful in Hadoop?
                                                        [4][CO3]

b) Explain Shuffle and Sort Algorithm with Map Reduce. [4][CO3]

341

Q.4 a) What are Hadoop Benchmarks? Why they are used?   [4][CO4]
   b) What is Hadoop Cluster? Write steps for Cluster Setup and
      Installation.   [4][CO4]

Q.5 a) What is Kerberos? Explain use of it in Apache Hadoop. [4][CO4]
   b) What is Hadoop in cloud?   [4][CO4]

Q.6 a) Whether or not the pig Latin language is case sensitive? Differentiate
       between Pig Latin and Pig Engine.   [4][CO5]
    b) Explain the LOAD keyword in Pig script. What are the drawbacks
       Pig? How it is comparable to HIVE?   [4][CO5]

342

Total no. of Pages:01

Roll no..............

END TERM EXAMINATION

May-2023

IT406 WEB TECHNOLOGY

Time: 3:00 Hours

Max. Marks: 40

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

1) Explain the error control mechanism in TCP. [5] [CO #1]
2) Write short notes on the working of telnet and usenet. . [5] [CO #2]
3) What is search engine optimization? Discuss its significance in web mining. Explain the basic principle in the working of search engine optimization. [5] [CO #3]
4) Discuss the evolution of different web platforms in terms of challenges and opportunities of web 1.0, web 2.0, web 3.0 and web 4.0. [5] [CO #3]
5) Fetching something over the network is both slow and expensive. What can be done to improve the Quality of Service (QoS) of the web server. [5] [CO #4]
6) Describe the HTTP connection types and their effects on the round-trip times for communication between client-server. [5] [CO #4]
7) Differentiate between the following [10] [CO #5]
   (a)   Push Protocol and Pull Protocol
   (b)   Social Web and Semantic Web
   (c)   Static Webpage and Dynamic Webpage
   (d)   Data Mining and Web Mining
   (e)   Precision and Recall

Total no. of pages: 03

VI/VIII SEMESTER

B. Tech.

END TERM EXAMINATION

IT420   Computer Vision

Roll no...............

MAY-2023

Time: 3:00 Hours

Max. Marks: 40

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

Q1. (a) Consider two image subsets S1 and S2 for V= [0]. Determine whether the regions are:

4- adjacent   b. 8- adjacent   c. m-adjacent

[3] [CO2]

S1				S2			
1	1	1	1	1	1	1	0
1	1	0	1	1	0	1	1
1	1	0	1	0	0	1	1
1	0	0	0	1	1	1	1

(b) (i) Suppose you have a digital image of size 1024x1024 pixels, where each pixel is represented by 8 bits. What is the total size of the image in bytes?

(ii) Find the number of bits required to store a 256 X 256 image with 32 gray levels?

[3] [CO2]

(c) A 4 bits/pixel image of size 5 × 5 is shown below. (i) Find the gradient and magnitude using Sobel operator (ii) Laplacian using a 3 × 3 at intensity value 14.

[4] [CO2]

10	8	4	2	15
6	9	11	6	5
2	4	8	0	1
4	14	13	7	9
12	1	3	6	8

Q2. (a) What is Principal Component Analysis. Apply principal component analysis to reduce the following 2-D feature vector into 1-D feature vector. Use PCA Algorithm to transform the pattern (3, 7) onto the eigenvector. [5+1] [CO3]

	X_1	X_2	X_3	X_4	X_5	X_6
X	2	3	4	5	6	7
Y	1	5	3	6	7	8

(b) Obtain Histogram and Histogram equalization for a given image (4 x 4) – 4 bit per pixel is given by: [4] [CO4]

10	12	8	9
10	12	12	14
12	13	10	9
14	12	10	12

OR

(b) Suppose you have an image of size 256x256 pixels, and you want to compute its 2D Fourier Transform. The image is represented as a matrix of pixel values, where each value is between 0 and 255. [4] [CO4]

a. What is the frequency domain representation of the image?
b. How many complex values are there in the frequency domain representation?

Q3. Explain any three of the following: [3+3+3] [CO5]

a) Illustrate region-based segmentation and region growing with examples.
b) Evaluate the following terms:
    (i)   Region merging.   (ii) Erosion and dilation.
c) How does the Non-Max Suppression technique work?
d) What are compound morphological filtering processes? Explain about Hit or Miss Transformation.

c) What are some common problems that can occur when using thresholding to binarize an image, and how can you address these problems?

Q4. (a) What is transfer learning, and how can it be used to improve the accuracy of image classification models in computer vision? [4] [CO6]

OR

(a) What are some common challenges faced when training an image classification model in computer vision? [4] [CO6]

(b) Suppose you have an image of size 64x64 pixels, and you want to compute the HOG features for this image. You decide to divide the image into 8x8 cells, and each cell will have a block size of 2x2 cells. The orientation bin size is 9, meaning that each histogram will have 9 bins. [7] [CO4]

a. How many cells will the image be divided into?
b. How many blocks will there be in the image?
c. How many histograms will there be in each block?
d. How many elements will each histogram contain?
e. How many total elements will the HOG feature vector have?

END TERM EXAMINATION
IT428 Mobile and Digital Forensics

MAY-2023

Max. Marks : 50

Time: 3Hours

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

Q.1 a) How Voice and SMS inception takes place in case of 3G/4G networks. Explain whole process in detail. [5][CO2]

b) What are calling and barring GSM network services. Write all the service codes related to them and explain them? [5][CO2]

Q.2 Discuss the following issues w.r.t to SMS security in detail.

a) Integrity Issues

b) Confidentiality Issues. [5 x 2 = 10][CO3]

Q.3 a) List all the best practices and guidelines as per IOCE and ACPO w.r.t to digital forensic evidence. [5][CO4]

b) List all the possible data that can be treated as evidence w.r.t to mobile phone forensics and discuss fundamental questions and problems related to these evidence? [5][CO4]

Q.4 a) Explain the Analysis Procedure and Data Preservation and Isolation from the Network both the concepts w.r.t forensics procedures for mobile phone. [5][CO4]

b) List all the sim car files that are used and discuss these files and the information they hold [5][CO4]

346

Q.5 a) Discuss Procedures for handling Android devices in depth?

[5][CO5]

b) What is meant by imaging android usb mass storage devices.
Explain the whole process?   [5][CO5]

Q6 Explain the following in details:

a) Wireless network security threats.
b) PDA threats and vulnerabilities.
c) Cell Phone Threats and Vulnerabilities.
d) Cell Phone Hacking and Phreaking.   [2.5 x 4 =10] [CO1]

347

B.Tech [IT]

Sixth/Eighth SEMESTER

END SEMESTER EXAMINATION

May-2023

IT-430 SPEECH & NATURAL LANGUAGE UNDERSTANDING

Time: 3:00 Hours

Max. Marks : 50

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

Q.1 Explain the following terms related to NLP: (i) Word sense disambiguation (ii) N-gram language modelling.   (5+5) [CO1]

Q.2 a) Justify whether stemming and lemmatization would improve the text classification performance in every case, using any example.
b) What are the different text pre-processing steps in NLP?
(5+5) [CO2]

Q.3 a) What are the different categories of phonemes? Give examples of each category.
b) Use the phonemes 'UH', 'AA', 'D', 'IY', 'B', 'T', 'K', to form as many different words in English as possible.   (5+5) [CO4]

Q.4 a) Explain the speech spectrogram, its plot, characteristics, uses and types.
b) Differentiate between silence, voiced and unvoiced segments of a speech signal.   (5+5) [CO5]

Q.5 Describe the modern speech recognition architectures from the perspective of deep learning. (10) [CO6]

Q.6 a) Differentiate between **hypernym** and **hyponym** inter-relationship graphs in WordNet, taking examples for both.
   b) Explain by solving using an example how WordNet can help in word sense disambiguation.

(5+5) [CO3]

B.Tech. (ME)

END SEMESTER EXAMINATION

May- 2023

ME202 THERMAL ENGINEERING - II

Time: 3:00 Hours

Max. Marks: 40

> **Note:** All **FIVE** questions are compulsory. All questions carry equal marks.
> **Q.3 & Q.4** have internal choice.
> Assume suitable data, wherever needed, if missing.

Q 1. Write short notes on **ANY TWO** of the following, **using suitable diagrams:**

    e. Turbo Propellor & Turbojet Engines
    f. Ramjet engine & pulse jet engine.
    g. Compressible and incompressible fluid flow.
    h. Shock waves and its applications.

$(4 \times 2 = 8)$ [CO 1]

Q 2. Derive **ANY TWO** of the following equations:

    d. For a steady one-dimensional flow derive the continuity equation for perfect gases in terms of Mach number?
    e. For a steady one-dimensional flow derive the stagnation pressure-energy equation for a perfect gas in terms of Mach number?
    f. Derive the expression for reversible, isentropic work of compression for reciprocating compressors, by using steady flow energy equation.

$(4 \times 2 = 8)$ [CO 2]

Q 3. Discuss the concepts of Sonic Velocity & Mach Number? Assume Nitrogen has a static temperature of 25°C and a stagnation temperature of 250°C. Calculate the Mach number?

OR

State the Rankine-Hugonit equations for normal shock waves? Assume, the sound Velocity, Pressure & Temperature of a duct are 320 m/s, 1 bar & 295k respectively, calculate the Mach number, Stagnation Temperature, and

350

stagnation Pressure? *Assume velocity of sound in dynamic condition $= \sqrt{(\gamma RT}$), $y = 1.4$, and $R = 287 J /Kg\text{-}K$*

(8) [CO 3 & 4]

Q 4. A centrifugal compressor running at 1440 rpm, handles air at 101 kpa and 20°C and compresses it to a pressure of 6 bar isentropically. The inner and outer diameters of the impeller are 14 cm & 28 cm respectively. The width of the blade at inlet is 2.5 cm. The blade angles are 16° and 40° at entry and exit. Calculate the mass flow rate of the air, degree of reaction, power input and width of blades at outlet. *Assume sp. Gas constant, R = 0.287 KJ/Kg-k.*

OR

A single acting single stage reciprocating air compressor of 250 mm bore and 350 mm stroke runs at 200 rpm. The suction and delivery pressure are 1 bar & 6 bar, respectively. Calculate the theoretical power required to run the compressor and the isothermal efficiency in each of the following conditions:
a. isothermal compression
b. polytropic compression, n=1.3
c. isentropic compression, y=1.4
Neglect the effect of clearance in all cases.

(8) [CO 5 & 6]

Q.5. Draw a neat sketch of regenerative Brayton cycle with reheat and intercooling? The ideal air-standard Brayton cycle operates with air entering the compressor at 95kPa & 22°C, the pressure ratio (r_p) is 6:1 and the air leave after heat addition at 1100 K. Calculate the compressor work & Turbine work for per unit mass flow and the cycle efficiency?

(Assuming the Air standard assumptions for isentropic compression under steady flow conditions, and that K.E and P.E. effects are negligible, and for air $C_p=1.005$ kJ/kg and y=1.4)

(8) [CO 5 & 6]

-------------------------xxx----------------------------
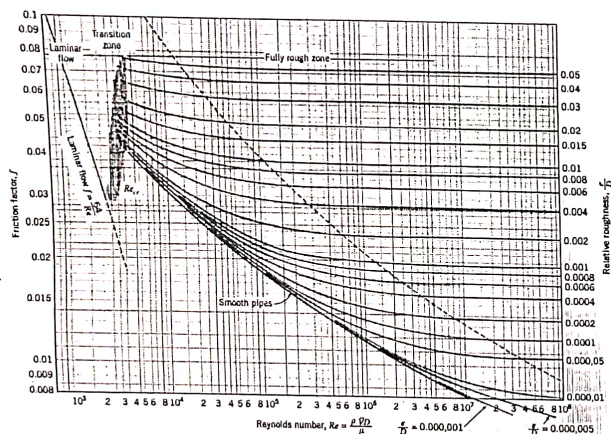
Roughness for Pipes of Common Engineering Materials

Pipe	Roughness, e	
	Feet	Millimeters
Riveted steel	0.003–0.03	0.9–9
Concrete	0.001–0.01	0.3–3
Wood stave	0.0006–0.003	0.2–0.9
Cast iron	0.00085	0.26
Galvanized iron	0.0005	0.15
Asphalted cast iron	0.0004	0.12
Commercial steel or wrought iron	0.00015	0.046
Drawn tubing	0.000005	0.0015

4ᵗʰ SEMESTER

B.Tech. (Mech.)

END SEMESTER EXAMINATION   *May -2023*

ME204 FLUID MECHANICS

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

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

Q.1[a] A liquid flows down inclined plane surface in a steady, fully developed laminar film of thickness h. Simplify the continuity and Navier-Stokes equation to model this flow field. Obtain expressions for the liquid velocity profile, the shear stress distribution, the volume flow rate, and the average velocity. Relate the liquid film thickness to the volume flow rate per unit depth of surface normal to the flow. Calculate the volume flow rate in a film of water h = 1.2 mm thick, flowing on a surface b = 1 m wide, inclined at $\theta = 10^0$ to the horizontal.

[b] Develop relations for momentum and displacement BL thickness.

[c] A racing car travels at 90 km/h along a straightaway. The team engineer wishes to locate an air inlet on the body of the car to obtain cooling air for the driver's suit. The plan is to place the inlet at a location where the air speed is 60 km/h along the surface of the car. Calculate the static pressure at the proposed inlet location. Express the pressure rise above ambient as a fraction of the freestream dynamic pressure.

Q.2[a] Water flows from a very large tank through a 5-cm diameter tube. The liquid in the manometer is mercury. Estimate the velocity in the pipe and the rate of discharge from the tank. (Assume the flow is frictionless).

Mercury
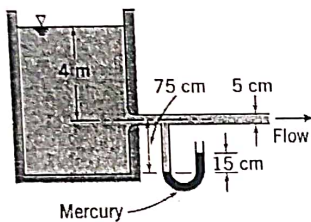
[b] Explain EGL, HGL and Kinetic energy coefficient or correction factor.

[c] Explain turbulence intensity and Prandtl mixing length hypothesis

Q.3[a] The drag of a sonar transducer is to be predicted, based on wind tunnel test data. The prototype, a 0.3 m diameter sphere, is to be towed at 2.57 m/s in seawater (μ/ρ =1.57 X 10^{-6} m²/s, ρ= 1000 kg/m³). The model is 15cm in diameter. Determine the required test speed in air (μ/ρ=1.46 X 10^{-5} m²/s, ρ = 1.227 kg/m³). If the drag of the model at these test conditions is 2.7N, estimate the drag of the prototype.

[b] A hydraulic system operates at a gage pressure of 20 MPa and 55 °C. The hydraulic fluid is SAE 10W oil. A control valve consists of a piston 27 mm in diameter, fitted to a cylinder with a mean radial clearance of 0.004 mm. Determine the leakage flow rate if the gage pressure on the low-pressure side of the piston is 1.0 MPa. (The piston is 15 mm long.). viscosity =0.018 kg/m.s and SG=0.92.

[c] Derive the relation for minor loss in case of sudden enlargement of pipe.

Q.4[a] 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 volume flow rate of 0.012 m3 /s. What pressure (gage) must the pump produce at the pipe to generate this flow rate? The inside diameter of the smooth pipe is 70 mm.

[b] Explain Pressure distribution for uniform flow over cylinder in real and ideal flow with and without BL separation for laminar and turbulent BL.

[c] In winter, Delhi Experiences cold winds blowing form The Himalayas which brings about dramatic decrease in the local temperatures. At a given time, the temperature at Shimla is 1°C and at Delhi, 400 km directly downstream, it is 17°C. The average wind velocity is 50 km/hr and it is observed that the air heats up at the rate of 1.5°C/hr as it flows past the hotter plains. Find the rate of fall of temperature at Delhi assuming the temperature gradient between the two cities to be constant.

Q.5[a] The velocity profile u of a boundary layer flow over a flat plate is given by

$$\frac{u}{U} = \sin\left(\frac{\pi}{2}\frac{y}{\delta}\right)$$

If the boundary layer thickness is given as $\delta = \sqrt{\frac{230\nu x}{13U}}$,develop the expression for the local drag coefficient C_f over the distance x = L from the leading edge of the plate.

[b] Derive and explain Reynolds Stresses.

[c] Oil flows through a pipeline at a rate of 2.96 m³/S. The pipe inside diameter is 1.23m; its roughness is equivalent to galvanized iron. The maximum allowable pressure is 8.27MPa; the minimum pressure required to keep dissolved gases in solution in the oil is 345kPa. The oil has SG = 0.93; its viscosity at the pumping temperature of 60 c is μ=0. 0168 N.s/m² . For these conditions, determine the maximum possible spacing between pumping stations. If the pump efficiency is 85 percent, determine the power that must be supplied at each pumping station.

6. Determine the maximum power transmitted by an open belt drive having width 10 mm, thickness 5 mm, density 0.98 gram/cm³. The coefficient of friction between belt and pulley is 0.4. The belt and pulley have contact by 160°. If the maximum stress in the belt is not to exceed 150 N/cm². Also calculate the corresponding linear speed of the belt. [08][CO-6]

7. [a] With the help of neat sketch, describe the Klein's construction and discus its applications. [04][CO-1]

[b] Compare among the knife edge, roller and flat face followers. [04][CO-2]

8. Attempt any two of the following:

[a] Describe compound and reverted gear trains. [04][CO-5]

[b] With the help of neat sketch, define pressure angle in gearing and cam-follower mechanisms and enumerate their importance. [04][CO-2]

[c] State and prove the law of gearing. [04][CO-1]

[d] With the help of neat sketch, describe Davis & Ackerman steering system. [04][CO-3]

-END-

Total no. of Pages: 04   Roll No._____

IV SEMESTER

B.Tech. - ME

END TERM EXAMINATION   *May-2023*

ME206   KINEMATICS OF MACHINES

Time: 3:00 Hours   Max. Marks : 40

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

1 [a] With the help of examples, state and describe Gruebler's criterion for degree of freedom. [04][CO-1]

[b] With the help of neat sketch, describe Whitworth and Crank & slotted lever quick return mechanisms. [04][CO-1]

2. Draw velocity and acceleration diagram for the mechanism given in Fig.1 below, all the dimensions are in metres. BC and MN are two connecting links hinged at M. The crank rotates with 480 rpm CCW and makes 30° with the IDC. Also determine the velocity and acceleration of slider C with respect to another slider N. [08][CO-2]
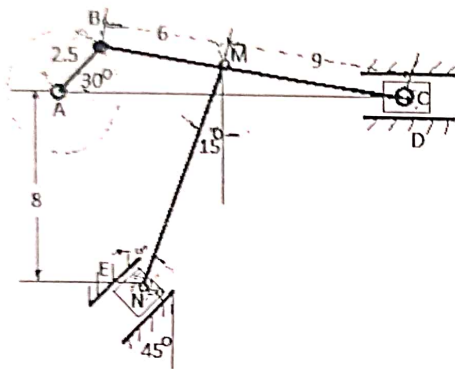
Fig.1

3   Draw the displacement curve and cam profile for the roller follower having radius 12 mm to attain the following specification of cam-follower mechanism.

The base circle of cam has radius 20 mm and lift of follower is 16 mm.

The upward motion of follower is with uniform acceleration and retardation motion up to 120°.

The dwell period at the top most position is 30°.

The return motion of follower is with simple harmonic motion till next 90°.

The rest is dwell period.   [08][CO-3]

4   [a] With the help of neat sketch, describe the law of belting for power transmission through Belt & Pulley system.   [04][CO-2]
    [b] Determine the loss of power in a flat foot step bearing due to friction between the materials, if the vertical load of 24 kN is applied and the shaft is rotating at 120 rpm. The outer and inner diameters are 20cm and 15 cm. The coefficient of friction may be assumed as 0.08.   [04][CO-4]

5   Fig.2 shows an epicyclic gear train. Pinion A has 20 teeth and is rigidly fixed to the motor shaft. The wheel B has 32 teeth and gears with A, and also with annular fixed, wheel D. Pinion C has 20 teeth and is integral with B (C.B being a compound gear wheel). Gear C meshes with annular wheel E, which is keyed to the machine shaft. The arm rotates about the same shaft on which A is fixed and carries the compound wheel B, C. If the motor runs at 1200 r.p.m., find the speed of the machine shaft. Find the torque exerted on the machine shaft if the motor develops a torque of 150 Nm.   [8][CO-5]

Fig. 2

355   Roll No...............
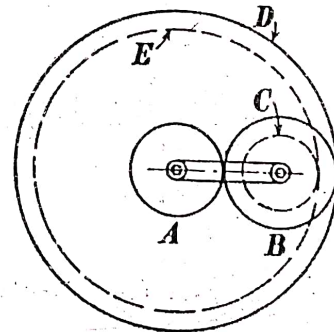
FOURTH SEMESTER
B.Tech. ME

END TERM EXAMINATION   **MAY-2023**
ME208 MANUFACTURING TECHNOLOGY-I

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

Note: Answer all questions. Question number 1 is compulsory. Assume suitable missing data, if any.

1[a] What are the typical situations in which following processes are recommended. Justify your answer suitably.

[i] Investment casting

[ii] Centrifuging

[iii] GTAW

[iv] Gas cutting

[v] Drawing and deep drawing   5 [CO1,2,3,5]

[b] Differentiate the following briefly

[i] Cold shut and mis run

[ii] Constant current and constant voltage type power sources

[iii] Stress strain curve for brittle and ductile materials

[iv] Press forging and drop forging

[v] Cold rolling and hot rolling   5 [CO1,2,4,5]

2[a] With reference to a solid-state Laser beam welding, discuss the following briefly.

(i) Working principle and mechanism of laser operation with a net sketch

(ii) Constructional features

(iii) Lasing materials

(iv) Advantages, limitations and applications   5 [CO 3]

[b] Sketch and explain any five welding defects briefly with special emphasis on their causes and remedies.

                                                         5 [CO 3]

                                                         P.T.O.

356

3[a] With a neat sketch discuss the Ultra-sonic welding with special emphasis on
(i) Working principle
(ii) Equipment components like generator, transducers, booster and welding horn
(iii) Advantages and limitations
(iv) Applications   5 [CO 3]
[b] With neat sketches discuss the direct and indirect extrusion processes. Also discuss their relative merits and demerits and applications. 5 [CO 5]

4[a] With neat sketches describe the working principle of the following processes with their specific applications.
(i) Metal spinning
(ii) Wire drawing   5 [CO 5]
[b] Briefly explain the powder metallurgy process with a block diagram. Describe any two methods by which powder suitable for powder metallurgy can be produced.   5 [CO6]

[5] Write short notes on the following [Any Four]

[i] Advancement in manufacturing technologies

[ii] Casting inspection methods

[iv] Electron beam welding equipment

[v] Mechanical properties of metal

[v] Punching and blanking   10 [CO 1,2,3,4]

END

357

IV SEMESTER
B. Tech Electring Engineering

END Term Examination

May 2023

ME252 Power Plant Engineering

Time: 3:00 Hours

Max. Marks: 40

Note: Answer any five questions.
Assume missing data suitably, if any.
Use of steam table and Mollier chart permitted.

Q. 1 (a) Name various conventional non-conventional energy sources for electric power generation. What are the advantages and limitations of non-conventional energy over conventional energy for electric power generation? [3,5][CO-1]

(b) Define load factor, capacity factor and use factor of a power station.
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.

Sr No	Time (Hours)	Load (kW)
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.

Q.2 (a) "In a thermal power plant, boiler burning Pulverized Coal generates about 80% fly ash and 20% bottom ash". With the help of a suitable sketch, explain how ash is collected at different points of the plant. [3,5][CO1,2]

(b) Steam at 20 bar and 360^0 C is expanded in a steam turbine to 0.08 bar. It then enters to a condenser, where it is condensed to a saturated liquid water. The pump feeds back the water into the boiler.
Calculate
  i) per kg of steam the net work and cycle efficiency assuming idle process
  ii) If the turbine and the pump have each 80% efficiency, Find the percentage reaction in the net work and cycle efficiency

Q. 3 (a) Discuss the relative advantages and disadvantages of closed cycle and open cycle gas turbine plants. [3,5][CO1,2]

(b) 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. Calculate specific work output, cycle efficiency and work ratio. Assume isentropic efficiencies of the compressor and the turbine at 85 and 90 percent respectively. What is heat rate in kJ/kW-hr?
If the rating of the turbine is 1300kW what is the mass flow in kg/s? Neglect mass flow of fuel and take cp=1.005 kJ/kgK.

Q.4 (a) Discuss various components and working of a hydroelectric Power Plant with a suitable diagram. [4,4][CO-2]

(b) Discuss the working of a combined cycle power plant and its advantages.

Q. 5 (a) With the help of a neat sketch explain different components of a diesel engine power plant. [4,4][CO- 3]

(b) Describe the working principle of Nuclear power plant with a neat sketch. Discuss the merits and demerits of Nuclear power.

Q. 6 Write short notes on any two of the following. [4,4][CO3,5]
  i)   Wind energy and Tidal energy.
  ii) Combined cycle power plants
  iii) Condensers and cooling towers

3 5 9   Roll No. ....

B. Tech.

FOURTH SEMESTER [PE]

END TERM EXAMINATION   May-2023

ME262   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. (a) How do you consider the initial tightening load when external forces are acting on a bolt?   [CO#3] [3]
   (b) A 0.3125 m x 0.325 m diesel engine running at 320 rpm has a compression pressure of 2.25 N/mm^2 and a maximum explosion pressure of 3.8 N/mm^2. The head is held in place by eight M14 x 2c bolts arrange on a 0.4 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#3] [5]

3. A countershaft made of cold-rolled steel transmits 40 kW at 320 rpm and is supported on bearings 1.5 m apart. It carries two pulleys mounted upon it. One pulley is 0.45 m in diameter and is located 0.38 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 0.635 m in diameter is located 0.45 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#4] [8]

4. Design completely a close-coiled helical spring to absorb 500 Nm of energy whose mean diameter of coils is 8 times the wire diameter. The initial compression of the spring is 50 mm and the additional compression is 100 mm while absorbing the shock.
[CO#5] [8]

5. Design a pair of cast teeth helical gears for transmitting 25 kW at 1800 rpm of the driver gear and 600 rpm of the driven gear. The helix angle is 30° and the profile is corresponding to 20° full-depth system. The driven gear has 24 teeth and the overhang of each gear is 150 mm.
[CO#6] [8]

6. Design a friction clutch with hardened steel clutch plates of inner and outer friction surface diameters of 50 mm and 75 mm respectively. The clutch is to transmit 4 kW at 825 rpm in oil atmosphere.
. [CO#7] [8]

Total No. Pages: 04

Roll no..........

VIth SEMESTER
[B.Tech.]

END TERM EXAMINATION

May-2023

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) Heat is generated in a stainless-steel plate (Thermal conductivity = 20 W/m-K) of thickness 1.0 cm (as shown in figure) at a uniform rate of 500MW/m^3. The sides of the plates are maintained at 200°C (left side) and 100°C (right side) respectively. What will be the, i) temperature distribution across the plate, ii) location and value of maximum temperature, iii) heat flux from both the sides of the plate and its direction. Assuming one-dimensional steady-state conduction. [1+1+2=4] [CO1]

T$_1$= 200°C
(left side)

stainless-steel plate

T$_2$= 100°C
(right side)

1.0 cm

x

Q.1 b) A furnace wall (as shown in figure) is made of three layers (A, B, C). First layer(A) is of insulation (k$_A$ = 0.5 W/m-K), 10 cm thick. Its face is exposed to gases at 900°C with convection coefficient of 100 W/m^2-K. It is covered with a 10 cm thick layer (B) of fire brick (k$_B$ = 0.8 W/m-K) with a contact resistance of 2.0 × 10^{-3} m^2-K/W between layer A and layer B. The third layer (C) is a plate of 10 cm thickness (k$_C$ = 5 W/m-K) with a contact resistance between layer (B) and layer (C) of 1.0 × 10^{-3} m^2-K/W. The plate is exposed to air at 40°C with convection coefficient of 10 W/m^2-K. Determine: i) the rate of heat flux and, ii) temperature drop across the interfaces (AB & BC). [2+2=4][CO1]

Q7 a) A spherical liquid oxygen tank 0.3m in diameter is enclosed concentrically in a spherical container of 0.5m diameter and space in between is evacuated. The tank surface is at 90K and has emissivity of 0.1. The container surface is at 300K and has the emissivity of 0.2. What will be net heat transfer rate and evaporation rate (kg/hour) of the liquid oxygen. Latent heat of vaporization of oxygen =220 kJ/kg. [4] [CO6]

Evaporation

Liquid oxygen tank of
D$_1$=0.3m, ε$_1$=0.1, T$_1$=90K

Liquid oxygen

Spherical container of
D$_2$=0.5m, ε$_2$=0.2, T$_2$=300K

Q7 b) Determine the view factor or shape factor of the following given geometry in figure:

i) F$_{1-2}$, F$_{1-1}$ for a Conical cavity with semi-vertex angle 'α';

ii) F$_{1-2}$, F$_{2-1}$ for a long square duct having a Diagonal partition [2+2=4][CO6]

Opening(2)

Conical cavity(1)

α

Diagonal

A$_1$
A$_2$
A$_3$

(i)

(ii)

Interface-AB ---- ... ---- **Interface-BC**

$T_{\infty 1}$= 900°C; h_1 = 100 Wm²-K

| Layer - A | Layer - B | Layer - C |

$T_{\infty 2}$= 40°C; h_2 = 10 Wm²-K

10cm   10cm   10cm

Q.2 a) A thermocouple junction is in the form of a 3mm diameter sphere. The junction, initially at 30°C, is inserted in a stream of hot air of temperature 400°C and then taken out after 15 seconds. The junction is then immediately placed in a cold air of temperature 20°C. What temperature will be attained by this junction 20 seconds after placing it in cold air. [**Given:** Specific heat of thermocouple material = 400.0 J/kg-K; density of thermocouple material = 8000 kg/m³; Thermal conductivity of thermocouple material = 40 W/m-K; Convective heat transfer coefficient for hot air stream =50 W/m²-K; Convective heat transfer coefficient for cold air = 10 W/m²-K]   [4][CO2]

Q.2 b) Describe the physical significance of the followings: **i)** Fin effectiveness; **ii)** Fin efficiency; **iii)** Biot Number; **iv)** Fouling factor   [1x4=4][CO2]

Q.3 a) With the help of schematic diagram, describe the various regimes of Pool Boiling.   [4][CO3]

Q.3 b) With the help of schematic diagram, describe the Filmwise and Dropwise condensation.   [4][CO3]

Q4 a) Derive the expression for Log Mean Temperature Difference (LMTD) for parallel flow type heat exchanger.   [4][CO4]

Q4 b) A thin rectangular plate (0.3m x 0.4m) is maintained at a uniform temperature of 100°C (as shown in figure). It is placed in an air of temperature of 30°C. What will be the heat transfer rate by natural convection from both the sides of plate when vertical height is: **i)** 0.3m;   **ii)**0.4m.
[**Given:** At mean film temperature, Kinematic viscosity of air = 1.8x10⁻⁵ m²/s; Prandtl number of air = 0.7; Thermal conductivity of air= 0.028 W/m-K; coefficient of volumetric expansion= 0.003 K⁻¹; For vertical plate, $Nu= 0.59(Ra)^{0.25}$ for $10^4<Ra<10^9$; $Nu = 0.13(Ra)^{0.25}$ for $10^9<Ra<10^{13}$]   [4][CO3]

0.3 m   Rectangular plate
0.4 m

(i)

0.4 m   Rectangular plate
0.3 m

(ii)
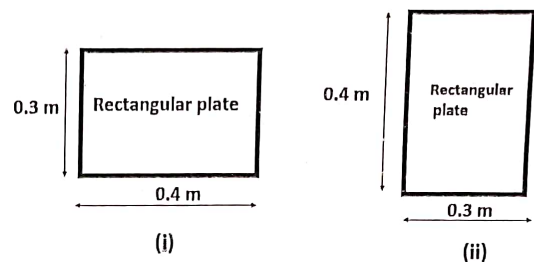
Q5 a) A counter-flow type heat exchanger is required to cool 50,000 kg/hour of Alcohol from 60°C to 40°C using 40,000 kg/hour of water entering at 10°C. What will be the exit temperature of water, heat transfer rate and surface area required. [**Given:** overall heat transfer coefficient = 600W/m²-K; specific heat (alcohol) = 3800 J/kg-K; specific heat (water) = 4200J/kg-K].   [1+1+2 =4] [CO4]

Q5 b) An oil (specific heat = 3kJ/kg-K) enters a parallel flow heat exchanger at rate of 7 kg/s with a temperature of 120°C. The flow rate of cooling water is 15 kg/s with an inlet temperature of 20°C. heat transfer area is 10 m² and overall heat transfer coefficient is 1200W/m²-K. Determine the outlet temperature of water and oil. [specific heat (water) = 4200J/kg-K]   [4][CO4]

Q6 a) A diffuse surface at 1600K has the spectral hemispherical emissivity as:
$\varepsilon=0.4$ $(0 \leq \lambda \leq 2 \ \mu m)$;
$\varepsilon=0.8$ $(2\mu m < \lambda \leq 5 \ \mu m)$;
$\varepsilon=0$ $(\lambda > 5 \ \mu m)$
What will be the total hemispherical emissivity and emissive power of the surface. Also, find out the wavelength at which spectral emissive power is maximum. [**Given:** At, $\lambda T = 3200 \ \mu m$-K, blackbody radiation function = 0.32; At, $\lambda T = 8000 \ \mu m$-K, blackbody radiation function = 0.86].   [4][CO5]

Q6 b) Describe the followings: **i)** Spectrum of electromagnetic radiation indicating thermal radiation, visible radiation, Ultraviolet radiation, and Infrared radiation with their wavelength range; **ii)** Kirchhoff's law of Radiation; **iii)** Wein's displacement law; **iv)** Absorptivity, Reflectivity, and Transmissivity   [1x4=4][CO5]

363

SIXTH SEMESTER
B.Tech [ME]

END SEMESTER EXAMINATION   May-2023

ME304 Design of Machine Elements
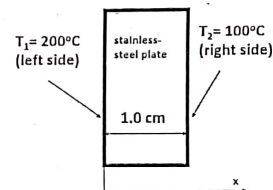
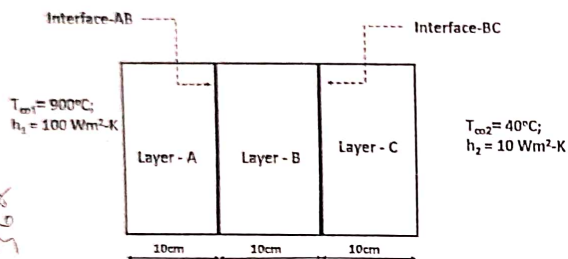Time: 3:00 Hours   Max. Marks : 40

> **Note :** Answer any five questions.
> All questions carry equal marks. Assume suitable missing data, if any. Design Data H/Book is **NOT** allowed

Q.1[a] Explain the following types of fits, with examples:

(i) Clearance fit (ii) Transition fit and (iii) Interference fit.   [2] CO-1

[b] Show that hollow shaft is stronger and stiffer than a solid shaft for the same weight and material?   [2] CO-1

[c] A thin pressure vessel (radius/thickness=20) closed at both ends is pressurised to 7MPa as test pressure. If the yield strength of the material is 450MPa, determine the factor of safety on the basis of maximum shear stress theory and distortion energy theory.   [2]CO-1

[d] How localised stresses in machine component be avoided? Explain with diagrams.   [2]CO-2

Q.2 A long thin pressure vessel of AISI1020 (Yield stress 350MPa) with 70mm internal diameter and 2.5mm thick is subjected to an internal pressure of 6MPa. If the cylinder is also subjected to a twisting moment of 70Nm, determine the factor of safety on the basis of Maximum Principal stress, Maximum shear and Distortion energy theory. Which theory of failure is better for this design?   [8]CO-1

Q.3 Design a simple cotter joint for an axial load of 100kN. Assume that all the parts are made of same material with permissible stresses of 70MPa, 50MPa and 90MPa in tension, shear and compression respectively.

[8]CO-2

Q.4 Design a screw and nut of a vertical screw jack to raise or lower a load of 50kN to a height of 300mm. Screw is made of SAE1030 alloy steel

with yield strength in tension and compression of 324MPa and 200MPa in shear. Assume that the nut is made of Phosphor Bronze with permissible stresses in tension, compression and shear of 42MPa, 38MPa and 35MPa respectively. A friction of 0.15 and bearing pressure 15MPa is adopted for the design. [8]CO-4

Q.5 A motor shaft rotating at 1440 rpm has to transmit 25 hp to a low speed shaft with a speed reduction of 3:1. The teeth of spur gears are 20° full depth involutes, with 18 teeth on pinion. Both pinion and gear are made of same material with permissible bending stress of 138MPa. Design the gears from stand point of strength, dynamic load and wear. Assume a Velocity factor (Cv) =3/(3 + v) , where v is pitch line velocity in m/s. Determine the module, face width and pitch diameter of gears. The surface endurance of the material is σ_{es} = 600 MPa; Modulus of Elasticity of pinion and gear = 200 GPa. Assume a first class commercial gear having an error of 0.07mm for which C=283kN/m. The wear factor K_w is 1.4 and endurance strength in bending is 1.75xBHN for the pinion. Hardness of the pinion is 180BHN. Select a service factor of 1.5 for the operation of the gear drive. [8]CO-5

Q.6 Design a Bush-pin type flexible coupling for transmission of 30kW from a motor to a centrifugal pump at 1448rpm. The following data is given: Diameter of motor shaft=38mm, Diameter of pump shaft=30mm, 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. [8]CO-6

Q.7 Design a triple riveted butt joint with zigzag 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. [8]CO-3

END

VI SEMESTER

B.Tech.(Mechanical Engineering)

END TERM EXAMINATION   *May-2023*

ME306a   **Manufacturing Technology-II**

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

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

Q.1 Design a gear box of a machine tool have 4 spindle speeds (2 X 2) ranging from 300 to 520 rpm. The gear box should be a compact one and gears are made up of mild steel. Also
    (a) Select an optimum ray diagram
    (b) Calculate the shaft sizes
    (c) Show the layout of the gear box
    (d) Find out the numbers of teeth on various gears
                                  [Marks 4][CO2]

Q.2 Differentiate between Mechanical stepped and Mechanical step-less drives of machine tool with application in Machine tools. With neat sketches explain Norton Gear Drive and Kopp Variator.
                                  [Marks 4][CO3]

Q.3 Discuss the design criteria for machine tool structures and also explain the role of materials selection of machine tool structures with respect to strength and deflection.
                                  [Marks 4][CO3]

OR

Q.3' By the mean of sketches. Illustrate the salient design features of spindles used in machine tool.
                                  [Marks 4][CO3]

Q.4 Describe the working principle of USM with a neat sketch. Explain the function of Horn in USM. Explain the process parameters how effect on metal removal rate in USM
                                  [Marks 4][CO4]

Q.5 Explain the principle of metal removal by the EDM. Why copper is generally used as electrode in EDM process? Explain the function of Di-electric Fluid in Electro Discharge Machining?

[Marks 4][CO4]

OR

Q.5' Show that the metal removal in ECM process depends on the quantity of electric current and chemical equivalent weight. Explain the surface finish is affected ECM process by the selective dissolution and sporadic breakdown of the anodic film.

[Marks 4][CO4]

Q.6 A sine-bar having a length of 250 mm with each roller having a diameter of 30 mm is used for taper angle measurement of a component. The vertical distance between the surface plate and the centre of the roller is 80 mm. The calculated taper angle (in degrees) Why sine bar cannot be used above 45 angles. Prove it.

[Marks 4][CO4]

Q.7 Define and Classify tolerances. Tolerances for a hole and shaft assembly having a nominal size 50 mm are as follows:

Hole = $50^{+0.02}_{+0.00}$ mm and Shaft = $50^{+0.05}_{-0.08}$ mm
Determine the following:
   (a) Maximum and minimum clearances
   (b) Tolerances on Shaft and Hole
   (c) Allowance
   (d) Type of fit

[Marks 4][CO4]

Q.7' Explain Hole basis system? Hole basis system is preferred over the shaft basis system, Explain. Measure a distance of 6.905 mm with the help of slip gauge using 112 set. Show the arrangement with sketch. M122/1

	range	quantity
--	1.0005	01
0.001	1.001-1.009	09
0.01	1.01-1.49	49
0.1	1.6-1.9	04
0.5	0.5-24.5	49
10	30-100	08
--	25. 75	02
	Total	122

[Marks 4][CO4]

Q.8 Discuss the 3-2-1 principle of location. Define and explain the terms Jigs with its uses. Explain different types of drilling Jigs with neat sketches.

[Marks 4][CO5]

Q.9 Construct Merchant Circle diagram and drive the relationships between frictional force system and shear force system with the cutting forces.

[Marks 4][CO1]

OR

Q.9' Draw and explain different types of Clamping devices are used in fixture. Design a milling fixture for cutting a keyway 5 mm wide x 3 mm deep on mild steel shafts of 20 mm diameter and 120 mm length.

[Marks 4][CO5]

Q.10 Write the short notes on ANY FOUR the followings:
   (a) Interchangeability
   (b) Quick return Whitworth mechanism
   (c) MAF process
   (d) Snap Gauges
   (e) Machinability
   (f) Angular error
   (g) Tool Wear   [Marks 4][CO1, CO5]

Total no. of pages: 3   Roll No. _____

SIXTH SEMESTER
B.Tech.
END SEMESTER EXAMINATION   *May- 2023*

ME308   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 air property table, isentropic flow table and normal shock table are allowed. Drawn neat diagram wherever necessary. Assume suitable missing data, if any.

1 [A] If the stagnation conditions of the standard atmosphere at [5] [CO1]
        the mean sea level is given by pressure 1.0133 bar;
        temperature 288.2 K, and dynamic viscosity 1.79×10^{-5}
        kg/ms. Determine pressure, temperature, density and
        viscosity at altitudes of 10,000 m and 15,000 m.

   [B] Explain how does a shock wave develop in the diverging   [5][CO1]
        section of a supersonic nozzle? How does this wave move
        towards the exit?

   [C] Air is discharged from a reservoir at stagnation pressure of [5][CO1]
        6.91 bar and stagnation temperature of 325 °C through a
        nozzle to an exit pressure of 0.98 bar. If the flow rate is 3600
        kg/hr determine ffor isentropic flow: (i) throat are, pressure
        and velocity, (ii) exit area, Mach number, and (iii) maximum
        velocity.

2 [A] A finite amplitude expansion wave with a pressure ratio of [5][CO2]
1/1.35 across it traverses stagnant air at a pressure of 1.2 bar
and temperature 300 K in a duct. Determine (i) velocity of
the air in the duct, (ii) pressure and temperature of air, and
(iii) velocity of the wave.

[B] Explain how strong compression and expansion waves are [5][CO2]
formed in a compressible fluid.

[C] A gas (γ=1.3) at P_1=350 mbar, T_1=355 K and M_1=1.5 is to [5][CO2]
be isentropically expanded to 138 mbar. Determine (i) the
deflection angle, (ii) final Mach number and (iii) the
temperature of the gas.

3 [A] Explain the working of constant temperature hot wire [5][CO3]
anemometer and wedge probe with neat diagrams.

[B] The conditions of a gas in a combustor at entry are: pressure [5][CO3]
0.343 bar, temperature 310 K, fluid velocity 60 m/s.
Determine the Mach number, pressure, temperature and
velocity at the exit if the stagnation enthalpy of the gas
between entry and exit is 1200 kJ/kg. Take c_p=1.005
kJ/kgK, γ=1.4.

[C] Determine the air velocities and the Mach numbers from the 5] [CO3]
given data in each of the following cases:

	Pitot-tube pressure (gauge)	Free stream static pressure (gauge)	Free stream temperature
(i)	1.4 bar	-274 mbar	265 K
(ii)	195 mm Hg	-5 mm Hg	298 K
(iii)	56 mm Hg	6 mm Hg	305 K

Assume ambient pressure 1.013 bar.

4 [A] With help of schematic diagram show the main components [5][CO4]
of a gas turbine engine used for turbojet aircrafts? Also
explain the various processes occurring in the engine on
temperature–entropy (T–s) diagram.

[B] Explain the working of supersonic ramjet engine having [5][CO4]
Oswatitsch type diffuser with neat diagram. Also write its
four advantages and four disadvantages.

[C] The diameter of the propeller of an air craft is 2.7 m. It flies [5][CO4]
at a speed of 525 kmph at an altitude of 8000 m. For the
flight to jet speed ration of 0.85 determine (i) the flow rate
of air through the propeller, (ii) thrust produced, (iii)
specific thrust, (iv) specific impulse, (v) the thrust power.
Assume air density = 0.525 kg/m^3 at 8000 m.

5 [A] With neat diagrams explaining the working of hybrid rocket [5][CO5]
engine and Nuclear rocket engine.

[B] Explain the working of gas pressure feed system for liquid [5][CO5]
propellant rocket engines with neat diagram.

[C] Write down five advantages and five disadvantages of [5][CO5]
liquid propellant.

-------END-------

2

3

369

Roll no...............

VI SEMESTER
B.Tech

END TERM EXAMINATION   *May-2023*

ME310 AUTOMATION IN MANUFACTURING
Time: 03:00 Hours   *Max. Marks: 50*

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

Q.1   a) Define Automation. Discuss various levels of automation?
                                                    [5] [CO 1]

b) Discuss the various principles of material handling?   [5] [CO 1]

Q.2   a) Define pump and state the purpose of the pump in hydraulic
system & classify pumps?   [5] [CO 2]

b) Mention types of the directional control valve and method of
their actuation symbols?   [5] [CO 2]

Q.3   a) Explain with a neat sketch construction & working of the double
acting cylinder?   [5] [CO 3]

b) Explain the principle of cascade control system?   [5] [CO 3]

Q.4   a) State the elements of pneumatic circuit. Write the functions of
any two elements?   [5] [CO 4]

b) What is synchronizing? Explain the synchronizing circuit with
suitable approaches?   [5] [CO 4]

370

OR

a) Explain with block diagram the components present in a PLC and give their functions? [5] [CO 5]

b) How does a PLC differ from microprocessor? [5] [CO 5]

Q.5 a) Describe any one of the electro hydraulic circuits used in robotic system? [5] [CO 6]

b) Draw a neat sketch of an electro pneumatic for sequencing drilling and clamping cylinders? [5] [CO 6]

OR

a) List various mechanical feeding devices. Explain any one with neat sketch? [5] [CO 7]

b) With neat diagrams explain the functioning of various types of Transfer Mechanisms? [5] [CO 7]

6th SEMESTER
B.Tech. (ME)

END SEMESTER EXAMINATION (May–2023)

ME-312 Quality Management & Six Sigma

Time: 3:00Hours   Maximum Marks: 50

Note:Answer *Any Five* questions. Use of statistical tables is allowed.
Assume suitable missing data, if any.

1. [a] Define cost of quality. Discuss various quality costs.   (5)[CO#1]

   [b] Explain with suitable examples any two quality control tools. (5)[CO#2]

2. [a] Discuss quality philosophies of Crosby and Taguchi.   (5)[CO#2]
   [b] The quality assurance manager is assessing the capability of a process that puts pressurized grease in an aerosol can. The design specification call for an average of 60 pounds per square inch (psi) of pressure in each can with an upper tolerance limit of 64 psi and a lower tolerance limit of 56 psi. A sample is taken from production and it is found that the cans average 61psi with a standard deviation of 1.5 psi. What is the probability of producing a defect?   (5)[CO#3]

3. [a] Draw a 'p' chart for the following data. Revise the trial control limits if require and interpret the chart for assignable cause.   (5)[CO#3]

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 specification for a component are 90 ± 0.5, whereas the process report shows that process average is 89.8 mm and standard deviation is 0.15. Calculate the appropriate process capability measure(s).   (5) [CO#3]

4[a] Explain DMAIC principles of six sigma with the help of a suitable example. (5)[CO#2]

[b] Discuss implementation and registration process of ISO. (5) [CO#2]

5[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]

[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]

6. Write shot notes on **any four** of the following topics (4X2.5) [CO#2]

[a] Quality in service sector;

[b] Quality management awards;

[c] Causes of variation;

[d] Benefits of ISO;

[e] Application of Six sigma in manufacturing;

[f] Advantages of acceptance sampling.

373

Roll No. ......

Total No. of Pages: 2

VIᵗʰ SEMESTER (Mechanical)
B.Tech.
END SEMESTER EXAMINATION   May-2023
ME316   Power Plant Engineering
Max. Marks: 50

Time: 3 Hours

Note: 1. Attempt all questions by selecting any two parts from each question
2. Assume suitable missing data, if any.

1 (a) Specify the region where the water boils in the boiler and the reason for such boiling. [CO2][5]

   (b) Why water is not superheated in the boiler drum? Discuss [CO2,3][5]

   (c) What are the difficulties faced in coal crushing in the power plants and how it can be minimized? Explain [CO1,3][5]

2 (a) Describe the working and essential features requirements of any one advanced power cycle [CO1,2][5]

   (b) With the help of a simple diagram, explain the essential features of hydro power plant. [CO2,3][5]

   (c) Discuss the necessary aspects which direct the choice of particular type of power plant at a specified place. Substantiate your arguments with valid reasoning. [CO4][5] .

3 (a) Why Nuclear power reactor uses Control rods and nuclear reactor needs a moderator material? Explain [CO3,4][5]

(b) Explain the need of control system in power [CO3,4][5] plants. Justify your answer with at-least one suitable practical example

(c) How the various types of losses occurring in [CO2,3][5] Steam Turbines can be minimized?

4 (a) Discuss the various safety provisions necessary [CO4,5][5] for the Nuclear power plants.

(b) Define the term waste heat recovery and explain [CO3,4][5] how it is achieved in power plants.

(c) Air enters in the compressor of gas turbine plant [CO3,4][5] at 1 bar and 27 °C. Air is then compressed to a pressure of 12 bar and combustion takes place in the combustion chamber where the fuel (Calorific value of 46 MJ/kg). The Turbine Inlet Temperature rises to 1300 K, where it is expanded in the turbine (coupled with the compressor on the same shaft). Determine the Air fuel ratio and efficiency of the Plant

5 (a) How would you reduce the pollution from the [CO2,4][5] power plants? Discuss

(b) Why Energy conservation can help in reducing [CO4,5][5] the cost as well as requirement of resources? Explain

(c) How load curve can help power plant engineer to [CO3,4][5] design the power plant? Specify your answer based upon base load/peak load/average load.

375

END TERM EXAMINATION
ME-318
Computer Aided Manufacturing

Time: 3 Hours   MM-50

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

Q1: Discuss in detail the following with suitable examples: [10][CO1]
a) Numerically Controlled Machine Tools
b) Computerised Numerically Controlled Machine Tools
c) Direct Numerically Controlled Machine Tools
d) Computer Aided Manufacturing
e) Central Processing Unit

Q2: a. Elaborate various factors which a production controller should consider to adopt CNC tech-
nology for the First time in the industry.
b. What is a programming w.r.t. CIDM? Discuss APT with its various types of statements. [10][CO2]

Q3: a, Calculate the power required during cutting of a low carbon steel bar 45 mm diameter of
cutting force 150 kg at 200RPM.
b, What is Computer Aided Process Planning. Explain Generative, Interactive feature Based and
Technology oriented CAPP with schematic diagram. Also discuss its advantages and limitations.
[10][CO3]

Q4: a. Explain Circular Interpolation, Parabolic Interpolation and Linear Interpolation with suitable
examples.
b. Discuss following: w.r.t. C.A.M.
1. Online & Offline programming
2. Unidirectional & Bidirectional Approach
3. Resolution, Accuracy & Precision.
4. Product design.   [10][CO4]

Q5: Discuss in detail AI (Artificial Intelligence), Machine Learning, IOT with applications and suit-
able examples/ Schematic diagrams. Also elaborate these techniques with Schematic diagrams
and examples in relation to the following: [10][CO3]
I.   CAM (Computer Aided Manufacturing)
II.   CAD (Computer Aided Design)
III. FMS (Flexible Manufacturing System)
IV.   CIDM (Computer Integrated Design & Manufacturing)
V.   Automation.

Q6: a. Determine the cutting speed machining time per cut when work having 35mm diameter is
rotated at 200RPM, FEED GIVEN IS 0.2MM/REV and length of cut is 60mm.
b. Write APT Program to turn a cylindrical component on CNC Churchill lathe. Dimensions of com-
ponent is 30mm, 40mm, 50mm at a equidistant of 200mm. total length of component is 600mm.
Machining is to be done in two passes - rough cut and finish cut. material of component is Mild
Steel.[10][CO5]

VIII SEMESTER

B.Tech

END TERM EXAMINATION   May-2023

ME404 : INDUSTRIAL ENGINEERING

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

Note: Answer any five questions. Question 7 is compulsory.
All questions carry equal marks.
Assume suitable missing data, if any.

Q1. (a) What factors influence productivity?   [CO#1]
(b) Differentiate between micromotion and memo motion
(c) Discuss various types of recording techniques for method study
                    [CO#2] (3+3+4)

Q2. (a) Discuss Bathtub curve used for failure pattern.
                    [CO#5]

(b) Differentiate between Reliability, Availability and
Maintainability   [CO#5]

(c) A series system is composed of four components with
failure rates of 0.002, 0.001, 0.0025 and 0.0005. what is the
100 hours system reliability and also calculate MTTF.
                    [CO#5](3+3+4)

Q 3. (a) Discuss how control charts are used to monitor and improve
manufacturing process.   [CO#4]
(b) Arrange the jobs A,B,C..........H,I on machine 1 and machine
2 using Johnson's rule. Find total time and idle time of each
machine   [CO#3](5+5)

Job	A	B	C	D	E	F	G	H	I
M/c1	3	6	5	10	7	9	8	6	5
M/c2	7	9	8	5	4	10	4	9	12

Q 4. (a) What is the purpose of conducting job analysis by an Industrial engineer? [CO#2]

(b) What is Process Capability Ratio? What factors influence process capability in terms of machine and equipment? [CO#4]

(c) Food served at a restaurant should be between 39°C and 49°C when it is delivered to the customer. The process used to keep the food at the correct temperature has a process standard deviation of 2°C and the mean value for these temperatures is 40. What is the process capability index of the process. [CO#4] (3+3+4)

Q5. (a) What are the main objective of maintenance management? Write about some common maintenance planning techniques. [CO #5]

(b) What are the key principles of material handling? List some common material handling equipment use in industries. [CO #5][5+5]

Q6. (a) Discuss about acceptance sampling. [CO#4]

(b) Define Statistical Quality Control [CO#4]

(c) Assuming that the total observed time for an operation of assembling an electric switch is 100 min. If the rating is 120%, find normal time. If an allowance of 10% is allowed for the operation determine the standard time. [CO#2][3+3+4]

Q 7. Write Short Notes on (Any Five): 5X2=10

(i)PMTS (ii) Relation of material handling with plant layout (iii) Gantt chart (iv) value chain (v) 5S concept (vi) Lean Manufacturing (vii) Ergonomics (viii) six-sigma

END SEMESTER EXAMINATION   *May-2023*

PAPER CODE ME406 & TITLE OF PAPER: Elastic and Plastic Behaviour of Materials

Time: 3:00 Hours   Max. Marks : 40

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

Q1. Answer the following questions in brief and to the point:
  [a]. The fracture toughness $K_{(IC)}$ of zirconia is $8MPa(m)^{1/2}$. If a panel of this material with central penny crack is loaded in tension to 150GPa, assuming a constant parameter of unity then what is the maximum flaw size (2a)?   CO-4
  [b]. What is the effect of strain rate on yield strength of the material?   CO-1
  [c]. How does the grain size affect the selection of materials for creep resistance?   CO-5
  [d]. What is elastic recovery? List the factors responsible for elastic recovery.   CO-2
  [e]. Explain Paris equation for crack propagation in fatigue loading.   CO-4
  [f]. Define low cycle and high cycle fatigue?   CO-4
  [g]. State Von Mises & Tresca yield criteria for ductile materials.
                                                              CO-1
  [h]. Define effective stress and effective strain.   CO2
                                                              [1x8]

Q2. [a] What are requirements of a creep resistant material? What materials would you consider to use for jet engine blades at 550°C?
                                                              [2] CO-5
  [b]. An alloy tie bar in a chemical plant has been designed to withstand a stress of 25 MPa at 620°C. Creep tests conducted on the specimens of this alloy under these conditions indicated a steady state creep rate of s^{-1}. In service it was found that for 30% of the

running time the stress and temperature increased to 30 MPa and 650°C. Calculate the average creep rate under service conditions. It may be assumed that the alloy creeps according to the equation:

$\varepsilon_{ss} \& = A\sigma^5 \exp\left(-\dfrac{Q}{RT}\right)$, where A and Q are constants. Q has a value of

160 kJ mol^{-1}.   [6]CO-5

Q3. The stress state at a point is given by following components of stress tensor:

$$\sigma_{ij}=\begin{pmatrix} 70 & 30 & 25 \\ 30 & 80 & 40 \\ 25 & 40 & 90 \end{pmatrix}MPa$$

(i) Determine the normal stress on octahedral plane whose normal has the direction cosines: 1/√3, 1/√3, & 1/√3 with the principal axes.
(ii) Determine the total shear stress on the above plane.
(iii) If the yield strength of the material is 90MPa, determine whether the material yields as per Von Mises and Tresca.

[8]CO-2

Q4. (a) At 8% and 18% elongation the loads on a tensile test piece of tempered aluminium alloy are 1.59kN and 1.66kN respectively. The test piece has initial width of 12.5mm, thickness of 1.4mm and gauge length of 50mm. Determine the 'n' and 'k' values if the material obeys power law of strain hardening.   [4]CO-2

(b).The plastic flow behaviour of a material is given by σ = 800ε$^{0.22}$MPa. *Bar-A* of this material was first cold worked to reduce the area of cross section by 25%, followed by additional cold work of 30%. Another *bar-B* of the same material was cold worked to reduce the cross section by 55%. After cold working which of the two bars will have higher yield strength?   [4]CO-3

Q5. Failure took place in an airline due to improper repair of rivets (Ø12 mm in diameter=2a) made of 6061-T6 aluminium alloy having fracture   toughness of   50MPa/√m. The fatigue crack growth rate for this alloy is given by:

$\dfrac{da}{dN} = 4X10^{-8}(\Delta K)^4$ where 'a' is in m and ΔK is in MPa/√m.

Assuming that the plane was cruising at an altitude of 8000m. The

atmospheric pressure decreases by 13Pa for every meter increase in altitude. Assuming that the fatigue failure started with one rivet hole, calculate the number of flights before failure. The aircraft body can be considered to be a cylinder of diameter 4.65m and wall thickness of 9mm.   [8]CO-4

Q6. A steel sheet of 1mm thickness and 60mm width is bent under plane strain conditions over a tool having radius of curvature of 90mm. If the flow stress of the material in plane strain condition is 475MPa. and coefficient of friction (µ) = 0.125. Then solve the followings:
If the above bending operation is done on V bending Die with a die opening width of 100mm, what is the maximum bend force required?
If the elastic portion is considered in the above problem, what fraction of thickness will remain elastic? Consider E as 200GPa and Poisson's ratio as 0.3.
What %age error does neglecting the elastic core cause in the calculation of the bending moment?   [8]CO-3

Q7 A steel shaft of AISI1030 is subjected to a torsional moment that varies from 330 Nm clockwise to 110 Nm counter-clockwise and an applied bending moment at a critical section varies from +440 Nm to –220 Nm. The shaft is of uniform cross-section and no keyway is present at   the critical section. Determine the required shaft diameter using Goodman and Soderberg criteria. The material has an ultimate strength of 550 MPa and a yield strength of 410 MPa. Take the endurance limit as 0.5 times the ultimate strength, factor of safety of 2, size factor of 0.85 and a surface finish factor of 0.62.   [8]CO-4

380

VIII SEMESTER

B.Tech.

END TERM EXAMINATION   May-2023

ME408   COMBUSTION GENERATED POLLUTION

Time: 03:00 Hours   Max. Marks: 50

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

Q.1a Explain various types of air pollutants resulting from vehicle emissions.   [05] [CO#1]

Q.1b 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.   [05][CO#1]

OR

Q.1 Using the equation based on initial rate of NO formation, estimate whether during typical SI engine combustion the kinetically formed NO could reach the level of equilibrium concentrations.   [10] [CO#1]

Q.2a Explain various effects of reduction in compression ratio on SI engine emissions. Explain with a neat sketch.   [10] [CO#2]

OR

Q.2a Propane (C_3H_8) is burned with 75% excess air during a combustion process. Assuming complete combustion, determine the air–fuel ratio.   [5] [CO#2]

Q.2b Explain HC emissions occurring due to wall quenching.

[5] [CO#2]

Q.3 What do you mean by the term alternative fuels? Explain the effect of alcohol fuels on regulated and unregulated emissions as compared to gasoline. [10] [CO#3]

OR

Q.3 A diesel engine is operating at overall f =0.6. Taking diesel fuel as $(CH_2)n$ and the combustion gas temperature and pressure as 2200 K and 60 atm calculate the initial oxidation rate of soot particle and the reaction constants as given for the NS-C mechanism. Estimate the period during which a soot particle of 50 nm diameter would get completely oxidized. [10] [CO#3]

Q.4 Explain the working of evaporative emission control system for a PFI engine with a detailed diagram. [10] [CO#4]

Q.5 Explain the methods used for the application of EGR in turbocharged engine and how EGR is controlled? [10] [CO#5]

EIGHT SEMESTERS

B. Tech.

END-TERM EXAMINATION   *MAY-2023*

ME420   MATERIALS MANAGEMENT

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 objectives of materials management? [5]   CO1
Explain them.

(b) What are the reasons for uncertaining inventory?   [5]   CO2

2 (a) Explain optimal policy curve for rationalization.   [5]   CO4

(b) A company has the annual requirement of the 15 items [5]   CO5
as given below:

Item	Annual usage	Unit cost (Rs.)
1	30000	1
2	2800	10
3	300	10
4	1100	5
5	400	7
6	2200	3
7	1500	2
8	8000	3
9	3000	4
10	800	8
11	20000	2
12	500	4
13	7000	3
14	5000	6
15	10000	3

Use the ABC analysis to categorize the items and draw the
ABC curve.

3 (a) Explain Wilson model and calculate optimum system [5] CO4
cost, economic lot size.

(b) A hardware store procures and sells hardware items. The [5] CO5
following information is available:

Expected annual sales   – 1500 units
Ordering cost   – Rs. 500 per order
Holding cost   – 25% of average inventory value

The item can be purchased in the following schedule:

Lot size	Unit price (Rs.)
1 – 999	25.00
1000 and above	23.00

Determine order size.

4 (a) What are the factors considered in favour of making? [4] CO3

(b) A trading company starts its operations on March 1, [6] CO5
2023. Its stock register reveals the following data
regarding goods in March, 2023.

(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
LIFO method

5 (a) What are the reasons for classification, codification and [6] CO3
standardization of materials?

(b) For purchasing of spares, the probability is given as: [4] CO5

r	0	1	2	3	4	5	6
P(r)	0.923	0.040	0.020	0.010	0.005	0.002	0.00

C = Rs.1,00,000/unit
U = Rs.1,00,00,000/-
g = 50,000/-
Calculate optimal number of spares to be ordered.

6 Write short notes on any FOUR of the following: [10] CO2
   (a) Six rights
   (b) JIT
   (c) Advantages of centralized
   (d) Importance of good store-keeping
   (e) Cost consideration in making

384

IV SEMESTER

B.Tech. (MC)

END TERM EXAMINATION

May-2023

MC202 Real Analysis

Time: 03:00 Hours

Max. Marks: 50

Instructions:
- Attempt any 5 questions
- All questions carry equal marks
- Assume suitable missing data if any.

1. (a) What are open sets in a metric space? Let $X = [0, 2)$ and d be usual metric on X. Is the subset $A = [0,1)$ of (X, d) open set?

[1+4] [CO3]

1. (b) State Cauchy's General Principle of convergence. Using Cauchy's General principle of convergence show that the sequence $\left\{\frac{1}{n}\right\}$ converges.

[2+3] [CO-4]

2. (a) Does the sequence $\{s_n\} = \left\{\frac{n+1}{2n-1}\right\}$ converge to $\frac{1}{2}$. If yes, find a natural number m such that $\left|s_n - \frac{1}{2}\right| < 0.01$ for all $n \geq m$.

[5] [CO-2]

2. (b) Define Metric Space. Let d be a metric on X. Prove or disprove that the function $d^*(x, y) = \frac{d(x,y)}{1+d(x,y)}$ is a metric on X.

[5] [CO-1,3]

3. (a) Discuss the countability of the set of all rational numbers.

[5] [CO-1]

3. (b) Define Cauchy sequence in a Metric space. Does a Cauchy sequence always converge in a metric space. Justify your answer.

[1+4] [CO-1, 4]

4. (a) Prove that a subset A a metric space (X, d) is closed if and only if A contains all its limit points.

[5] [CO-3]

385

4. (b) Consider the function $f(x) = \begin{cases} 0, \text{if } x \text{ is rational} \\ 1, \text{if } x \text{ is irrational} \end{cases}$. Explain whether the function f is Riemann integrable on any interval.

[5] [CO-5, 6]

5. (a) Let (X, d) be a metric space and A be a subset of X. Define closure of A. Show that $\bar{A}$ closure of A is the intersection of all closed sets containing A.

[5] [CO-3]

5. (b) Let P^* be a refinement of a partition P of an interval. Then for a bounded function f show that $L(P, f) \leq L(P^*, f)$.

[5] [CO-5,6]

6. (a) Discuss the Riemann integrability of monotonic functions.

[5] [CO-5, 6]

6. (b) Let a, b, c be three real numbers such that $a < b < c$. Let f be a function which is Riemann integrable over $[a, b]$ and over $[b, c]$. Then show that f is Riemann integrable over $[a, c]$ and $\int_a^c f = \int_a^b f + \int_b^c f$.

[5] [CO-5,6]

~END~

Total No. of Pages: 02
FOURTH SEMESTER
END SEMESTER EXAMINATION

786

Roll No.
B.Tech[MC]
May 2023

MC204, Scientific Computing

Time: 3.0 Hours

Max. Marks: 40

Note: *Attempt ANY EIGHT questions. All questions carry equal marks. Assume suitable missing data, if any. Non-programmable simple calculators are allowed.*

1. Find the real root of the equation $x \log_{10} x = 1.2$ using Newton-Raphson method correct up to four decimal places. [CO-1,2]

2. State and prove the order of convergence for Newton-Raphson method. [CO-2]

3. Solve the following system of equations by Gauss-Seidal method upto three iterations

$$20x + y - 2z = 17$$
$$3x + 20y - z = -18$$
$$2x - 3y + 20z = 25$$

[CO-3]

4. Find the largest eigen value and the corresponding eigen vector of the matrix $\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ using power method correct upto three decimal places. [CO-4]

5. Find the missing term in the table:

x:	2	3	4	5	6
y:	45	49.2	54.1	—	67.4

[CO-3,4]

6. Evaluate $f(4)$ using cubic interpolating polynomial for the following values:

x:	0	1	2	3
f(x):	1	2	1	10

[CO-4]

7. Given that:

x:	1	1.1	1.2	1.3	1.4	1.5	1.6
y:	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Find $\frac{dy}{dx}$ at (1.1). [CO-2]

8. State and prove the sufficient condition for the convergence of Gauss-jacobi iterative method. [CO-4]

9. Use Simpson's 1/3rd rule to find $\int_0^{0.6} e^{-x^2} dx$ by taking seven ordinates. [CO-4]

10. Using modified Euler's method, find $y(0.4)$ for the given IVP:

$$y' = y + e^x, \quad y(0) = 0.$$

by taking $h = 0.1$. [CO-5]

END TERM EXAMINATION   **May-2023**

MC206   Computer Organization & Architecture
Time: 03:00 Hours   *Max. Marks: 50*

Note : All questions carry equal marks.
Answer any one of questions 3 and 4.
Answer any one of questions 10 and 11.
Assume suitable missing data, if any.

Q.1   Perform the following operations to get the respective outputs on an
8-bit register R, where R = 11001100:   [5][CO2]
    i. Selective – set operation (Output = 11111100)
    ii. Selective – complement operation (Output = 11111010)
    iii. Selective – clear operation (Output = 00000000)
    iv. Mask operation (Output = 11000000)
    v. Insert operation (Output = 11000101)

Q.2   Consider the snapshot of the main memory content as shown
below:

The first instruction requires two memory locations and is stored at
locations 200 and 201. LOAD TO AC indicates the instruction
type, i.e. it loads the contents to Accumulator. MODE represents
the Addressing Mode used by the instruction. 500 represents the
address field within the instruction. Further assume that there is one
source register R having value of 400. The memory content at
address 399 is 999, at address 400 is 1000, at address 401 is 1001
and so on at every next location, the memory content increases the
previous content by one. Find the effective address as well as the
operand to be loaded into the Accumulator for the following
addressing modes: [5][CO2]
    i.   Direct
    ii.   Immediate
    iii. Indirect
    iv.   Relative

MEMORY ADDRESS	CONTENT	
200	LOAD TO AC	MODE
201	500	
.	.	
.	.	
399	999	
400	1000	
401	1001	
.	.	

Q.3   [2+3][CO1]

  i. Explain the types of interrupts.
  ii. Differentiate between RISC and CISC.

OR

Q.4   Write a short note on Multiple Processor Organization. [5][CO1]

Q.5   We have 2 designs D1 and D2 for a synchronous pipeline processor. D1 has 5 stage pipeline with execution time of 3 ns, 2 ns, 4 ns, 2 ns and 3 ns. While the design D2 has 8 pipeline stages each with 2 ns execution time. How much time can be saved using design D2 over design D1 for executing 100 instructions?

                                               [5][CO3]

Q.6   A hypothetical processor instruction set contains 120 instructions. Each instruction takes 8 cycles to complete execution. The hardware supports 200 control signals and 16 flags. 8 branch conditions are used to control the Branch logic. What is the size of the Control memory Address Register and Control memory Data Register when 1 address field is used to control the branch logic?

                                               [5][CO3]

Q.7   [2+3][CO6]

  i. For the following memory organization, evaluate the average memory access time for a machine with a cache hit ratio of 80% and cache access time of 5 ns and main memory access time of 100ns:
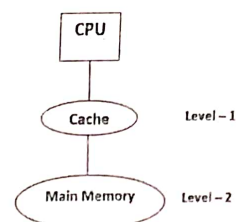
  ii. What is the average access time to transfer 96kB of data, if the data transfer rate is 20kbps, seek time is 10 msec and the disk rotates at a speed of 6400 RPM?

Q.8   Consider the main memory size of 64kW, and further assume that one word takes 4 bits of space in memory. Given the block size of memory is of 16 words, and cache has 128 blocks. Find the number of tag bits if 2-way set associative mapping is used to map the memory blocks into the cache.   [5][CO4]

Q.9   Consider a reference string: 4, 7, 6, 1, 7, 6, 1, 2, 7, 2. For 3 frames in the memory, find the page fault rate respective to: [5][CO4]
  i. FIFO Page replacement algorithm
  ii. LRU Page replacement algorithm

Q.10 Explain the concept of Direct Memory Access. Also explain how it is different from programmed and interrupt driven I/O.   [5][CO5]

OR

Q.11 What are priority interrupts? Explain how the priority interrupts are handled by Daisy chaining mechanism.   [5][CO5]

Q.12 Distinguish between Strobe Control and Handshaking mechanisms of Asynchronous Data Transfer between CPU and I/O Devices.

                                               [5][CO5]

390

B.Tech[MC]

FOURTH SEMESTER

May 2023

END SEMESTER EXAMINATION

MC208, Linear Algebra

Max. Marks: 50

Time: 3.0 Hours

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.*

[10 marks] [CO-1,2]

1. State and prove Rank-Nullity theorem.

2. Write a linear transformation $T : V_2 \to V_4$ with $T(1, 1) = (1, 1, 1, 1)$, $T(1, -1) = (-1, -1, -1, -1)$. Find the dimension of its range and kernel. [CO-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 $4x_1 - 3x_2 + x_3 = 0$ is the kernel of T. [CO-3]

4. Find the row and column space of the matrix $A = \begin{bmatrix} 1 & 2 & 0 & -1 \\ 2 & 6 & -3 & -3 \\ 3 & 10 & -6 & -5 \end{bmatrix}$.

   Also write their dimensions. [CO-2]

5. Let W be the subspace of R^4 spanned by the vectors $u_1 = (1, 2, 5, -3)$, $u_2 = (2, 3, 1, -4)$, $u_3 = (3, 8, -3, -5)$. Find the basis of W and extend to a basis of R^4. [CO-2]

6. Transform the given basis $\{(1, 1, 1), (0, 1, 1), (0, 0, 1)\}$ of R^3 into the ortho-normal basis of R^3. [CO-4]

7. 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]

391

8. Find the angle between the matrices $A = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 5 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & 0 \end{bmatrix}$.

[CO-4]

9. Define the adjoint of a linear transformation T and hence write the adjoint of

$$T(x, y, z) = (4x + 2y - 5z, x - y + z, 2x + y - 3z)$$

[CO-3,4]

10. Write the symmetric matrix corresponding to the quadratic form

$$Q(x, y, z) = 3x^2 + 4xy - y^2 + 8xz - 6yz + z^2$$

and check whether it is positive definite?   [3+2][CO-4]

11. Find the Jordan canonical form J and an invertible matrix Q such that

$J = Q^{-1}AQ$ where $A = \begin{bmatrix} -3 & 3 & -2 \\ -7 & 6 & -3 \\ 1 & -1 & 2 \end{bmatrix}$ [CO-5]

- - - - - - - - - - - - -

B. Tech. [MC]   6th *Semester*

> **NOTE:** *Attempt any five (5) questions only. Question 1 is compulsory.*
> *Assume suitable missing data if any.*

Q1. Answer the following questions [Compulsory question]:

A) Consider *create table* statements below. Draw an ER diagram from which these create table statements could have been derived. Be sure to mark any key and participation constraints.   [2][CO 3]

```
create table Shelf (
    A number primary key,
    B number not null unique,
    C number
);
create table Bag (
    D number primary key,
    A number not null,
    foreign key (A) references Shelf(A)
);
```

B. Differentiate between the 'where' and 'having' clauses in SQL.   [2][CO 2]

C. Consider the relation scheme R(A, B, C, D, E, H) and the set of functional dependencies. What are the candidate keys of R?   [2][CO 3]

$$A \rightarrow B; \quad BC \rightarrow D; \quad E \rightarrow C; \quad D \rightarrow A$$

D. A transaction passes through several states during its execution, until it finally commits or aborts. Give the state diagram and label each state transition. [2][CO 6]

E. Insert the following elements in a B-tree of order 4:   [2][CO 5]

21, 56, 1, 90, 13, 48, 27, 50

F. Are the following three schedules result equivalent, i.e. produce the same result?   [2][CO 6]

Schedule S1		Schedule S2		Schedule S3	
T1	T2	T1	T2	T1	T2
R (X)		R (X)			R (X)
X=X+5		X=X+5			X=X×3
W (X)		W (X)			W (X)
R (Y)			R (X)	R (X)	
Y=Y+5			X=X×3	X=X+5	
W (Y)			W (X)	W (X)	
	R (X)	R (Y)		R (Y)	
	X=X×3	Y=Y+5		Y=Y+5	
	W (X)	W (Y)		W (Y)	

Q2. a) Differentiate between composite attribute and multivalued attribute.
                                                                [2][CO 2]

b) Consider the relation schema R(A, B, C, D, E, G) with functional dependencies F = {AB->C, AG->E, B->D, E->G}. Determine if the decomposition {ABC, CDE, EG} of R(A, B, C, D, E, G), is (a) dependency-preserving, and (b) lossless.   [3][CO 4]

c) Justify the statement "Strict two phase locking may still lead to deadlocks" with an example.   [2][CO 6]

Q3. Consider the following relations:
         Bike(bid, model, year),
         Station(sid, name, city, zip_code),
         Trip(tid, date, start_sid, end_sid, bid), *start_sid* and *end_sid* are
     foreign keys to *Station*, and where *bid* is a foreign key to *Bike*.

A. Write the SQL queries for the following:

   a) Find the number of stations belonging to the same zip code.   [2][CO 2]
   b) Find details of all the trips made on bikes that were manufactured after 2016.   [2][CO 2]
   c) Find station id and zip code of station "Delhi Technological University" in the city "New Delhi".   [1][CO 2]

B. What will be output returned by the following SQL query: [2][CO 2]

```
SELECT Station.city, count(*)
FROM Trip JOIN Station
ON Station.sid = Trip.start_sid
GROUP BY Station.city;
```

Q4. Consider a file of 8192 records. Each record is 16 bytes long and its key field is of size 6 bytes. The file is ordered on a key field. The file is stored in a file system with a block size 512 bytes and the size of the block pointer is 10 bytes. [5 + 2 = 7][CO 5]

A. If the primary index is built on the key field of the file, and a multilevel index scheme is used to store the primary index, find the number of first-level and second-level blocks in the multilevel index.

B. Suppose that the file is *not* ordered by the key field and we want to construct a B-tree access structure (index) on the key field. Calculate the order p of the B-tree.

Q5. A) Explain the wait-die and wound-wait deadlock prevention policies.
[3][CO 6]

B) Consider a schedule S as given below. The subscript gives the transaction numbers viz., T_1, T_2 and T_3. [2 + 2 = 4][CO 6]

S: $R_1(A)$, $R_2(A)$, $W_3(A)$, $W_1(A)$

Determine if the schedule is: a) conflict serializable, and b) View serializable. If the schedule is serializable, write down the equivalent serial schedule.

Q6. Explain (any two) terms with suitable examples: [3.5 * 2 = 7][CO 6]
a) Recoverable schedule
b) Cascade rollback
c) View serializable schedule

Q7. A) Insert the following keys into an empty extendible hashing structure: 2, 10, 7, 3, 5, 16, 15, 9, 11, 17. Assume the bucket Size is 3. If the global depth is X, then the Hash Function returns X least significant bits. [4][CO5]

B) Write a short note on any one RDBMS – Oracle, MySQL, or SQL Server.
[3][CO1]

All the Best

VI SEMESTER

B.Tech. (M & C)

END TERM EXAMINATION   *May-2023*

MC 304 . Theory of Computation

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

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

Q.1 [a] Construct a Moore machine equivalent to the mealy machine
       below: [5][CO1,3]

Present State	Next State			
	$a=0$		$a=1$	
	State	Output	State	Output
$\rightarrow q_1$	q_1	1	q_2	0
q_2	q_4	1	q_4	1
q_3	q_2	1	q_3	1
q_4	q_3	0	q_1	1

Figure 1: Mealy to Moore Conversion

   [b] Prove/Disprove that each of the classes of languages in Chomsky
       classification (Type 0, Type 1, Type 2 and Type 3) is closed under
       concatenation.   [5][CO2]

Q.2 ATTEMPT ANY TWO PARTS IN THIS QUESTION.

   [a] Using Pumping lemma prove that the language $\{1^p \mid p$ is prime$\}$ is
       not regular.   [5][CO1,2]

   [b] If L is a regular set over Σ, then show that L^T and $\Sigma^* - L$ *are* also
       regular.   [5][CO2,3]

1

[c] Using algebraic method for Arden's Theorem, find the regular expression accepted by the automata given below:

[5][CO1,2]
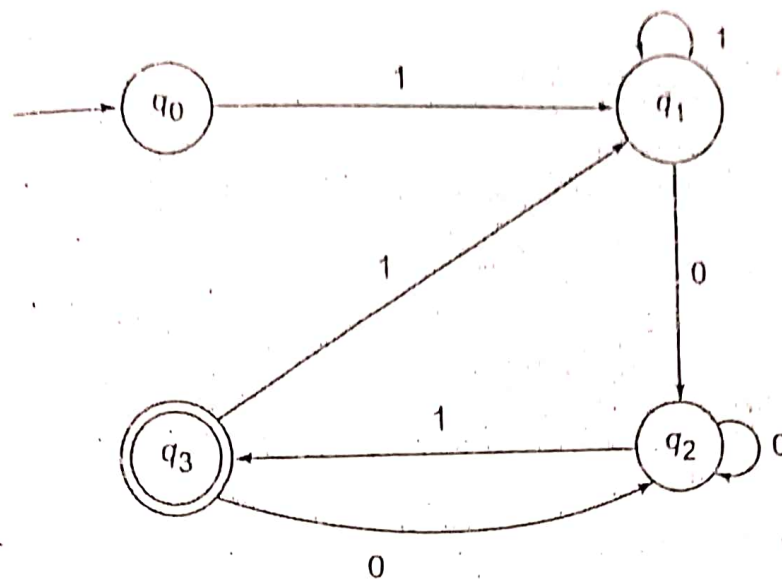
Figure 2: Arden's Theorem

Q.3 ATTEMPT ANY TWO PARTS IN THIS QUESTION.

[a] Reduce the following grammar to Chomsky Normal Form.

$$S \rightarrow 1A|0B, \quad A \rightarrow 1AA|0S|0, \quad B \rightarrow 0BB|1S|1$$

[5][CO3,4]

[b] Reduce the following grammar to its Greibach Normal Form.

$$S \rightarrow SS, \quad S \rightarrow 0S1|01$$

[5][CO3,4]

[c] Find the reduce grammar equivalent to the grammar

$$S \rightarrow aAa, \quad A \rightarrow bBB, \quad B \rightarrow ab, \quad C \rightarrow aB$$

[5][CO3]

Q.4

[a] (i) Define a deterministic pda.

(ii) Define ambiguous grammar. Show that the grammar given below is ambiguous. [2+3][CO1]

$$S \rightarrow aB|ab, A \rightarrow aAB|a, B \rightarrow ABb|b$$

2

[b] Consider the context free grammar G: $S \rightarrow aSb|aS|a$. Construct:

    (i) a pda accepting the L(G) by empty store.

    (ii) a pda accepting the L(G) by final state.

                                         [5][CO3,4]

Q.5 [a] What type of moves are possible in a Turing machine. Explain. Consider the Turing machine M given by transition diagram below. Obtain the computation sequence of M for processing the input string 0011.

                                         [5][CO1]
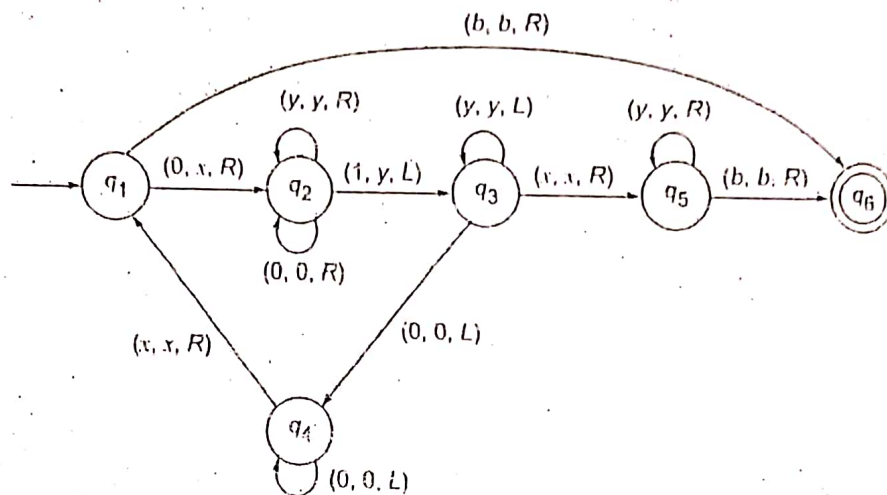
Figure 3: Turing Machine, M

[b] Construct a Turing Machine that accepts $\{0^n 1^n \mid n \geq 1\}$.

                                         [5][CO1,3]

3

Total no. of pages :2   Roll No._____

6th SEMESTER   B.Tech (MC- Engg.

END SEMESTER EXAMINATION   MAY 202

MC – 306   Financial Engineering

Time : 3 hrs   Max. Marks: 5

Note: Q.No.1 is compulsory, answer any other three questions.

Statistical table is allowed. Assume missing data, if any.

1. (a) Let A(0)=100 , A(1)=110 , A(2)=121, and stock price can follow four   5
   possible scenario;   CC

Scenario	S(0)	S(1)	S(2)
W1	50	60	72
W2	50	60	58
W3	50	45	55
W4	50	45	40

$S(i), i = 0,1,2$ is stock price at i^{th} time interval. Compute Risk
Neutral Probability (RNP).

(b) Consider a portfolio of two assets a1 & a2 with no short sell,   5
     with the following statistical parameters   CO
     $\mu_1 = 7.5\%, \mu_2 = 15\%$, $\sigma_1 = 12\%$, $\sigma_2 = 35\%$, $\rho_{12} = -0.22$.
     Find the value of minimum risk, the expected return and weight
     of the assets.

(c) The stock price is Rs.100. The continuously compounded risk   5
     free interest rate is 8% and the annual volatility is 20%.   CO
     European Call options are written with a strike price of Rs.90
     and time to expiration of 3 months. The stock will pay a
     dividend continuously at the rate of 2%. Use the Black –
     Scholes formula to find the price of one such call option.

(d) $\{N(t), t \geq 0\}$ be a Poisson process with parameter λ. Prove that   5
     $\{N(t) - \lambda t, t \geq 0\}$ is a martingale.   CO

2. (a) A stock price following SDE $dS(t) = \mu S(t) dt + \sigma S(t) dW(t)$ 5
        has an expected return of 16% and a volatility of 30%. The   CO
        current price is Rs.38. What is the probability that a European
        call option on the stock with an exercise price of Rs.40 and a
        maturity date in 3 months will be exercised?

(b) Solve the SDE $dX(t) = X(t)\,dW(t)$ with $X(0) = 1$ and prove that its solution is $X(t) = \exp(W(t) - \frac{t}{2})$.

5
CO4

3. (a) Evaluate $\int_0^T W^3(t)\,dW(t)$ using Ito – Doeblin formula of version two.

5
CO4

(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 $\sqrt{S(t)}$.

5
CO4

4. (a) Consider a portfolio of two assets a_1 & a_2 with the following statistical parameters $\mu_1 = 10\%$, $\mu_2 = 20\%$, $\sigma_1 = 12\%$, $\sigma_2 = 25\%$, $\rho_{12} = -0.6$. Obtain the equation of Markovitz curve, and using that find value of minimum risk, the expected return.

5
CO5

(b) Prove that if short sales are not allowed then the risk of the portfolio can not exceed the greater of the risks of the individual components of the portfolio.

5
CO5

5. (a) A portfolio with three securities a_1, a_2, a_3 with expected returns, $\mu_1 = 20\%$, $\mu_2 = 13\%$, $\mu_3 = 4\%$, standard deviations of returns, $\sigma_1 = 25\%$, $\sigma_2 = 28\%$, $\sigma_3 = 20\%$, and the correlation between returns, $\rho_{12} = 0.3$, $\rho_{13} = 0.15$ and $\rho_{23} = 0.4$. Compute the weights of individual assets in this portfolio for minimum variance.

5
CO5

(b) Using the following data:

Scenario	Probability	Return K1	Return K2
ω1 (recession)	0.2	−10%	30%
ω2 (stagnation)	0.5	24%	-10%
ω3 (boom)	0.3	20%	10%

Find the weights in a portfolio with expected return $\mu_P = 25\%$. and compute the risk of this portfolio

5
CO5

398

Sixth Semester
B. Tech.

End Term Examination

May 2023

MC 310: Software Engineering

Time: 3:00 Hours

Max. Marks: 50

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

1. (a) In the context of software development, describe the problems that can arise if the user, developer, and client are the same person. How would you solve such problems? Mention some potential advantages given the same situation. [5][CO1]

    (b) Explain in detail the differences between portability and reusability in relation to software. Why are they so important? [5][CO3]

2. (a) Describe prototyping model of software development. Under what circumstances this model is suitable over other models? [5][CO1]

    (b) What are functional and non-functional requirements? In the context of requirements engineering, discuss the activities of elicitation, analysis, specification, validation, and documentation. [5][CO2]

3. (a) State the purposes of data flow diagrams and entity relationship diagrams? Give an example diagram of each. [5][CO3]

    (b) In the context of system design, discuss the concepts of problem partitioning, top-down design, bottom-up design, functional oriented approach, and object oriented approach.

    [5][CO3]

4. (a) Explain all the levels of COCOMO Model. Mention its advantages and disadvantages. [5][CO4]

(b) Discuss typical software risks. Describe the activities involved in software risk management. [5][CO4

5. (a) Explain the SEI Capability Maturity Model (CMM). Why is it suggested that CMM is a better choice than ISO-9001? [5][CO5]

(b) Assume that a program will experience 200 failures in infinite time. It ha now experienced 100. The initial failure intensity was 20 failures/CPU hour.
(i) Determine the current failure intensity.
(ii) Find the decrement of failure intensity per failure.
(iii) Calculate the failures experienced and failure intensity after 20 and 100 CPU hours of execution.
(iv) Compute addition failures and additional execution time required to reach the failure intensity objective of 5 failures/CPU hour.
Apply the basic execution time model for the above mentioned calculations. [5][CO5]

6. (a) In relation to software testing, discuss the concepts of code inspection, levels of testing, alpha testing, beta testing, and debugging. [5][CO6]

(b) Discuss the relation between software quality and maintenance. Describe various categories of maintenance. Suggest five actions you can take to improve software maintenance. [5][CO3]

---END---

Roll No. _____

VI SEMESTER

B.Tech. (MCE)

END TERM EXAMINATION   **May-2023**

MC312   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). Write a program in Prolog to find the sum of first N natural numbers.   [3 marks][CO5]

(b). Explain, with Prolog programs, how the following operations are performed on the List data structure: [3+2 = 5 marks] [CO5]

   (i) Finding the sum of all elements of a given list.

   (ii) Divide the list in two lists of approximately same length.

Q.2. (a) Given the information below for two attributes and a class label: [4 marks] [CO6]

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]

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. (a). Explain Sussman's Anomaly in Goal Stack Planning with the help of an example.   [3 marks][CO3]

(b). Given an initial state: {ON (B, A) ∧ ONTABLE (A) ∧ ONTABLE(C) ∧ ONTABLE(D) ∧ ARMEMPTY}, and the goal state as: {ON(C, A) ∧ ON(B,D) ∧ ONTABLE(A) ∧ ONTABLE(D)}. How can the goal state be achieved with Goal Stack Planning ? Explain all the steps involved.   [5 marks] [CO3]

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][CO2, CO3]

```
MAX  ............                                    ................
MIN  ............                                    ................
MAX  ............                                    ................
MIN  ............                                    ................
MAX  ............                                    ................
MIN  ............                                    ................
```

```
0  5  -33  3  -30  2  -23  5  2  5  -50  1  5  1  -30  -55  -33  2
```
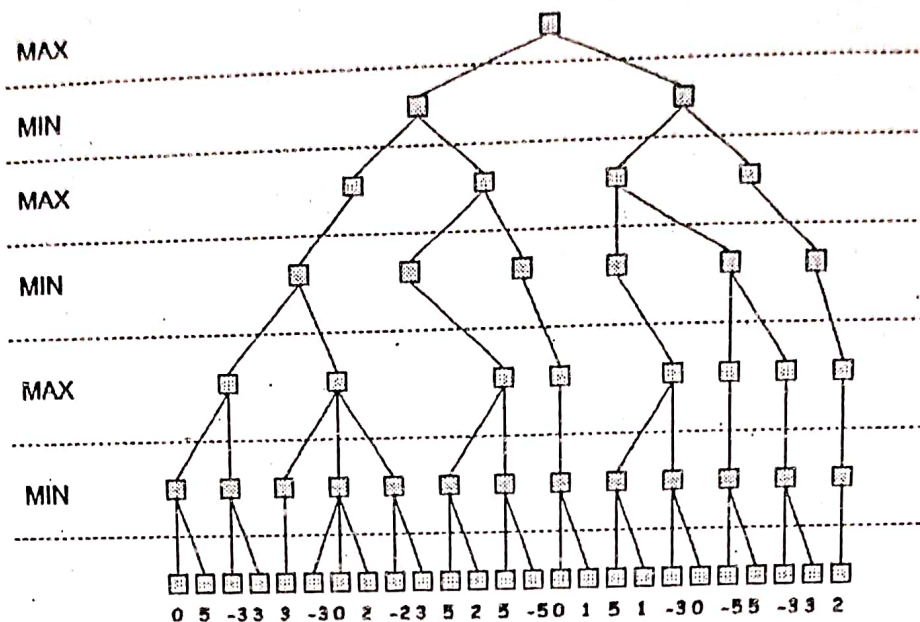
(b). How do you define the term "*Strategy*" in game playing algorithms with respect to MAX player ? Given a 4-ply game tree with MAX at the root, how many strategies exist for the MAX player ?

[3 marks][CO2, CO3]

Q.5. Given a set of locations and distances between them, the goal of the Traveling Salesperson Problem (TSP) is to find a shortest tour that visits each location exactly once. Assume that you do not return to the start location after visiting the last location in a tour. We would like to solve the TSP problem using a hill-climbing algorithm. Each state corresponds to a permutation of all the locations (called a tour). The function "*neighbours(s)*" generates all neighbouring states of any state "s" by swapping two locations. For example, if s =<A-B-C> is a tour, then, <B-A-C>, <C-B-A> and <A-C-B> are the three neighbours generated by "*neighbours(s)*" function. We can set the evaluation/heuristic function for a state to be the total distance of the tour where each pairwise distance is looked up from a distance matrix. For example, if s =<A-B-C> is a tour, then total distance of this tour is $d(A, B) + d(B,C)$, where $d(A, B)$ is the distance between A and B, and $d(B, C)$ is the distance between B and C. Suppose the table below represents the distance matrix between four locations: M, W, E and S.

	M	W	E	S
M	0	1.1	1.4	0.9
W	1.1	0	0.6	0.7
E	1.4	0.6	0	0.5
S	0.9	0.7	0.5	0

Now, we need to apply hill climbing algorithm from the initial state:
<W-M-E-S>.

(a). Compute the total distance of the initial state. [1 mark][CO1]

(b). What are the possible neighbouring states of the given initial state that can be generated by the "*neighbours*" function ? [1 mark][CO1]

(c). From the initial state, what is the next state reached with the hill climbing algorithm. [2 marks][CO1]

(d). Explain when the hill climbing algorithm will terminate from the initial state. List out all the states reached by hill climbing algorithm till the algorithm terminates. [3 marks][CO2]

(e). Suppose there are "n" locations, what can be the maximum size of the search space, i.e., maximum number of states in the search space. [1 mark][CO1]

Q.6. (a) Compare the two blind search algorithms on the basis of time complexity, space complexity, completeness and quality of solution by representing your analysis with suitable diagrams and mathematical analysis as applicable. [5 marks][CO4]

(b). Briefly explain Ant Colony optimization with an example. [3 marks] [CO2]

*********************END*********************

Total No. of Pages : 02

VIII Semester   END SEMESTER EXAMINATION   B.Tech.

PAPER CODE - MC406   May -2023

TITLE OF PAPER - Partial Differential Equations

TIME: 03 HRS   MAX. MARKS: 50

Note: Attempt any FIVE questions. Each question carry equal marks.

    Assume suitable missing data, if any.

1. (a) Solve $\dfrac{y^2 z}{x} p + xzq = y^2$.   [5] CO-1

  (b) Find the integral surface of the linear partial differential equation   [5] CO-1
$x(y^2 + z)p - y(x^2 + z)q = (x^2 - y^2)z$ which contains the line $x + y = 0$,
$z = 1$.

2. (a) Reduce $\dfrac{\partial^2 z}{\partial x^2} = (1+y)^2 \dfrac{\partial^2 z}{\partial y^2}$ to canonical form.   [5] CO-2

  (b) Solve the following problem using the method of separation of   [5] CO-2
variables
$$\begin{cases} \dfrac{\partial u}{\partial x} = 2\dfrac{\partial u}{\partial t} + u, \quad x \in \mathbb{R}, \ t > 0 \\ u(x,0) = 6e^{-3x}. \end{cases}$$

3. (a) Obtain a Fourier series solution of the following initial/boundary   [5] CO-3
value problem modeling a vibrating string of finite length l, fixed at
both ends and released from rest with intial deflection $f(x)$.

$$\begin{cases} \dfrac{\partial^2 u}{\partial t^2} = c^2 \dfrac{\partial^2 u}{\partial x^2}, \quad 0 \le x \le l, \ t > 0 \\ u(0,t) = 0, \quad u(l,t) = 0 \\ u(x,0) = f(x), \quad \dfrac{\partial u}{\partial t}(x,0) = 0. \end{cases}$$

(b) Solve the following initial value problem for inhomogeneous wave [5] CO-3
equation
$$\begin{cases} \dfrac{\partial^2 u}{\partial t^2} = 9\dfrac{\partial^2 u}{\partial x^2} + e^x - e^{-x}, \quad x \in \mathbb{R}, \ t > 0 \\ u(x,0) = x, \quad \dfrac{\partial u}{\partial t}(x,0) = \sin x. \end{cases}$$

4. (a) Show that the solutions of the heat equation are invariant under [5] CO-4
parabolic dilations.

(b) Define fundamental solution $\Phi(x, t)$ for the heat equation. Hence, [5] CO-4
evaluate $\displaystyle\int_{-\infty}^{\infty} \Phi(x, t) \, dx.$

5. (a) Solve the initial value problem for heat equation [5] CO-4

$$\begin{cases} \dfrac{\partial u}{\partial t} - \dfrac{\partial^2 u}{\partial x^2} = 0, \quad x \in \mathbb{R}, \ t > 0 \\ u(x,0) = g(x) \end{cases} \qquad \text{where } g(x) = \begin{cases} 1, & \text{for } |x| < 2 \\ 0, & \text{for } |x| > 2 \end{cases}$$

(b) State strong maximum/minimum principle for harmonic func- [5] CO-5
tions. Further, let $u(x, y)$ be harmonic in the disk $x^2 + y^2 < r_0^2$. If u
achieves its maximum at the point $(0,0)$, then show that u must be
constant throughout the disk.

6. Solve the following boundary value problem [10]

CO-5

$$\begin{cases} \dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = 0, \quad 0 \le x \le 2, \ 0 \le y \le 3 \\ u(x,0) = \dfrac{2}{3}\sin\dfrac{3\pi x}{2}, \quad u(x,3) = 0, \quad 0 \le x \le 2 \\ u(0,y) = 0, \quad u(2,y) = 0, \quad 0 \le y \le 3. \end{cases}$$

× × ×

2

404

B.Tech (VIII SEMESTER)

END TERM EXAMINATION

May-2023

MC-418

Optimization techniques

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 Consider the following quadratic programming problem (QPP):

Max $z = x_1 + x_2 - x_1^2 + 2x_1x_2 - 2x_2^2$

subject to $2x_1 + x_2 \leq 1$

$x_1, x_2 \geq 0$

(a) Express the objective in the standard QPP form $c^T x + x^T D x$. Is D positive definite?

(b) Solve the QPP by Wolfe's method if it is solvable. 　　　　[4,6][CO2]

Q.2 (a) Define Linearizing cone. Mention the relation between linearizing cone and feasible direction.

(b) Consider the constraints set $x_1 + x_2 \leq 4$, $x_1^2 + x_2^2 \leq 16$ and $x_2 \geq 0$. Let $\hat{x} = (0,4)^T$. Obtain feasible direction and linearizing cone at $\hat{x}$. Does the basic constraint qualification hold at $\hat{x}$? 　　　　[4,6][CO3]

Q.3 (a) Derive the dual of the given linear programming problem using Lagrange approach.

Max $c^T x$

subject to $Ax \leq b, x \geq 0$

(b) State Hanson's converse duality theorem. 　　　　[8,2][CO3]

4|05

Q.4 (a) For the given function $f(x,y) = ye^{-x}$. Mention the feasible region for $f(x,y)$ to be Quasiconvex and Quasiconcave using the concept of bordered Hessian matrix.

(b) Solve the following linear fractional programming problem by the Simplex algorithm

$$\text{Max } z = \frac{x_1}{x_1+x_2+1}$$
subject to $x_1 + x_2 \leq 1$
$$x_1 + 2x_2 \leq 1$$
$$x_1, x_2 \geq 0$$

[4,6][CO4,CO5]

2

End Term Examination
8th Semester (B.Tech), May 2023
Fuzzy Sets and Fuzzy Logic(MC-432)

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

Note: Attempt any five questions questions.

Q 1. (a) Consider fuzzy sets $\tilde{A}$ & $\tilde{B}$ defined on the set of real numbers in the interval $[0, 10]$ with membership function as: (i) $\mu_A(x) = \frac{x}{x+2}$, (ii) $\mu_B(x) = \frac{1}{[1 + 10(x-1)^2]}$. What do these fuzzy sets physically represent? Evaluate compliment, Union, intersection and Difference of these fuzzy sets.

(b) Let $\tilde{A} = (-2, 1, 3)$ be a triangular fuzzy number. Compute triangular approximation of $\tilde{A}^{-1}$. Also, compute error approximation of $\tilde{A}^{-1}$. Show the result diagrammatically also.

                                                           CO-1,4

Q 2. Let $\tilde{A} = [1; 6; 7; 9]$, $\tilde{B} = [2; 3; 5; 9]$ and $\tilde{C} = [2; 4; 7; 10]$ are three trapezoidal fuzzy numbers. Perform the following:

(a) Aggregate Fuzzy set $\tilde{A}$, $\tilde{B}$ and $\tilde{C}$, and do the defuzzifcation using Mean of maximum (MOM) method.

(b) Perform $(\tilde{A} + 2\tilde{A}-5\tilde{A}^2)$.

                                                           CO-1,4,6

Q 3. (a) Define input on the universe X=$[0, 50, 100, 150, 200]$ on the output universe Y=$[0, 50, 100, 150, 200]$. Two fuzzy sets $\tilde{A}$, $\tilde{B}$ on X as:
$\tilde{A} = \{\frac{0.9}{0} + \frac{0.8}{50} + \frac{0.3}{100} + \frac{0.6}{150} + \frac{0.1}{200}\}$
$\tilde{B} = \{\frac{0.1}{0} + \frac{0.9}{50} + \frac{0.7}{100} + \frac{0.8}{150} + \frac{0.1}{200}\}$
and a fuzzy set $\tilde{C}$ on Y as:
$\tilde{C} = \{\frac{0.3}{0} + \frac{0.1}{50} + \frac{0.4}{100} + \frac{0.6}{150} + \frac{0}{200}\}$
Define a fuzzy relation "$If\ \tilde{A}\ Then\ \tilde{B}\ Else\ \tilde{C}$".

(b) again continuing with above example suppose $\tilde{A}$ ia replace by $\tilde{A}' = \{\frac{0.7}{0} + \frac{0.8}{50} + \frac{0.4}{100} + \frac{0.4}{150} + \frac{0.2}{200}\}$ then compute new $\tilde{B}$ say $\tilde{B}'$.

                                                           CO-1,2,3

Q 4. (a) Draw A general scheme of a fuzzy controller for evaluating human behaviour and explain.

(b) Explain fuzzy inference system using Mamdami model.

                                                           CO-4,5

Q 5. (a) Given $\tilde{A}$ and $\tilde{B}$ as triangular fuzzy numbers defined as $\tilde{A} = (-2, 0, 2)$, $\tilde{B} = (2, 4, 6)$, find $\max(\tilde{A}, \tilde{B})$ and $\min(\tilde{A}, \tilde{B})$. Is $\tilde{A} > \tilde{B}$?

(b) What do you mean by fuzzy equivalence relation. Give its graphical representation and matrix representation.

CO-1,2,6

Q 6. Let $\tilde{A} = (-2, 0, 2)$, $\tilde{B} = (2, 4, 6)$ and $\tilde{C} = (1, 4, 6)$ be three triangular fuzzy numbers.

(a) Calculate $\tilde{A} \oplus \tilde{B} \odot \tilde{X} = \tilde{C}$ and find the value of $\tilde{X}$ if exists.

(b) Evaluate possible errors.

CO-1,2,6

408

VI SEMESTER
B.Tech

END TERM EXAMINATION   May-2023

MG302 - Fundamental of Management

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 Discuss the five basic human needs   [10 Marks][CO#1]

Q.2 What is PESTEL analysis   [10 Marks][CO#1]

Q.3 Explain the key financial instruments traded in the stock market?
                                                 [10][CO#2]

Q.4 Discuss the 4 P's of marketing.   [10 Marks][CO#2]

Q.5 What are the differences between marketing and selling?
                                                 [10 Marks][CO#3]

Q.6 Discuss DIKW model.   [10 Marks][CO#3]

ЧⅠⅠ

FOURTH SEMESTER   B.Tech.   (Branch -Production-)

END SEMESTER EXAMINATION MAY 2023

PE 202   THERMAL ENGINEERING-II

Time : 3 hr   Max Marks: 40

Answer **ALL** questions. Assume missing data suitably if any.

1(a)   Derive expression for intermediate temperature of an Otto cycle for maximum work done per kg of air in which the upper and lower temperature limits are T_3 and T_1 .

(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 27^0 C respectively. Heat is added till the temp at the end of constant pressure is 1500^0 C. Determine (i) pressure and temperature at all salient points (ii) Cut off ratio (iii) heat supplied per kg of air (iv) air standard cycle efficiency (v) mean effective pressure.   (3,5) [CO1]

2(a)   Show that the maximum specific net work output of gas turbine cycle $W_{max} = C_p (\sqrt{T_{max}} - \sqrt{T_{min}})^2$ where T_{min} and T_{max} are minimum and maximum temperature of brayton cycle.

(b)   A gas turbine power plant consists of two stage compressor and single stage turbine. An intercooler is used between two stages of compressor. The air is taken to the compressor at 1 bar and 300 K and the maximum temperature in the cycle is limited to 1100 K. The pressure ratio is 7. If the plant capacity is 10 MW, find (i) Thermal efficiency of plant (ii) fuel consumption and air flow rate in kg/hr. calorific value of fuel = 39780 kJ / kg . Don't neglect the fuel quantity.   (3,5) [CO2]

3(a)   Derive the expression for work done in two stage air compressor. State the merits of multi stage compressor.

(b)   A single acting two stage compressor with complete intercooling delivers 10 kg/min of air at 15 bar. The suction occurs at 1 bar and 300 K.

The compressor runs at 450 rpm. The compression and expansion processes are reversible and assume n= 1.3. Determine (i) the power required to drive the compressor (ii) the isothermal efficiency (iii) the free air delivery and (iv) the heat transferred in intercooler. If the clearance ratios for LP and HP cylinders are 0.04 and 0.06 respectively, calculate swept and clearance volumes for each cylinder   (3,5) [CO3]

4(a)   Explain the working principle of centrifugal compressor with a neat sketch.

(b)   Define the following : (i) Thermal diffusivity (ii) Thermal resistance.Derive the expression for critical thickness of insulation for sphere .   (4,4) [CO4, CO5]

5(a)   Derive the expression for rate of heat transfer and overall heat transfer coefficient for three layered composite cylinders.

(b)   A reactor wall 300 mm thick is made up of an inner layer fire brick (k = 0.9 W/m/K) covered with a layer of insulation (k = 0.12 W/m/K). The reactor operates at a temperature of 1600 K and outide wall temperature 300 K. Determine the thickness of firebrick and insulation which minimises heat loss. Also calculate the heat loss such that insulation material has a maximum temperature of 1473 K   (4,4) [CO5]

6(a) Air at 30°C is flowing over a flat plate which is 200mm wide and 500mm long. The plate is maintained at 90°C. Find the heat loss per hour from the plate if the air is flowing parallel to 500mm side with 2m/s velocity. Take the properties of air at mean temperature 60° C. $v = 18.97 \times 10^{-6}$ m² /s ; $\rho = 1.06$ kg/m3 ; k=28.96 × 10^{-3} W/Mk ; Cp = 1.005 kJ / kgK

(b)   Explain the various laws of radiation heat transfer.   (4,4) [CO6]

7   Explain the following:
    (i) Gas turbine cycle with regeneration
    (ii) Surging and choking of compressor.   (3,5) [CO2, CO4]

6b Find the initial feasible solution of the following Transportation problem using Vogel's Approximation Method [CO3] 4

Destinations

		D	E	F	G	Supply
	A	8	2	4	6	155
Sources	B	2	5	4	3	140
	C	5	7	3	4	90
	Demand	70	120	90	80	

7a A project consists of four major jobs for which an equal number of contractors have submitted tenders. The tender amount quoted (in Lakhs of rupees) is given in the matrix. Find the assignment which minimize the total cost of the project, when each contractor has to be assigned at least one job and a job cannot be divided. [CO3] 4

Jobs

		A	B	C	D
	1	10	24	30	15
Contractors	2	16	22	28	12
	3	12	20	32	10
	4	9	26	34	16

7b What is the condition for an infeasible solution while solving linear programming problem using simplex method? What you will do in such a situation? Also discuss your actions if you encounter unbounded solution of the linear programming problem. [CO4] 4

Total No. of Pages: 04   Roll No...............
4th Sem
B.Tech
END SEMESTER EXAMINATION   May -2023
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 With the help of Input-Output production system diagram, explain productivity, efficiency and competitiveness.   CO1   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   4

2a Explain
(i) Product Layout and Process Layout
(ii) Make or Buy Decision   CO1   4

2b A retailer purchases Strawberries every morning at Rs 120 per box and sell them at Rs 200 per box. Any box remaining unsold at the end of the day can be disposed off next day at a salvage value of Rs 50 per case. (Thereafter it has no value). Past sales have ranged from 20 to 24 boxes per day. The following is the records of sales for the past 100 days.   CO5   4

Boxes sold	20	21	22	23	24
No of Days	10	20	30	25	15

Determine how many boxes the retailer should purchase per day to maximize his profits?

3a Briefly discuss the Delphi technique of Demand [CO4] 4
Forecasting.
A retail store located in Delhi needs to forecast the demand of television at its store. It believes that the sales at its store is related to the sales of television in Delhi. The data of last seven years is as below. If the next year sales in Delhi is expected to be 8 crores, forecast the next year 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 [CO4] 4
is given below. Using Exponential Smoothing Method with Alpha = 0.2 and 0.7, forecast the demand for 9th week. Calculate the forecast error and comment.

Week	Demand	Week	Demand
1	20	5	9
2	17	6	4
3	12	7	6
4	14	8	5

4a With the help of a neat diagram, discuss the Q-R [CO4] 4
inventory systems for procurement and Production cases.
Develop the relation for Economic Order Quantity for the procurement system.

4b Convert the following Primal into Dual by following all the steps:
Max Z = 6x1 + 3x2 + 5 x3   [CO3] 4
Subject to
3X1+5X2 +X3<=25
4X1+2X2 +7X3=18
3X1+5X3 >=10
X1, X2 >=0, X3 is unrestricted

5a ABC Ltd sells two products Sofa and Chair. To [CO4] 4
produce one unit of Sofa, 2 units of material X and 4 units of material Y are required. To produce one unit of Chair, 3 units of material X and 2 units of material Y are required. As the raw material is in short supply not more than 16 units of each material (i.e. X and Y) can be used. The profits per unit from selling Sofa and Chair are Rs 25,000 and Rs 5,000 respectively. At least 2 units of sofa must be produced and sold.
You are required to formulate a mathematical model and solve it graphically so as to maximize its profits.

5b Solve the following problem using Simplex [CO3] 4
Method
  Max Z = $5x_1 + 3x_2$
  s.t. $x_1 + x_2 \le 2$
        $5x_1 + 2x_2 \le 10$
        $3x_1 + 8x_2 \le 12$
  $x_1 , x_2 \ge 0$

6a Solve the following transportation problem to minimize the cost of transportation. Use North West Corner rule to find the initial feasible solution. [CO3] 4

Destinations

	D	E	F	G	Supply
A	8	2	4	6	155
B	2	5	4	3	140
C	5	7	3	4	90
Demand	70	120	90	80	-

Sources

B Tech [Prod & Indl Engg.]   **Fourth Semester**
End Sem Exam   (May - 2023)
PE – 206 : Fluid Mechanics & Machinery
Time: : 03 Hrs   Max Marks. 40

Note: Question No. 1 is Compulsory.
Attempt four Questions more from the rest of the Question Paper.
In total attempt Five Questions.
Assume missing data, if any.

Q No. 01   Differentiate between.   (02x4=08)

    (i) – Impulse and Reaction turbine.   [CO 01,

    (ii) – Finite and Infinite control valves   02 & 03]

    (iii) – Hydraulic Pump and Hydraulic motor

    (iv) – Open loop and close loop control

Q No. 02 (a) What is Capillarity? Also explain the mechanism of   (04)
Capillarity rise and fall in brief.   [CO 04]

Q No. 02 (b) What do you understand by Compressibility of fluid? Also   (04)
mention the factors on which it depends?   [CO 03]

Q No. 03 (a) Differentiating between Direct and Indirect measurement of   (04)
pressure, also mention one example of each.   [CO 05]

Q No. 03 (b) Differentiate between Specific gravity, Specific volume and (04)
Specific weight.   [CO 02]

Q No. 04 (a) Mentioning various differential head type of flow measuring (04)
devices, describe about any one type of it in brief.   [CO 01]

Q No. 04 (b) What are various flow measuring devices, which are based on   (04)
principles other than differential head type?   [CO 01]

Q No. 05 (a) What are the various parts of the Valve symbol? Show with an (04)
example of any 2x2 valve.   [CO 04]

Q No. 05 (b) Differentiating between Hydraulic and Pneumatic systems,   (04)
explain working of any of it with an example.   [CO 03]

16

Q No. 06 (a) Mentioning Principle of Operation of Reciprocating pump, (04)
also differentiate between single acting and double acting [CO 05]
reciprocating pump.

Q No. 06 (b) Showing various components of Centrifugal pump, describe (04)
the Principle of Operation of it. [CO 02]

Q No. 07 (a) What are various criterion on which the classification of (04)
Turbines may be done? Discuss in brief. [CO 01]

Q No. 07 (b). How the Specific speed of Turbine and Pump is defined? (04)
Mention in brief all the terms involved with it. [CO 04]

Q No. 08 Write short notes on any two of the following. (2x04=08)
(i) – Cavitation [CO 01,
(ii) – PID Control 02 & 03]
(iii) – CFD
(iv) – Hydraulic circuit

Total No. of Pages : 02

FOURTH SEMESTER

END SEMESTER EXAMINATION

417

Roll No. ......

B.Tech. (PE)

May-2023

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 Derive the shear angle relationship based on Merchant's [5][CO#2] minimum energy principle. State the assumptions made.

b From the machining performance viewpoint, which type of chip [3][CO#1] is preferred. Under what machining conditions, a ductile material like aluminium will give discontinuous chips?

2a Show that, when cutting metal orthogonally with a tool of zero [5][CO#3] rake angle, the rate of heat generation (P_s) in the shear zone is given by

$P_s = F_c \cdot V(1 - \mu r_c)$

where F_c = Cutting force
V = Cutting speed
μ = Mean coefficient of friction on the tool face
r_c = Cutting ratio

b What important role the chip breakers play during machining of [3][CO#1] the metals?

3a What is Tool life criteria? Explain the following kinds of tool [5][CO#4] damage:
(i) Flank wear
(ii) Crater wear

b What is the role of cutting fluid in grinding? [3][CO#5]

4a An automatic lathe is to be used to machine brass components 418 [5][CO#4]
75 mm long x 50 mm diameter using a depth of cut of 1.25 mm.
Assume that
Labour + Overhead rate = Rs. 5/hr
Reconditioning cost of the tool edge = Rs 0.25/edge
Loading and unloading time of the workpiece =15 sec.
Tool change time =5 min.
Feed =0.2 mm/rev.
Tool life relationship = $VT^{0.25}$ = 300
Calculate
(i) Optimum cutting speed for minimum cost
(ii) Corresponding tool life

b How do you interpret machinability of metal on the basis of [3][CO#4]
surface finish?

5a What is the measure of performance of a grinding wheel? Why [5][CO#5]
are specific energy values so much higher in grinding than in
traditional metal cutting processes?

b What are the different causes of grinding wheel wear? [3][CO#5]

6a A 10° back rake tool is to be used for machining on a lathe at a [5][CO#6]
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/mm². 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× 10³ kg/mm².

b What are the steps that have to be considered when cutting tools [3][CO#6]
have to be designed?

7a How broaches are classified? Explain with the help of a figure [5][CO#6]
the different portions of a pull type broach?

b State the advantages and disadvantages of Jigs and Fixtures. [3][CO#6]

END SEM. EXAMINATION   [MAY 2023]

PE252 MANUFACTURING MACHINES

Time: 3 Hrs.   Max. Marks: 40

> **Note:** Answer *Any Four* questions. Assume suitable missing data, if any.

1[a] Sketch various views of a RH, tapered shank twist drill and also explain its various elements and angles.   5 [CO 3]

[b] Explain the procedure to perform the following operations on a drilling machine .

(i) Tapping operation, M12×1.75

(ii) Reaming operation, Φ12.0 mm   5 [CO 3]

2[a] Differentiate the following briefly.

(i) Plain and Universal column and knee type milling machine

(ii) Up milling and down milling   5 [CO 4]

[b] With a neat sketch discuss the procedure to make a spur gear of following specification on a milling machine.
Gear specification: Diametral pitch (Dp) =16. Total nos. of teeth 16.
Gear material: Low carbon steel, Cutter material: HSS.   5 [CO 4]

3[a] With a neat sketch explain the working principle of an automatic feed mechanism of a standard shaper.   5 [CO 5]

[b] With a neat sketch explain inclined machining operation on a standard shaper. How are the cutting parameters controlled in this operation?   5 [CO 5]

PTO

4/20

4 [a] What is centreless grinding. With neat sketches discuss the working principle of various types of centreless grinding. 5 [CO6]

[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]

[5] Write short notes on the following [*Any Four*]

(i) Types of cutting fluids

(ii) Eccentric turning

(iii) Plain and side milling cutters

(iv) Differences in shaper and planer

(v) Wheel loading and glazing 10 [CO 1,2,4,5,6]

END

Total No. of Pages: 02

SIXTH SEMESTER

END SEMESTER EXAMINATION

Roll No. ......

421

B.Tech. (PE)

May-2023

PE302 Welding Technology

Time: 3:00 Hours

Max. Marks: 40

Note: Answer all questions.
All questions carry equal marks.

1a What are the functions of coating in coated electrode? What are [4][CO#3] Low hydrogen electrodes?

b Discuss the self-adjustment of welding arc and the type of [4][CO#3] power source, which will be selected for this purpose.

2a Differentiate between plasma arc welding and gas tungsten arc [5][CO#2] welding.

b Mention the characteristics of argon and helium as shielding [3][CO#3] gases.

3a Why is Submerged arc welding often limited to flat position [5][CO#2] welding and circumferential welding of pipes? Mention the advantages and applications of electroslag welding process.

b How is brazing different from soldering? [3][CO#1]

4a Describe the different types of lasers that are generally used in [5][CO#6] Laser beam welding process.

b Mention the advantages and applications of friction stir welding [3][CO#6] process.

5a A liquid penetrant test may be used for detecting defects in a [5][CO#4] welded joint:

(i) Outline the principle of this technique.

(ii) What type of defects may be revealed?

b Explain the principle of explosive welding. [3][CO#6]

6a Discuss the principle of operation and advantages of electron [5][CO#6] beam welding process.

b What property of Aluminum makes it different than the [3][CO#5] welding of steels?

4|22

7a Explain causes and remedies for the following welding [5][CO#4]
defects:
(i) Cracks (ii) Incomplete fusion (iii) Undercut

b What is the function of sonotrode in ultrasonic welding? [3][CO#6]

423

Precision Manufacturing.
PE-304
B.Tech (Production) - VI Sem

Time - 3 Hrs.

MM-40

Note: Attempt any 5 Questions & all Questions carry equal marks.

Q1 a, What is Precision Engineering.Discuss accuracy and smoothness and its need.
b, Elaborate various types of materials used for tools and machine elements .   [08][CO1]

Q2 a, Elaborate Hydrostatic, Hydrodynamic, Aerostatics and Aerodynamics bearings with their usage in industries.
b. Determine the cutting speed machining time per cut when work having 35mm diameter is rotated at 200RPM , FEED GIVEN IS 0.2MM/REV and length of cut is 60mm. [08][CO2]

Q3 a, Calculate the power required during cutting of a low carbon steel bar 45 mm diameter of cutting force 150 kg at 200RPM.
b, What is Computer Aided Process Planning.Explain Generative, Interactive feature Based and Technology oriented CAPP' with schematic diagram. Also discuss its advantages and limitations. [08][CO3]

Q4 Discuss sources and types of errors in Precision Manufacturing. Also elaborate the methods to control these errors. [08][CO4]

Q5 Describe Ultrasonic and Laser Beam Machining with schematic diagrams, principles involved, advantages and limitations.[08][CO4]

Q6 What is MEMS? Discuss their design and role in today's industries specifically in Automotive, Defence, Aerospace and Power sectors with suitable examples. [08][CO5]

End Sem Exam   (May - 2023)

424

PE – 306 : (Metrology and Quality Assurance)

Time: : 03 Hrs   Max Marks. 40

> Note: Question No. 1 is Compulsory.
> Attempt four Questions more from the rest of the Question Paper.
> In total attempt Five Questions.
> Assume missing data, if any.

Q No. 01 Differentiate between.   (02x4=0
    (i) – Roughness and Waviness of the surface.   8)
    (ii) – Hole basis and Shaft basis system.   [CO 01,
    (iii) – Direct Measurement and Comparison Measurement
    (iv) – Form and Profile in Geometrical Tolerance.   02 & 03]

Q No. 02 (a) Differentiating between Repeatability and Reproducibility, also   (04)
discuss their significance in brief.   [CO 04]

Q No. 02 (b) A Platinum resistance thermometer is calibrated in an   (04)
environment at a temperature of 15°C and has the following   [CO 03]
Resistance/Temperature characteristic.

Measurement with Calibrated Platinum Resistance Thermometer

Resistance (Ω)	0	3	6	9	12	15	18	21	24
Temperature (°C)	0	16	32	48	64	80	96	112	128

Two other similar Platinum resistance thermometer A and B have been used in an environment at a temperature of 50°C and the following Resistance/Temperature characteristic were measured.

Measurement with Platinum Resistance Thermometer A

Resistance (Ω)	2	5	8	11	14	17	20	23	26
Temperature (°C)	0	16	32	48	64	80	96	112	128

Measurement with Platinum Resistance Thermometer B

Resistance (Ω)	2	6	10	14	18	22	26	30	34
Temperature (°C)	0	16	32	48	64	80	96	112	128

Determine the Drifts present, if any, in Platinum Resistance Thermometers A and B with change in temperature (Calibrated), along with the respective values of Drift.

Q No. 03 (a) What are various types of Standards in Metrology? Explain by   (04)
making a comparison between them.   [CO 05]

Q No. 03 (b) Explaining advantages and disadvantages of Limit Gauges,   (04)
Differentiate between Plug Gauge and Progressive gauges.   [CO 02]

Q No. 04 (a) What is the purpose and procedure of Wringing of Slip Gauges? (04)
Also mention applications of slip gauges in brief. [CO 01]

Q No. 04 (b) Find out the blocks that would be selected from the Set M 87 of (04)
Slip Gauge for creating a dimension of 73.575 mm. [CO 03]

Slip Gauge Set M 87			
	Range	Steps	No. of Pieces
1-	1.0005 mm	–	1
2-	1.001 – 1.009 mm	0.001	9
3-	1.01 – 1.49 mm	0.01	49
4-	0.5 – 9.5 mm	0.5	19
5-	10 – 90	10	9

Q No. 05 (a) What are various types of Orientation features of Geometrical (04)
Dimensioning? Mention about any two in brief. [CO 04]

Q No. 05 (b) For a Hole Shaft system having basic size as 80.00 mm, the (04)
following data is given. [CO 03]
Maximum Metal limit on Shaft = 80.007 mm
Maximum Metal limit on Hole = 80.00 mm
Maximum Size of Hole = 80.046 mm
Minimum Size of Shaft = 79.95 mm
Find out. (i) – What type of Fit it is?
(ii) – What is the Allowance?

Q No. 06 (a) What are various elements of Gear measurement? Describe in (04)
brief. [CO 05]

Q No. 06 (b) Explain different tests conducted for Machine Tool Alignment in (04)
brief? [CO 02]

Q No. 07 (a) What is the principle on which Autocollimator works? Mention its (04)
working along with its application in brief. [CO 01]

Q No. 07 (b) What is the purpose of Pneumatic comparator? Describe its (04)
working in brief. [CO 04]

Q No. 08 Write short notes on any two of the following: (2x04=0
(i) – Sine bar. 8)
(ii) – Taylor's principle of Gauge design.
(iii) – Surface Roughness symbol. [CO 01,
(iv) – Dial Indicator. 02 & 03]

VI SEMESTER

B.Tech (Prod./Other Branches)

END TERM EXAMINATION   *MAY-2023*

PE-308   **Green Energy Technology**

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) Illustrate the importance of energy for a developing country like India? What is the present state of energy production and consumption in India?	10 marks (5+5)	CO-1
	(b) Analyze the future availability trend of fossil fuel in the world? Predict whether these fuels going to be extinct in the near future.		
Q.2	(a) Write a comprehensive note on different facets of the ecosystem.	10 marks (5+5)	CO-2
	(b) Why the sustainable development is a need of the hour? Write down a comprehensive note.		
Q.3	(a) Outline the role of an individual in society in preventing pollution and adapting green energy in developing countries.	10 marks (5+5)	CO-3
	(b) Demonstrate measures you think should be taken to make the DTU campus self-sustainable.		
Q.4	(a) Describe Green Building, mentioning its features and overall benefits towards sustainability.	10 marks (5+5)	CO-4
	(b) Identify and compare various green building rating systems/codes.		

Please Turn Over for remaining four questions

Q.5	(a) What is meant by carbon capture and storage and how it can help reduce global warming problems?	10 marks (5+5)	CO-5
	(b) Describe the vital importance of hydrogen as a sustainable energy source for mitigating climate change.		
Q.6	(a) Discuss the need for energy storage. Also, give a classification of different energy storage systems with a brief introduction.	10 marks (5+5)	CO-6
	(b) Illustrate the working of batteries used in electric cars and modern-day vehicles and examine the problems associated with their disposal.		
Q.7	(a) What innovative solution can you propose to convert waste into energy for a metro city like Delhi?	10 marks (5+5)	CO-7
	(b) Explain the need & potential of using biofuels in the present Indian energy scenario.		

Q.8	Write short notes on any two of the following:
	  a. COP27
	  b. Carbon Sequestration
	  c. Phase change materials
		10 marks (5+5)	CO-2
			CO-5
			CO-6

428.

Roll No...............

SEM.: SIXTH

B. Tech. Production Engg.

END TERM EXAMINATION

May - 2023

Paper Code: PE - 312, Course Title: Automobile Engg.

Time: 3 Hours

Max. Marks: 50

Note : (i) Attempt All questions.

(ii) All questions carry equal marks.

(iii) Assume suitable missing data, if any.

1. Answer any five of the following questions:

[a] What are the two basic function of fuel injector?
CO- 1[2]

[b] Name electrical systems of automobile. CO- 2[2]

[c] What do you understand by Hydraulic brakes?
CO- 3[2]

[d] What do you understand by Suspension System?
CO- 4[2]

[e] What do you mean by principal of steering? CO- 5[2]

[f] Difference between brake down and preventive maintenance of an automobile CO- 6[2]

2. Answer any TWO questions out of the following:

[a] With the help of neat sketches explain the working of Battery Ignition system of four cylinders S.I. Engine.
CO- 2[5]

[b] Name the different types of cooling systems used in an modern automobile. State the function of thermostat used in cooling system. CO- 2[5]

[c] Draw the neat sketch of four stroke of Diesel Engine and explain its working. CO- 1[5]

4 29

3. Answer any TWO questions out of the following:
   [a] Explain with the help of a neat sketch Principle, Working of Mechanical brake systems   CO- 3[5]
   [b] What do you mean by steering? Explain the Ackerman principle of correct steering.   CO- 5[5]
   [c] What do you mean by powered brake? Explain Hydraulic brake.   CO- 3[5]

4. Answer any TWO questions out of the following:
   [a] Name the different types of suspension systems used in modern automobile. Explain independent suspension systems   CO- 4[5]
   [b] What are the purposes and characteristics of rigid axle suspension system?   CO- 4[5]
   [c] What do you mean by steering a vehicle? With the help of neat sketch explain Centre point Steering.   CO- 5[5]

5. Answer any TWO questions out of the following:
   [a] Explain the following terms with respect to an automobile: Maintenance and servicing   CO- 6[5]
   [b] With the help of neat sketch explain the different types of fuel systems used in a heavy duty C. I. engines. CO- 1[5]
   [c] How will you find the faults in the engine? What are the engine common faults and their remedies?   CO- 6[5]

U29-A   Roll No. ....

PT404 – POLYMER PRODUCT AND DIE DESIGN

Time – 3 Hours

Max Marks: 40

Note :   Answer any five questions.

Assume suitable missing data, if any

1[a]. Discuss the term "product design". Define the characteristics of the successful product design. (4)

[b]. Describe the stress-strain behaviour of plastics. How do you perform stress analysis in plastics. (4)

2[a]. What is a "molding cycle" in injection molding. Explain the design limitation of product based on processing techniques. (4)

[b]. Define two platen and three platen moulds with appropriate figure. (4)

3[a]. Define sprue, runner and gate. What are the factors on which optimum size of gate depends. (4)

[b]. Explain the following with appropriate illustrative sketches. (4)

I.   Holes

II.   Threads

4[a]. Briefly discuss product design features along with properties of some common cross-sections based on mechanical engineering analysis. (4)

[b]. Give an outline for testing and quality control for a polymer product. (4)

5[a]. With the help of suitable examples, discuss the designing of an injection molded product. (4)

[b] Differentiate between parting line and weld line. Discuss the role of tolerance for designing a polymer product. (4)

6[a]. Write about the criteria for the selection of a material for a polymer product. (4)

[b] Define die design criteria. What are the different types of dies used in extrusion process. Explain one of them with appropriate diagram. (4)

8ᵗʰ SEMESTER 430

B.TECH

END SEMESTER EXAMINATION

MAY 2023

PE 412 SUPPLY CHAIN MANAGEMENT & VALUE ENGINEERING

Time 3 Hour   Max. Marks: 50

Note: Question no. 6 is compulsory
 Answer any four questions from remaining
     Assume suitable missing data, if any

1. Explain push-pull supply chain system with an example. why is it called an ideal matrix? (Marks 10) (CO#1)

2. Discuss the MRP in Manufacturing planning and control system in detail. (Marks 10) (CO#2)

3. A speciality pharmaceutical company is considering expanding its operations into Middle Asia, when five companies dominate the consumption of speciality pharmaceuticals. What sort of distribution network should this company utilize? (Marks 10) (CO#3)

4. You are the CEO of a small electrical manufacturing firm that is about to develop a global strategy. Would you prefer a speculative strategy, a hedge strategy, or a flexible strategy? Would your answer to this question change if you were the CEO of a large electrical firm? (Marks 10) (CO#3)

5. For an item, the annual demand is known to be 4000 units which is uniformly distributed over the year. The unit cost of the item is Rs. 350 and the holding cost is 10% of the value. It costs Rs 500 to place an order for this product. Determine (a). Economic order quantity. (b) The Change in EOQ when the ordering cost changes to Rs. 600 (c) The Change in EOQ when the holding cost becomes 8% of the item value (d) Number of orders per year (e) Optimal time between two consecutive orders (Marks 10) (CO#4)

CASE STUDY

Selecting Transportation Models for China Imports

Jackie Chen, vice president of China Imports, was looking to design a framework to select transportation modes for various products imported from China to the United States. His basic options were to either use air freight or ocean shipping in 20-foot containers. Air freight was faster and more reliable, but ocean shipping was much cheaper. He decided to evaluate the shipping decision for two very different product categories consumer electronics, such as smartphones, and decorative hardware, such as door handles and hinges.

China Imports provided a variety of products to its customers from a warehouse near the port of Long Beach, California. The company incurred a holding cost of 25 percent on all inventory held and aimed to provide a 98 percent cycle service level on its products. The high level of service aligned with the high quality of products that the company imported.

Transportation Options from China

Air freight and ocean shipping were the two options available to move product from China to the United States. Air freight charged $10 per kilogram shipped and required a minimum shipment of 50 kg. Besides being fast, air freight was also quite reliable. The average lead time on air freight was one week, with a standard deviation of lead time of 0.2 weeks. Ocean shipping was much cheaper and cost $1,200 per 20-foot container. Given that each container could hold up to 15,000 kg, the shipping cost per kilo by ocean was more than a hundred times cheaper than air freight. Ocean shipping, however, took longer and was less reliable. The average lead time using ocean shipping was nine weeks, with a standard deviation of three weeks.

Product Characteristics

Weekly demand for smartphones averaged 1,000 and had a standard deviation of 400. Each smartphone cost $300 and weighed 0.1 kg. The typical life cycle for a smartphone was about one year; it was critical to not lose demand early in the life cycle because of a lack of product availability. Weekly demand for decorative hardware averaged 5,000, with a standard deviation of 1,000. Each unit of decorative hardware cost $20 and weighed 1 kg. Decorative hardware tended to have a long life cycle the company was still selling door handles and hinges that were introduced more than a decade earlier.

Question

6. What other factors should be considered in the choice of transportation mode? What mode would you recommend for each product? Suggest a general framework that Jackie can use across all product categories. (Marks 10) (CO# 4,5)

432   Roll No..........

8th Semester

B.Tech

End Term Examination   May-2023

PE414   Flexible Manufacturing Systems

Time:03:00 Hours   Max. Marks: 50

> **Note:** Answer any five question only, question 7 is compulsory.
> All questions carry equal marks.
> Assume suitable missing data, if any.

Q1. (a) Discuss about the key components of FMS database system.

[CO# 2]

(b) Does Artificial Intelligence/ Machine learning increase the degree of flexibility in Manufacturing System?   [CO# 5]

Q2. (a) What are the common challenges in implementation of FMS?

[CO# 1]

(b) List out the advantages of FMS in prismatic component production.   [CO# 5]

Q3. (a) How simulation be used to model a Flexible Manufacturing System? What are the limitations of simulation?   [CO# 3]

(b) What are the five assumptions in Knowledge Based Scheduling System?   [CO# 4]

Q4. (a) How possibility distributions in FMS systems are justified

[CO# 5]

(b) How can FMS technology be used to optimize material usage and reduce waste in manufacturing operation?   [CO# 4]

Q5. (a) Construct precedence diagram and compute balance delay and line efficiency.   [CO#3]

Element no	1	2	3	4	5	6	7	8	9	10	11	12
Predecessor element	-	1	2	1	4	3,5	6	7	6	6	10	8,9,11
Time(Sec)	5	3	4	3	6	5	2	6	1	4	4	7

(b) List out the key operations of an industry into different categories of FMS software with brief explanation. [CO#2]

Q6. (a) What do you mean by predictive control of FMS?

(b) How FMS is applied in sheet metal fabrication? Explain. [CO#5]

Q7. Write Short Notes on: (Any five) [5X2=10]
  (i) Group Technology
  (ii) Cellular Manufacturing cell
  (iii) Mathematical Modelling
  (iv) Part families
  (v) Computer-aided Process Planning
  (vi) Coordinate Measuring Machines
  (vii) Elements of FMS

FOURTH SEMESTER

B.Tech

END TERM EXAMINATION   May 2023

COURSE CODE: SE 202   COURSE TITLE: OOSE

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) Explain macro and micro process of Booch Methodology.
                                                  [3][CO1]

(b) What are the various requirement elicitation techniques. Which requirements elicitation is most popular? Explain.   [5][CO3]

Q.2 . Consider a course scheduling system (CSS) for scheduling courses in Delhi Technological University. The purpose of CSS is to:

(i) enable entering data of courses, faculty members, the available facilities.

(ii) calculate and propose schedule for courses.

(iii) enable to manually update the proposed schedule, but keep track of the consistent schedule.

- Entering programs and courses: An administrator should be able to enter new program and its running period. A data entry operator should be able to enter details of courses with their examiners. The examiner should be able to upload lecture, tutorials, projects, etc.

- Entering resources: An administrator should be able to enter information about lecture rooms and laboratories in which classes will be taken place.

- Scheduling: It provides schedule proposal, the days and time, and places where they can be scheduled. The scheduler allows

some manual predefinition of the schedule. It shows if there are any conflicts.

Draw the following using standard notations. If necessary, you can make suitable assumptions regarding the details of various features of CSS, but you must clearly write down the assumptions you make.

(i) Identify use cases and actors.

(ii) Draw use case diagram for CSS

(iii) Write use case description of "Schedule Course" use case.

[8][CO5]

Q.3 Draw class diagram for the CSS given above. [8][CO5]

Q.4 Draw sequence diagram of "Schedule course" (basic flow and at least 2 alternative flows) use case of CSS. [8][CO5]

Q.5 Consider the process of scheduling course in CSS. Construct the scenario diagram, scenario matrix, test case matrix and test case matrix with actual values. [8][CO5]

Q.6 Consider the process of creating a document in Microsoft Word. Draw its activity diagram. State the necessary assumptions.

[8][CO5]

Q.7 Consider an example of stack where two operations (push and pop) are allowed. There are four events, namely, new, push, pop and destroy with the following purposes:

- New: To create an empty stack.
- Push: To push an element in the stack, if space is available.
- Pop: To pop out an element from the stack, if it is available.
- Destroy: To destroy the stack after the completion of its requirement, i.e. instance of the stack class is destroyed.

Identify the states and draw their state chart diagram.

[8][CO5]

FORTH SEMESTER

B.Tech.

END TERM EXAMINATION

May-2023

SE204a Machine Learning

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) What are different types of machine learning algorithms? [2][CO1]

b) Differentiate between linear and non-linear activation function. [2][CO2]

c) What is ensemble learning? [2][CO1]

d) What are various performance measures used for regression problem? [2][CO1]

Q.2 a) How decision tress are pruned? [2][CO1]

b) Differentiate between ID3, CART, and C4.5 algorithms. [3][CO2]

c) What key hyperparameters are required for the random forest classifier? [3][CO1]

Q.3 a) What is kernel trick? How it is useful for support vector machines? [4][CO4]

b) Consider the following dataset given below. Find the class label for the following test sample. [2][CO4]

    i.   Color = Red, Type = SUV, and Origin = Domestic

    ii.   Color = Yellow, Type = Sports, and Origin = Imported

Id No.	Color	Type	Origin	Stolen
1	Red	Sports	Domestic	Yes
2	Red	Sports	Domestic	No
3	Red	Sports	Domestic	Yes
4	Yellow	Sports	Domestic	No
5	Yellow	SUV	Imported	No
6	Yellow	SUV	Imported	Yes
7	Yellow	SUV	Domestic	No
8	Red	SUV	Imported	No
9	Red	Sports	Imported	Yes

c) Explain prior and posterior probability in Naïve Bayes with example?   [2][CO4]

Q.4 For the given feed forward network, perform forward and backward sweep using back-propagation algorithm and find the updated weights (perform computations for first iteration only). Activation function used is sigmoid function. Initial weights, bias and target output t_5 corresponding to Y_5 are provided in table. Assume $\eta = 0.5$. $b_1 = 0.6$, $b_2 = 0.7$, $w_{13} = 0.25$, $w_{23} = 0.17$, $w_{14} = 0.13$, $w_{24} = 0.29$, $w_{35} = 0.4$, $w_{45} = 0.57$, $t_5 = 1$.
    [8][CO2]
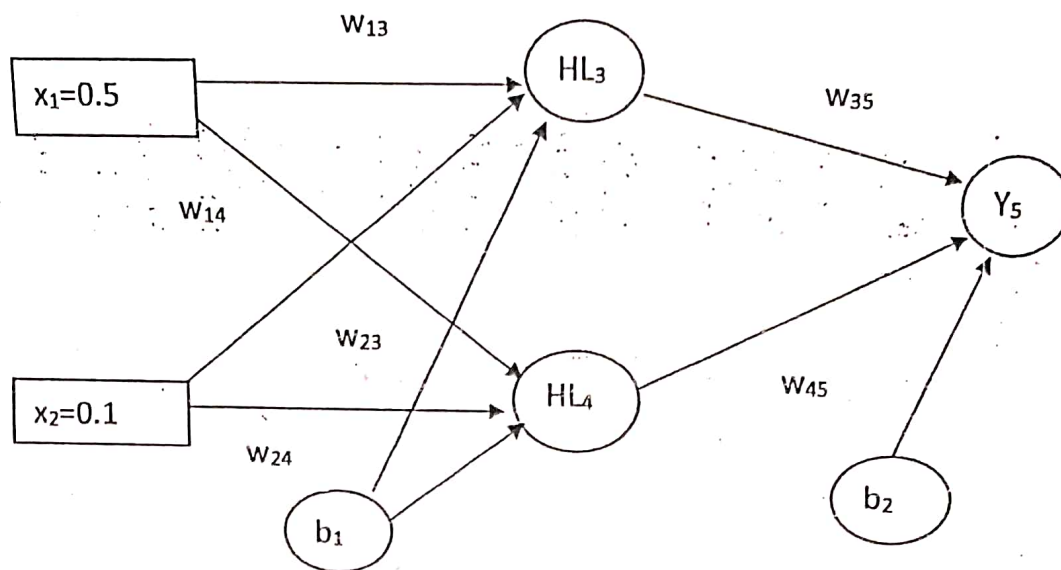
Q.5 a) Consider the following dataset given below with five with five training instances each having three attributes (pepper, ginger, and chilly). Compute the class label for test instance (pepper = false, ginger = true, chilly = true) using three-nearest neighbors (k=3) with weighted vote according to hamming distance.

Training Instance	Pepper	Ginger	Chilly	Food Liked
A	True	True	True	No
B	True	False	False	Yes
C	False	True	Tre	No
D	False	True	False	Yes
E	True	False	False	Yes

    [4][CO5]

b) Can we choose a machine learning classifier based on the size of the training set?
    [2][CO5]

c) What are advantages and disadvantages of naïve bayes classifier?
    [2][CO2]

Q.6 a) How principal component analysis is useful for dimensionality reduction. [3][CO3]

b) Compute the principal component using PCA algorithm for the given data.
$$\{3, 4, 5, 6, 7, 8, 9 \; ; 2, 6, 4, 7, 8, 9, 11\}$$

[5][CO3]

Q.7 a) Differentiate between feature selection and feature extraction. How chi-square is used for relevant feature selection. [4][CO5]

b) What functionalities are supported by the following libraries?

    i.   sklearn

    ii.   pandas

    iii.   pytorch

    iv.   numpy

[4][CO1]

IV SEMESTER
B.Tech(SE)

ENDTERM EXAMINATION   May-2023

SE206 Database Management System

Time: 03:00Hours   Max.Marks:40

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

Q.1 Consider the following relations containing airline flight [8M][CO2] information:

Flights (flno: integer, from: string, to: string, distance: integer, departs: time, arrives: time)

Aircraft (aid: integer, aname: string, cruisingrange: integer)

Certified (eid: integer, aid: integer)

Employees (eid: integer, ename: string, salary: integer)

Note: Employees relation describes pilots and other kinds of employees as well; every pilot is certified for some aircraft (otherwise, he/she would not qualify as a pilot), and only pilots are certified to fly.

Write the following queries in tuple relational calculus:

  i) Identify the flights that can be piloted by every pilot whose salary is more than rupee 100,000.

  ii) Find the eids of employees who are certified for exactly three aircraft.

  iii) Find the eids of employees who make the highest salary.

  iv) Find the eids of employees who are certified for the largest number of aircraft.

Q.2 Compare and contrast traditional file systems with database [8 M][CO 1] systems? Differentiate between relational schema and relational instance? Define the terms cardinality, optionality and degree of a relation? What are domain constraints?

Q.3 Consider a relation R with the following attributes: B (Broker), [8M][CO 3] O (Office of the Broker), I (Investor), S (Stock), Q (Quantity of stock owned by an investor) and D (Dividend paid by a stock), with the functional dependencies given below.

439

Hence, the overall schema is R= (B,O,I,S,Q,D). Now assume that the following FDs are required to hold on this database.

I → B, IS → Q, B → O, S → D

(i) List all the candidate keys for R.

(ii) Is the relation in 3NF? If yes, Justify. Otherwise carry out decomposition of R into relations that satisfies 3NF with lossless-join and preserving dependencies.

(iii) Is the relation in BCNF? If yes, justify. Otherwise find a lossless-join decomposition of R into BCNF.

Q.4 (i) Consider the following transactions with data items P and Q [6 M][CO 4] initialized to zero:

T1: read(P);
read(Q);
If P=0 then Q:=Q+1;
write(Q);
T2: read(Q); read(P);
If Q=0 then P:=P+1; write(P);

Solve and find any non-serial interleaving of T1 and T2 for concurrent execution leads to a serializable schedule or non-serializable schedule. Explain?

(ii) Check whether the given schedule S is view serializable or not. Also, draw the precedence graph. If yes, then give the serial schedule. At last, draw the dependency graph for the serial schedule.

$$S : R_1(A), W_2(A), R_3(A), W_1(A), W_3(A)$$

Q.5 (i) Which concurrency control protocols ensure both conflict [4M][CO 2] serializability and freedom from deadlock? Name and explain that protocols.

(ii) Explain ACID properties and illustrate them through examples?

**Q.6** Write a short note on the following with an example: (ANY 3)   [6 M][CO 5]

a) Indexing and Hashing
b) B tree and B+ tree
c) Data Independence
d) Log-Based Recovery
e) Dense Index and Sparse Index

4th SEMESTER
B.Tech

END TERM EXAMINATION   **May-2023**
SE208 ALGORITHM ANALYSIS AND DESIGN
Time: 03:00 Hours   Max. Marks: 50

> Note : All questions carry equal marks,
>   Choose any 5 questions from the following,
>   Assume suitable missing data, if any,

Q.1 [a] Use dynamic programming for Floyd Warshall Algorithm, find the shortest path distance between every pair of vertices. [10][CO 4]
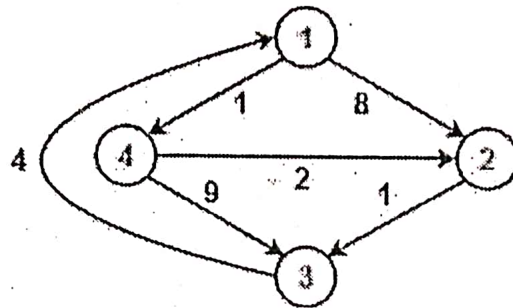

[b] Define different nodes generated by backtracking , discuss   its complexity of backtracking and also write its application.[5] [CO 5]

Q.2 a) Explain what are P and NP problems with example.   [5][CO 6]
     b) Give the running time of the following code with an explaination [5][CO 1]

```
for(i =1; i ≤ n; i = i +1){
    for(j = 1; j ≤ n; j = j * 2) {
}}
```

Q.3[a]Use Bellman Ford greedy algorithm to find the shortest path to all nodes from node A.   [5][CO 3]
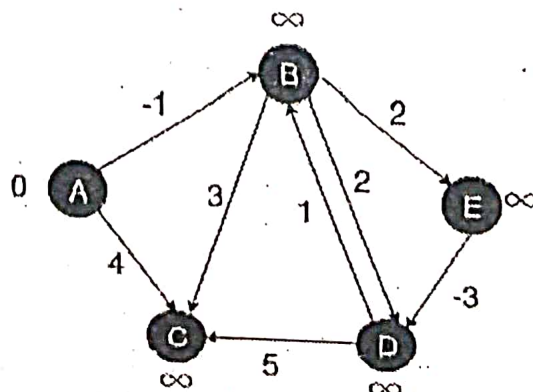
[b] Explain with steps the divide and conquer method for Strassen's algorithm for matrix multiplication for following matrices. [5] [CO2]

$$\begin{pmatrix} 1 & 3 \\ 7 & 5 \end{pmatrix} \begin{pmatrix} 6 & 8 \\ 4 & 2 \end{pmatrix}$$

Q.4 [a] Use dynamic programming to find the maximum profit to cut a rod of length 5 [5] [CO 4]

Length=	1	2	3	4	5
Price =	2	7	10	11	12

Length = 5   Rod Cutting Problem

[b] Find the recurrence relation of the following program. [5] [CO 1]

```
int P(int n {
if (n≤1) return 1;
else return 2 * P (n/2) + n; }
```

Q.5 Consider the following weighted graph and use Dijkstra's algorithm and find the shortest paths from vertex s to the other vertices in the graph. In which order are the shortest paths computed? [10] [CO3]
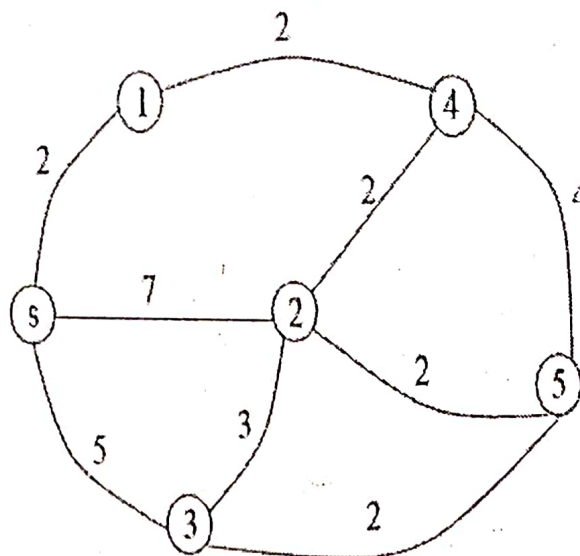
Q6 [a] Given tw—strings $X=BACDB$ and $Y=BDCB$ find the longest common subsequence using dynamic programming. Constructing the LCS Tables. Show tracing of the LCS. What is the complexity of time and space [10] [CO4,1]

[b] Define NP Hard and NP Complete problems with example

[5] [CO6]

Q7 a) Solve the Knapsack 0/1 problem using branch and bound LC N=5, capacity: m=15 weights: w1,w2,w3,w4,w5=4,4,5,8,9 Profits: p1,p2,p3,p4,p5=4,4,5,8,9 [5][CO5]

b) Explain the best case and worst case of quicksort algorithms with examples. [5][CO2]

SIXTH SEMESTER

B.Tech.

END TERM EXAMINATION   May-2023

SE302 Empirical Software Engineering

Time: 03:00 Hours   Max. Marks: 40

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

Q.1 (a) How do empirical studies in software engineering differ from those in other research areas?

(b) Differentiate between forest plot and funnel plot using defect prediction.

(c) What is publication bias? How funnel plots are useful in detection of publication bias?

(d) How can the Bugzilla system be integrated with software repositories such as CVS and SVN?

[8][CO1, CO3]

Q.2 (a) What are various experimental design types used in experimental studies?   [4][CO2]

(b) Compare and contrast various statistical tests with respect to their assumptions and normality conditions of the data.

[4][CO4]

Q.3 (a) What are various sources of data collection for conducting empirical studies? Which data source is easily accessible?

[4][CO2]

(b) What is a significance of confusion matrix? Derive confusion matrix for a three class problem?   [4][CO4]

1

Q.4 (a) What is the purpose of weighting the terms in a document? What are the steps followed to compute TFIDF. [4][CO2]

(b) Two training programmes were conducted for software professionals by an organization. Nine participants were asked to rate the training programmes on a scale of 1 to 100. Using Wilcoxon signed-rank test, evaluate whether one program is favourable over the other at 5% (one-tailed) significance level. [4][CO5]

Participant No.	Program A	Program B
1	25	45
2	15	55
3	25	65
4	15	65
5	5	35
6	35	15
7	45	45
8	5	75
9	55	85

Q.5 (a) A researcher wants to compare the performance of five learning techniques on multiple data sets (six) using the performance measure, area under the ROC curve. The data for the scenario is given below. Determine whether there is any statistical difference in the performance of different learning techniques at 5% significance level. [4][CO4]

Dataset	Technique				
	T1	T2	T3	T4	T5
D1	0.9	0.56	0.72	0.55	0.93
D2	0.89	0.69	0.69	0.59	0.48
D3	0.72	0.65	0.62	0.6	0.93
D4	0.55	0.79	0.66	0.76	0.83
D5	0.63	0.61	0.61	0.78	0.63
D6	0.69	0.54	0.9	0.65	0.79

(b) Differentiate between type-I and type-II errors. [2][CO4]

(c) What is the purpose of Bonferroni–Dunn correction? [2][CO4]

2

Q.6 (a) Identify the categories to which the following threats belong and threat mitigation for the following threats:

- Threat caused by inadequate size and number of samples.
- Threat caused by influence of human factors.
- Threat caused by measurement bias.
- Threat caused by using the same data for testing and training.
- Threat caused by usage of inappropriate performance measures.
- Threat caused by exploring only open source systems.
- Threat caused by considering inappropriate level of significance.
- Threat caused by incomplete or imprecise data sets.

[8][CO5]

Q.7 (a) Consider the following data given below, calculate the Infogain for each term. [5][CO6]

Document/Term	T1	T2	T3	T4	T5	T6	OutVar
D1	1	0	1	0	1	0	Y
D2	0	0	0	1	0	1	N
D3	0	1	1	1	0	0	N
D4	1	1	1	1	1	1	Y
D5	0	0	0	1	1	0	Y
D6	1	1	1	0	1	1	Y

(b) What is self-plagiarism? What are various tools used for plagiarism detection? [2][CO5]

(c) What is a significance of stemming in text mining? [1][CO6]

B.Tech

END TERM EXAMINATION

May-2023

SE304 COMPUTER NETWORKS

Max. Marks: 40

Time: 03:00 Hours

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 using slow start, congestion avoidance, and congestion detection.   [8][CO 4]

Q.2 a) Explain how DNS works   [4][CO 6]
     b) Explain how Network Layer provides QoS in IP Protocol
                                                                          [4][CO 3]

Q.3 [a] What is distant vector routing protocol and what are the
         limitations?   [4][CO 3]
     [b] Station A needs to send a message consisting of 9 packets to
         Station B using a sliding window (window size 3) and go-back-n
         error control strategy. All packets are ready and immediately
         available for transmission. If every 5th packet that A transmits gets
         lost (but no acks from B ever get lost), then what is the number of
         packets that A will transmit for sending the message to B?
                                                                          [4][CO2]

Q.4 [a] Draw the following encoding scheme for the bit stream:
         0001110101
         I. NRZ   II. Manchester coding   [4][CO 2]
     [b] Explain the basics of substitution and transposition cipher with
         example   [4][CO 5]

Q.5 [a] Describe CSMA/CD protocol in Ethernet. [4][CO 2]

[b] Suppose in a CSMA/CD LAN, the maximum end-to-end propagation delay is 25.6 μsec. If the line is operating in 100MBPS then what will be the minimum frame length (in bytes) of the LAN? [4][CO 2]

Q 6 [a] [a] A 10-bit data bit block of 0111010111 is to be sent using hamming code for error detection and correction. Show how the receiver corrects an error that occurs in the 6th-bit position from the right. [4][CO 2]

[b] What are the responsibilities of presentation and transport layers [4][CO 1]

Q 7 [a] Define E-Mail. Explain the basics of POP3 and IMAP mail access protocols. [4][CO 6]

[b] What will be the routing table for node A using the link state write the steps [4][CO 3]
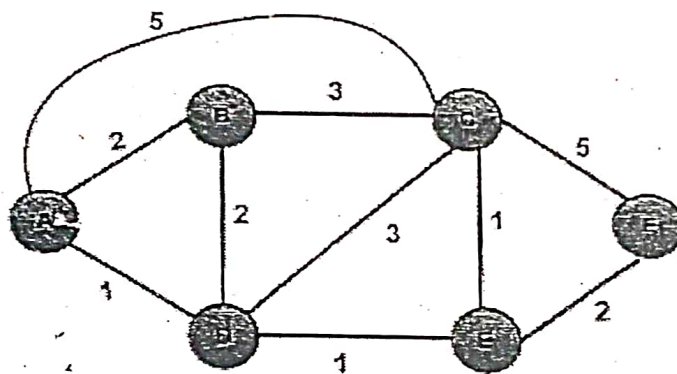
No	Confirmed	Tentative
1	(A,0,-)	
2	(A,0,-)	,(A,5,C),(A,2,B),(A,1,D)
3	(A,0,-),(A,1,D)	(A,2,B),(A,5,C),(A,2,E)

Total no. of Pages 02

Sixth Semester

End Semester Examination

446

Roll no..........

B.Tech.(SE)

MAY-2023

SE306 COMPILER DESIGN

Time: 3:00 Hours

Max. Marks: 40

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

1. [a] What do you mean by look ahead in parsing? Find look ahead of below grammar. [CO2] [5]

   S→a B a | a b

   B→b S b | b a

   [b] What do you mean by code optimization? Discuss different types of code optimization techniques. [CO4] [5]

2. [a] Define static and dynamic scoping. What will be the output of the following function call using static and dynamic scoping of variable? [CO3][5]

   ```
   int a= 10
   Void P()                void Q( )            void main( )
   {                       {                    {
   int a = 100;            cout <<a             P();
   Q ();                   }                    Q ();
   cout <<a                                     }
   }
   ```

   [b] Design a mealy machine and its transition table which accept two's complement of a binary number. [CO3][5]

3. [a] Calculate the follow set of all non-terminals in Grammar G.

   S→ XZ   X→ aX | bY | ε   Y→ bY | X   Z→ cZ | c   [CO1] [5]

   [b] Discuss various format of intermediate code generated in intermediate phase for following instruction c=a+b*d   [CO4] [5]

4. [a] What do you mean by S attribute and L attribute grammar ? explain with example. [CO4] [5]

[b] Explain Left recursion and how to remove it with explain with example. [CO2] [5]

5. Define DFA and design a minimize DFA for the language over alphabet Σ (a,b) in which i) number of a & b are divisible by 3. ii) all strings starts with "aa" [CO2] [10]

6. Write steps of SLR parsing and create SLR parsing table and draw DFA for the following grammar G: S→SaSb | ε [CO3][10]

SIXTH & EIGHTH SEMESTER

END SEMESTER EXAMINATION

B.TECH

MAY 2023

SE308 SOFTWARE RELIABILITY

Time: 3:00 hr.

Max. Marks: 50

> NOTE: *Attempt all the questions unless a choice is specified.*
> *Assume suitable missing data, if any.*

Q.1. i. How is bathtub curve applicable to system reliability? What are the three types of failure rates observed in bathtub curve.   [5] [CO2]
ii. Assume that a software system will experience 1500 failures at infinite time. It has now experienced 150 failures. The initial failure intensity was 3 failures per CPU hour. Calculate the current failure intensity using the BET model. Calculate the decrement of failure intensity per failure.   [5] [CO4]

Q.2. i. In which phase of SDLC software is not repairable and why? With the help of examples differentiate between repairable and non-repairable system. [5] [CO1]
ii. The failure data of a given product are given in Table 1. What is the likelihood that failures occur at a constant average rate of 15 failures/1000 hours? The observed value from χ^2 table at degree of freedom as 4 and risk factor as 0.1 is 7.78. Formulate H_0 and H_a and justify if H_o is accepted or not.   [5] [CO4]

Table 1

Cell(h)	Number in cell
0-999	12
1000-1999	16
2000-2999	8
3000-3999	15
4000-4999	7

Q.3. i. What is learning phenomenon of the testing team and how it influences the software reliability? Specify the reason for delayed S-shape curve for SRGM and plot its mean-value-function.   [5] [CO2]
ii. Differentiate between different types of software reliability engineering tests.   [5] [CO1]

OR

Define feature test, load test, regression test, test time and failure.   [CO1]

Q.4. i. Plot and explain the impact of with β and Θ variations on the Failure Intensity Function of GE NHPP Model respectively. [5] [CO3]

OR

With the help of suitable diagram, explain the probability density function curve for exponential distribution. [CO3]

ii. Discuss the three main sub-activities for executing the test. [5] [CO4]

Q.5. Consider Library Management System (LMS) that has the following functions [10] [CO5]

    i.   Register User
    ii.   Update User
    iii. Add Book
    iv. Issue Book
    v.   Return Book

LMS operates in a single environment-website. For the given LMS, the explicit key input variables and their associated probabilities are provided as follows (Table 2):

Table 2

Key Input Variable	Occurrence Probability
V1	0.4
V2	0.3
V3	0.2
V4	0.1

Assume suitable missing data, if any and perform the following steps-

    i.   Create Customer Type List
    ii.   Create Users Type List
    iii. Generate System Mode List
    iv. Prepare Functional Profile
    v.   Prepare Operational Profile

OR

Explain in detail the procedure for developing an Operational Profile with a suitable example. [CO5]

--END--

SIXTH SEMESTER

B.Tech. (SE)

END SEMESTER EXAMINATION   **May.2023**

SE316 NATURAL LANGUAGE PROCESSING

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

> **Note:** Answer any **five (5)** questions.
> Assume suitable missing data, if any.

1. Explain the following terms:
    a. Components of Natural Language Processing.   [2][COI]
    b. Python libraries for the execution of NLP.   [2][COI]
    c. Explain Feature System and Augmented Grammar.   [2][COII]
    d. Tokenization process for text while processing Natural Language   [2][COII]

2. Give any five applications of Natural Language Processing.   [8][COVIII]

3. What are the different phases of NLP. Explain with a flow diagram.   [8][COII]

4. Explain the NLP Pipeline with a detailed workflow.   [8][COIII]

5. Explain:

    a. The properties of Regular expressions with example.   [4] [COII]
    b. How can Regular Expressions be used in NLP?   [2] [COII]
    c. Write the regular expression for the language accepting all

      the string which are starting with 1 and ending with 0,

    over $\sum = \{0, 1\}$.   [2] [COII]

6. a. Differentiate between Tokenization and Stemming with example.
                                                   [4] [COI]

451

b. Perform Tokenization on the following para:

"Natural language processing (NLP) is a field of computer science, artificial intelligence, and computational linguistics concerned with the interactions between computers and human (natural) languages."

What is the total no. of tokens generated? [4] [COI]

7. a. Explain Morphological Analysis & Parsing with examples. [4] [COII]
   b. Perform lemmatization & stemming on the following words: [4] [COII]
      a. Verbs: "running", "ate", "wrote"
      b. Nouns: "dogs", "children", "women"
      c. Adjectives: "better", "prettier", "happier"
      d. Adverbs: "quickest", "gently", "fiercely"

452

Roll No. ......

SIXTH SEMESTER

B.Tech. (SE)

END SEMESTER EXAMINATION

MAY-2023

SE 318   Advanced Database Management Systems

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] Explain the following: (i) System catalogue and its contents (ii) Triggers in PL/SQL.   [4][CO1]

[b] Differentiate between object relational database management system and object oriented database management system.   [4][CO2]

Q.2 [a] Consider the following database employee (emp_name, street, city), working (emp_name, factory, name_salary) factory (factory_name, city) Manager (emp_name, manager_name) Write any four relational algebra expressions for different operations.   [4][CO2]

[b] What are triggers? Explain the utility of triggers in DBMS. Give suitable SQL code for triggers.   [4][CO1]

Q.3 [a] Describe the phases of query processing by using a block diagram. Discuss the process of query optimization by using suitable example.   [4][CO3]

[b] Illustrate the concept of Shadow Paging with suitable example. Give the advantages and disadvantages of shadow paging.   [4][CO4]

Q.4 [a] Describe the Client-Server architecture of DBMS with the help of a block diagram.   [4][CO5]

[b] Explain centralized two-phase commit protocol in distributed environment. Give the algorithm for both coordinator and participants.   [4][CO6]

Q.5 [a] What are multimedia databases? Discuss the challenges in designing of multimedia databases. [4][CO7]

[b] What do you mean by the term database transaction? Briefly discuss the properties of database transactions performed in a concurrent environment. [4][CO8]

Q.6 Write short notes:

[a] XML and HTML. [4][CO2]

[b] Server System Architectures. [4][CO5]

******* END *******

ЧSЧ

SIXTH and EIGHTH SEMESTER
B.Tech
END TERM EXAMINATION   May-2023
SE326 Machine Learning

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) Explain three stages of model building in machine learning.   [2][CO1]

b) Differentiate between K-means and KNN algorithm.   [2][CO2]

c) What is hyperparameter optimization.   [2][CO1]

d) What is dimensionality reduction in machine learning?   [2][CO1]

Q.2 Consider the data given in the following table for a binary classification problem.

a) Construct complete decision tree for the given dataset using C4.5 algorithm?

b) Classify the following training instance *(female, family, small)*.

Customer Id	Gender	Car Type	Shirt Size	Class
1	Male	Family	Small	C1
2	Male	Sports	Medium	C1
3	Male	Sports	Medium	C1
4	Male	Sports	Large	C1
5	Male	Sports	Extra Large	C1
6	Male	Sports	Extra Large	C1
7	Female	Sports	Small	C1
8	Female	Sports	Small	C1
9	Female	Sports	Medium	C1
11	Male	Family	Large	C2
12	Male	Family	Extra Large	C2
13	Male	Family	Medium	C2

[8][CO2]

Q.3 For the given feed forward network, perform forward and backward sweep using back-propagation algorithm and find the updated weights (perform computations till second iteration only). Activation function used is sigmoid function. Initial weights, bias and target output t_5 corresponding to Y_5 are provided in table. Assume $\eta = 0.5$. $b_1 = 0.4$, $b_2 = 0.6$, $w_{13} = 0.12$, $w_{23} = 0.2$, $w_{14} = 0.15$, $w_{24} = 0.3$, $w_{35} = 0.45$, $w_{45} = 0.5$, $t_5 = 1$.

[8][CO2]
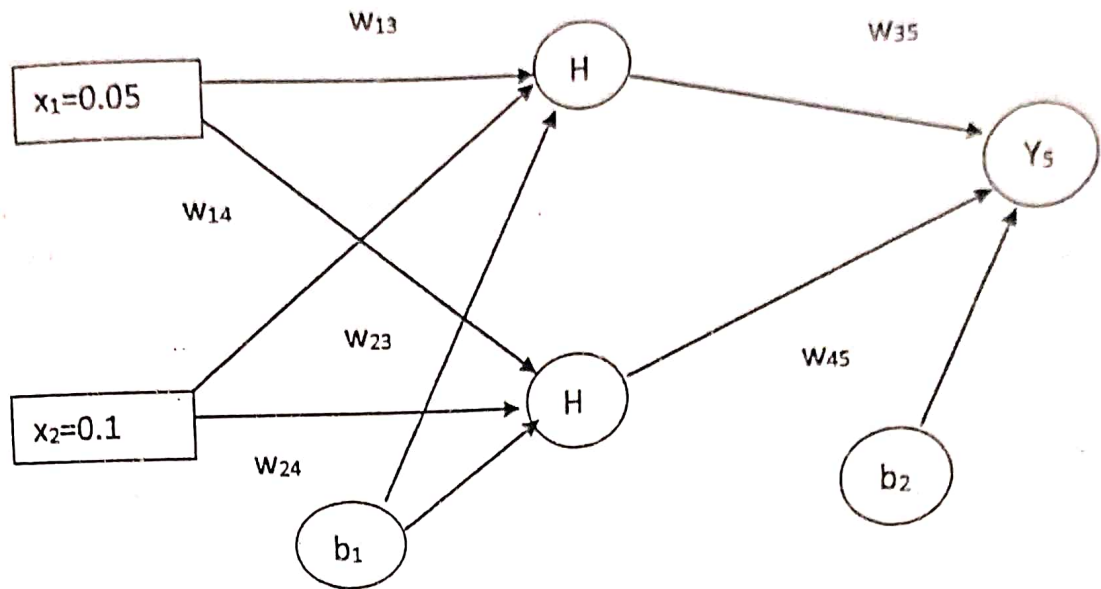
Q.4 a) Consider the table given below with four training instances each having two attributes (a1 and a2). Compute the class label for test instance t1 = (3,7) using three-nearest neighbors (k=3) with weighted vote according to using Euclidean distance.

Training Instance	a_1	a_2	Output
I_1	7	7	0
I_2	7	4	0
I_3	3	4	1
I_4	1	4	1

[4][CO5]

b) What is a difference between Euclidean distance and Manhattan distance? [2][CO1]

c) Compare KNN with support vector machines. [2][CO3]

Q.5 a) What is clustering? Explain DBSCAN clustering in detail. [4][CO4]

b) How naive bayes is useful for numerical and categorical values? [2][CO2]

c) Explain likelihood and evidence in Naïve Bayes with example? [2][CO1]

Q.6 a) Compute the principal component using PCA algorithm for the given data.

x: 5, 6, 7, 9, 10, 14, 19, 20

y: 7, 8, 9, 11, 12, 15, 21, 24

[5][CO4]

b) Explain ranking based feature selections methods with example? What is a significance of embedded methods for feature reduction? [3][CO3]

Q.7 a) What is transfer learning? What are various types of transfer learning? Explain with example. [4][CO6]

c) What is attribute transformation? Why are SVMs often more accurate than logistic regression? [4][CO2]

456

8th SEMESTER

B.Tech.

END TERM EXAMINATION

May-2023

COURSE CODE: SE406   COURSE TITLE: Advances in 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 In the context of re-engineering in software engineering, answer the following questions:

   a) What is reverse engineering? Discuss levels of reverse engineering? What are the appropriate reverse engineering tools? Discuss any two tools in details.   [3][CO5]

   b) Differentiate between reverse engineering and re-engineering? [3][CO5]

   c) What are the advantages of re-engineering. Explain, re-engineering is differed from restructuring?   [2][CO5]

Q.2 With reference to an Airline Industry as an example in business process re-engineering:

   a) List out any five tools commonly used for BPR.   [3][CO5]

   b) At what stage is it recommended for an Organisation to initiate BPR? Explain.   [3][CO5]

   c) Briefly explain why Downsizing and Outsourcing are not recommended as part of BPR.   [3][CO5]

Q.3 a) Consider that the placement section of an educational institution wants to develop and maintain a separate website of its own. Write down the issues that may be raised with respect to the design process. Also mention the various criteria for security in above web-based systems.
                                                                    [4][CO4]

   b) What is web-engineering? Consider the above project (as in part (a)), design a checklist for verification of this web-based software.
                                                                    [4][CO4]

Q.4 A car park has parking spaces, each of which can be used to park a car. A company has a group of employees. Some people own cars.

Consider the following:

[PLACE] : set of all uniquely identifiable parking places.

[CAR] : set of all uniquely identifiable cars.

[PERSON] : set of all uniquely identifiable persons.

Parked   : PLACE ——⊢→ CAR

Employees : PERSON

OWNS   : PERSON←——→ CAR

Write statements in formal methods to describe the following:

1. The cars that are parked.
2. The people who own the parked cars.
3. The places that are occupied.
4. Each employee owns a car.   [8][CO1]

Q.5 a) Why is the two-tier architecture not a practical client-server architecture? How does the three-tier architecture overcome the problems of the two-tier.   [4][CO3]

     b) What are the functions of a middleware in a three-tier architecture? Mention two popular middleware standards.   [4][CO3]

Q.6 The reuse of software raises a number of copyright and intellectual property issues. If a customer pays a software contractor to develop a system, who has the right to reuse the developed code? Does the software contractor have the right to use that code as a basis for a generic component? What payment mechanisms might be used to reimburse providers of reusable components? Discuss these issues and other ethical issues associated with the reuse of software.   [8][CO2]

Q.7 Cleanroom software engineering is characterised by three principal technologies, as given below. Write a short note on each of the below-identified technologies.

       a) Incremental development under statistical control.   [2][CO2]

       b) Function-based specification, design and verification.   [3][CO2]

       c) Statistical testing and software certification.   [3][CO2]

ՎՏ४

Roll no.............

B.Tech

END TERM EXAMINATION

May 2023

COURSE CODE: SE 416

COURSE TITLE: BIG DATA ANALYTICS

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) Define Big Data. Explain the Evolution of Big Data and their characteristics. [4][CO1]

(b) Illustrate the Hadoop core components with diagram. [4][CO2]

Q.2 (a) Imagine there are 50 packets, numbered 1,2,....,50 items, similarly numbered. Item a is in basket b if and only if a divides b evenly. For example basket is 12 is the set of items { 1,2,3,4,8,12,24 }. Describe all the association rules that have 100% confidence. [4][CO2]

(b) Discuss the functions of each of the five layers in Big Data architecture design. [4][CO1]

Q.3 (a) Suppose a data stream consists of the integers 1,3,2,1,2,3,4,3,1,2,3, 1. Let the hash function being used is

$h(x) = (6x+1) \bmod 5.$

Estimate the number of distinct in this stream using Flajolet-Martin algorithm. [5][CO3]

(b) List down the entities of YARN. [3][CO2]

Q.4 Differentiate between [4][CO3]
    (a) Map Reduce and Pig. [4][CO1]
    (b) Analysis and Reporting.

Q.5 (a) What do you mean by HiveQL Data Definition Language? Explain any three HiveQL DDL command with its syntax and example. [6][CO5]
    (b) What are the advantages of Hadoop. [2][CO2]

Q.6 (a) Explain DGIM algorithm for counting ones in a stream with example. [5][CO4]
    (b) Describe Characteristics of NoSQL database. [3][CO2]

Q.7 (a) Describe the Map Reduce execution steps with diagram. [6][CO3]

    (b) What is Zookeeper? [2][CO5]

4 6 o

VIIIth SEMESTER
B.Tech.

END TERM EXAMINATION

May-2023

COURSE CODE: SE418
COURSE TITLE: DATA MANAGEMENT AND ETHICS

Time: 3 Hours

Max. Marks : 50

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

Q.1 Summarize briefly on the following   [2.5*4][CO1, 2, 3, 4]

(a) Differentiate generalization and aggregation

(b) What is a weak entity set and how is it represented in the ER diagram?

(c) What is deferred database modification?

(d) What is data ethics?

Q.2 (a) What are the disadvantages of file processing system which were removed by the DBMS?   [5][CO1]

(b) What do you mean by referential integrity? Explain the concept of foreign key with a suitable example.   [5][CO1]

Q.3 (a) What is a transaction? Draw a state diagram of a transaction showing its states. Explain the ACID properties of a transaction with suitable examples. [5][CO3]

(b) Explain conflict serializability and determine whether the following schedule is conflict serializable or not.

T1: R(X), T2: R(X), T1: R(X), T2: R(Y), T3: R(Z), T2: W(Z), T3: W(X), T3: W(Y), T2: W(Y), T3: W(Z).   [5][CO3]

P.T.O

461

Q.4 (a) What is recoverability? Also explain types of recovery with suitable example. [5][CO3]

(b) Consider the relation R(X, Y, Z, W, P, Q) and the set of FDs F={XY→W,XW→P,PQ→Z, XY→Q}.

Determine whether the decomposition

R1(X, P, Q) R2(W, Y, Z, P, Q) is lossy or loss-less. [5][CO2]

Q.5 Describe the ethical issues related to data collection. [10][CO5]

Q.6 What are the 5 C's of data ethics. Explain. [10][CO4]

Q7. What are the ethics of using hacked data. Support your answer with the help of an example [10] [CO6]

2

5th and 7th SEMESTER
B.Tech.

END TERM EXAMINATION   MAY-2023
BBA 211 HUMAN RESOURCE MANAGEMENT
Time: 3:00 Hours   Max. Marks:50

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

Q.1 Illustrate the following with suitable examples:

(1A) What is Induction? Illustrate the purpose of Induction. What are the phases of socialization/induction?   (CO 3) [5]

(1B) Attempt any 1 part:

(1B-1) What do you mean by Job Analysis? Why does a company do job analysis? Define the steps involved in carrying out Job Analysis.

(CO 3) [5]

Or

(1B-2) Define the following terms. Also give suitable examples for each:

(i)   Job Description
(ii)   Job Specification
(iii) Job Enlargement and Job Enrichment
(iv)   Moonlighting Phenomenon
(v)   Job Design   (CO 3) [5]

Q.2 You are the HR Manager of a mid-sized manufacturing company. One of your employees, John, approaches you with a grievance. He claims that he has been unfairly treated by his supervisor, Sarah, who consistently assigns him more work and denies him opportunities for growth and promotion compared to his colleagues. John is frustrated and believes that his performance is being negatively impacted as a result. As the HR Manager, how would you handle this grievance situation? Outline the steps you would take to address John's concerns and ensure a fair and satisfactory resolution to the issue.   (CO 5) [10]

463

Q.3 You are the HR Manager of a multinational technology company. The organization recognizes the importance of management development to enhance the leadership capabilities of its managers. As the HR Manager, how would you approach management development and what methods or approaches would you utilize to develop and nurture the managerial talent within the company? Outline the various management development methods you would employ and explain their benefits in fostering effective leadership skills. (CO 4) [10]

Q.4 You are the HR Manager of a manufacturing company. The company has recently introduced a new production technology, and it requires all employees to undergo training to effectively operate the new equipment and processes. Outline the steps you would take to design and implement a training process that ensures employees are equipped with the necessary skills and knowledge to successfully adopt the new technology. (CO 4) [10]

Q.5 Explain the following:

(5A) What is the Kirkpatrick Model of training evaluation? Explain in de..... (CO 4) [4]

(5B) Explain the 360° of Performance Appraisal. (CO 4) [3]

(5C) Explain any 3 traditional methods of performance appraisal. (CO 4) [3]

२०१ ४६४

Roll no......................

2nd SEMESTER

B.Tech. [Evening](Civil Engg.)

END TERM EXAMINATION   May-2023

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.

Q.1 A force vector is represented by a line AB. The coordinates of the point A are (2, 4, 3) and point B (1, -5, 2) respectively. If the magnitude of force is 10 N, then determine:
(i) the components of the force along x, y and z - axes,
(ii) angles with x, y and z - axes and
(iii) specify the force vector.   (3+3+2) [CO1]

Q.2 A hammer of mass 750 kg drops from a height of 1.2 m on a pile of mass 200 kg. Find: (i) the common velocity after impact assuming plastic impact and (ii) the average resistance of the ground, if the pile mass comes to rest after penetrating 10 cm into the ground.   (4+4) [CO5]

Q.3 (a) A bullet of mass 100 gm is fired into a freely suspended target of mass 5 kg. On impact, the target along with the bullet moves with a velocity of 5 m/s in the direction of firing. Find the velocity of bullet.   (4) [CO5]

(b) Two forces of magnitudes 15 N and 12 N are acting at a point. If the angle between the two forces is 60^0, determine the resultant of the forces in magnitude and direction.   (4) [CO1]

Q.4 A short right circular cylinder of weight W rests in a horizontal V notch having the angle 2α as shown in Fig. 1. If the co-efficient of friction is μ, find the horizontal force P necessary to cause slipping to impend.
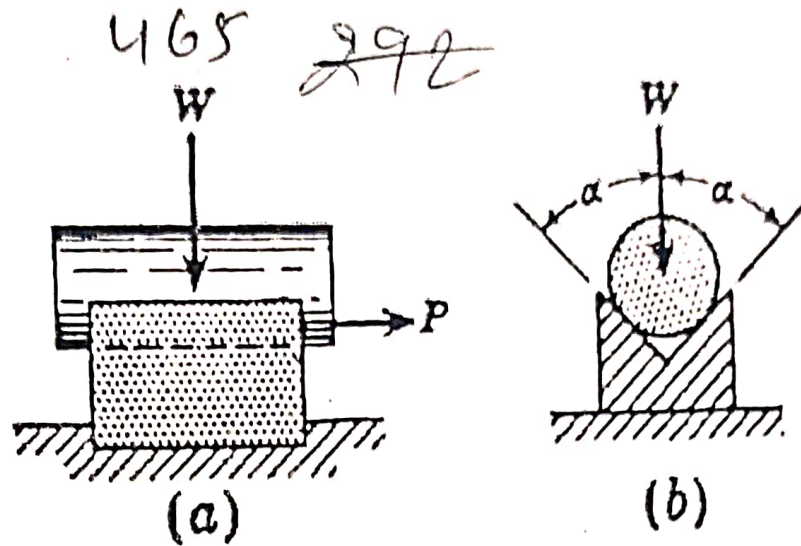
465 292

(a)   (b)

Fig. 1   (8) [CO2]

Q. 5 An aircraft moving horizontally at a speed of 144 kmph at an altitude of 735 m towards a target on the ground, releases a bomb, which hits the target. Estimate the horizontal distance of the aircraft from the target when it released the bomb. Calculate also the direction and velocity with which the bomb hits the target.

(8) [CO3]

Q. 6 From a rectangular lamina 10 cm X 14 cm in size, a rectangular hole of 3 cm X 5 cm is cut as shown in the Fig. 2. Find out centre of gravity and moment of inertia about horizontal and vertical axes passing through centroid of the section.

(2+3+3) [CO4]
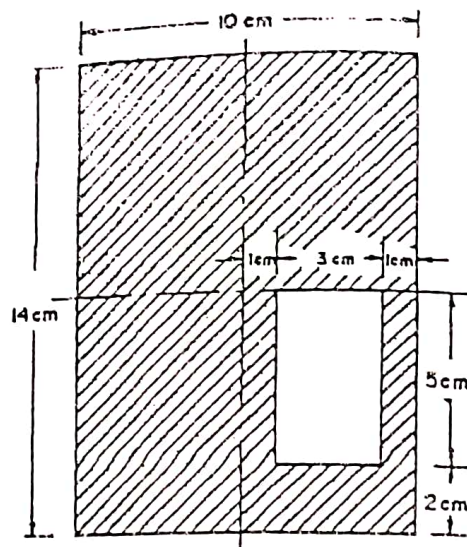
Fig. 2

II Semester

B.Tech. (civil) (Evening)

END SEMESTER EXAMINATION   May- 2023

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. For the flow situation shown in figure, calculate the discharge of oil (RD = 0.75) when the oil-mercury differential manometer reading h = 10 cm. Neglect all losses in the flow system.   (CO 2)
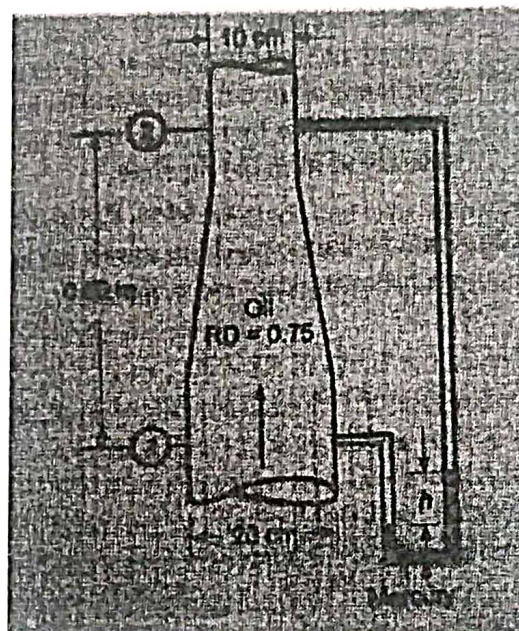
Q2. When a sudden contraction from 60 cm diameter to 30 cm diameter is introduced in a horizontal pipeline, the pressure drops from 10 KPa at the upstream of the contraction to 80 KPa on the downstream. Assuming a coefficient of contraction of 0.65   (CO 3)

(i) Estimate flow rate in the pipe and

(ii) The loss of head due to contraction.

Q3. Two pipes, each of 10 cm diameter and length 100 m, are connected in parallel between two points. Calculate the (a) Equivalent length of a single pipe of 10 cm diameter (b) Equivalent size (diameter) of a single pipe of length 100 m (Assume f is same for all the pipes).   (CO 4)

Q4. Three pipes A, B and C with details as given in the following list are connected in series.   (CO3)

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

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.

Q5. A venturimeter is used for measuring the flow of petrol in a pipeline inclined at 35° to horizontal. The sp. gravity of the petrol is 0.81 and throat area ratio is 4. If the difference in mercury levels in the gauge is 50 mm, calculate the flow in m³/s if the pipe diameter is 300 mm. Take Venturimeter constant as 0.975.   (CO 5)

Q6. A siphon consisting of a pipe of 12 cm diameter is used to empty kerosene oil (sp. gr=0.8) from the tank A. The siphon discharges to the atmosphere at an elevation of 1.2m. The oil surface in the tank is at an elevation of 4.2 m. The centre line of the siphon pipe at its highest point C is at an elevation of 5.7m. Determine

(i)   The discharge in the pipe
(ii)   The pressure at point C

The losses in the pipe may be assumed to be 0.45 m up to summit and 1.25 m from the summit to the outlet.   (CO 6)

468   295

> NOTE: All questions are compulsory
> All questions carry equal marks
> Assume suitable missing data, if any

1. (a) What do you understand by most economical section?   [2][CO1]

(b) The discharge of water through a rectangular channel of width 8m, is 15 m^3/sec when the depth of flow of water is 1.2m. Calculate: [6][CO2]

(i) Specific energy of the flowing water, (ii) Critical depth and critical velocity, (iii) Value of minimum specific energy.

2. (a) What do you understand by hydraulic jump? Explain with neat sketches.   [2][CO3]

(b) A sluice gate discharges water into a horizontal rectangular channel with a velocity of 6 m/s and depth of flow is 0.4m. The width of the channel is 8m. Detremine whether a hydraulic jump will occur, and if so, find its height and loss of energy per kg of water. Also determine the power lost in the hydraulic jump.   [6][CO3]

3. A Pelton wheel has to be designed for the following data. Power to be developed = 6000 kW. Net head available = 300m; Speed = 550 r.p.m.; Ratio of jet diameter to wheel diameter = 1/10; and overall efficiency = 85%.

Find the number of jets; diameter of jet; diameter of wheel; and the quantity of water required.   [8][CO4]

4. (a) What is draft tube? What is the purpose of providing draft tube in turbine? [2][CO4]

(b) A water turbine has a velocity of 6 m/s at the entrance to the draft-tube and a velocity of 1.2 m/s at the exit. For friction losses of 0.1m and a tail water 5m below the entrance to the draft-tube, find the pressure head at the entrance. [6][CO4]

or

(a) What do you understand by specific speed of turbines? [2][CO5]

(b) A turbine is to operate under a head of 25m at 200 r.p.m. The discharge is 9 cumec. If the efficiency is 90%, determine: [6][CO5]

(i) Specific speed of the turbine, (ii) Power generated, and

(iii) Type of turbine.

5. (a) Explain the different unit quantities of a turbine. [2][CO5]

(b) A turbine develops 9000 kW when running at 10 r.p.m. The head on the turbine is 30 m. If the head on the turbine is reduced to 18 m, determine the speed and power developed by the turbine. [6][CO5]

or

(a) What is the difference between pipe flow and open channel flow? [2][CO1]

(b) Find the discharge through a trapezoidal channel of width 8 m and side slope of 1 horizontal to 3 vertical. The depth of flow of water is 2.4 m and value of Chezy's constant, C = 50. The slope of the bed of the channel is given 1 in 4000. [6][CO1]

END SEMESTER EXAMINATION

April/May 2023

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) Find the expression for the central deflection and the slope at the ends of a simply supported beam carrying a central load W by moment area method. [CO2][4]

(b) Find the deflection at the free end of a cantilever which carries a uniformly distributed load. Use Castigliano's first theorem. [CO1][4]

Q.2 (a) A beam 4m long simply supported at its ends, carries a point load W at its centre. If the slope at the ends of the beam is not to exceed 1^0, find the deflection at the centre of the beam. [CO2][4]

(b)Find the deflection at the free end of a cantilever which carries a point load at the free end using strain energy method. [CO1][4]

Q.3(a) What is determinacy structure? [CO1][2]

(b) A truss of span 7.5 m carries a point load of 1 kN at joint D as shown in Figure. Find the reactions and forces in the members of the trusses. [CO3][6]
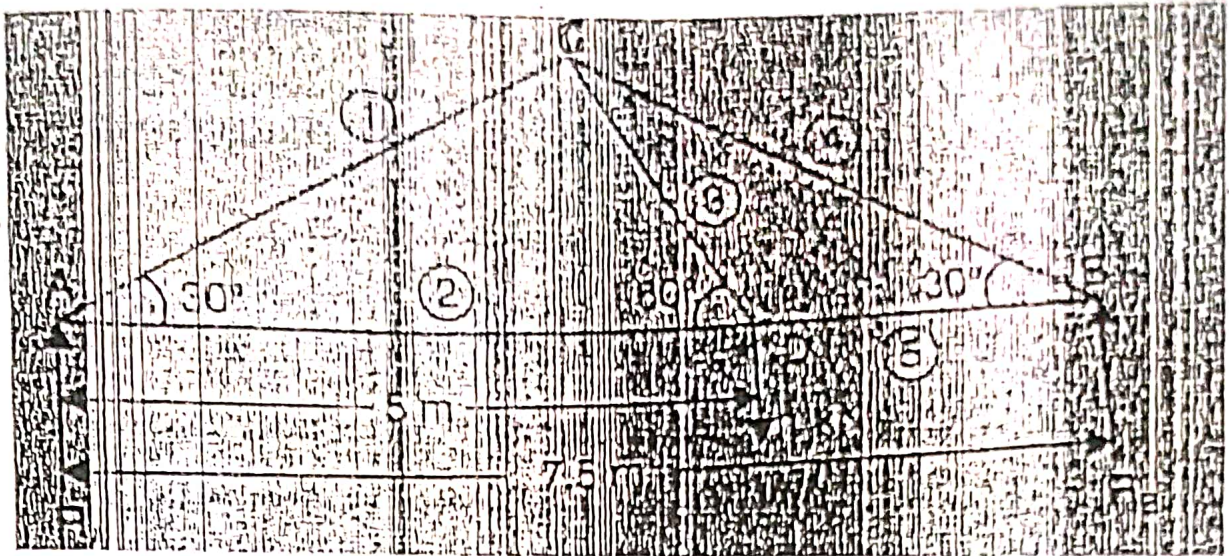
Q. 4 (a) Differentiate between two hinged and three hinged arches.

[CO5][3]

(b) A circular Arch to span 25m with a central rise 5m is hinged at the crown and springing. It carries a point load of 100kN at 6m from the left support. Calculate
(i) The reaction at the support
(ii) The reaction at the crown
(iii)   Moment at 5m

[CO5][5]

Q.5 (a) Define Slenderness ratio. What are the end conditions for a column?

[CO5][3]

(b) A column of timber section 15cm x 20cm is 6m long both ends being fixed. If the Young's modulus for timber=17.5 kN/m², determine:
(i) Crippling load and
(ii) Safe load for the column if factor of safety =3

[CO5][5]

Q.6 Write short notes on (Any two)
(i) Conjugate Beam Method
(ii) Macaulay's Method
(iii) Castigliano's First Theorem

[2x4=8]
[CO4]
[CO4]
[CO1]

472
299

END TERM EXAMINATION MAY 2023

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 permitted.

1(a) Describe stress strain relationship of Mild steel used in concrete as
     reinforcement with the help of a labelled sketch.   M4/CO1
 (b) Discuss the features of Working Stress design methodology in detail.
                                                                M4/CO1

2(a) A rectangular beam of RCC is 200 mm x 400 mm (effective depth). It
     has to resist a factored moment of 37.5 KN m. Determine the area of
     reinforcement required for the beam. Use M20 concrete and Fe 415
     steel. Draw a neat sketch of the beam section assuming that 8 mm
     diameter bars have been used for shear stirrups.   M4/CO2
 (b) Write details of any one test conducted on cement.   M4/CO2

3(a) Find the moment of resistance of a singly reinforced rectangular beam of
     RC 300 mm wide and 500 mm deep upto the center of tensile
     reinforcement. The reinforcement of the beam consists of 4 bars of 16
     mm diameter. Use M20 concrete and Fe415 steel grades.   M4/CO3
 (b) What do you understand by workability of concrete? Describe a method
     to measure workability.   M4/CO3

4(a) A rectangular RC beam has a width of 250 mm and effective depth of
     450 mm. It has 4-18 mm diameter bars as tension reinforcement. Take
     M20 grade concrete and Fe 415 grade steel. It is simply supported and is
     subjected to a shear force of 150 KN at service loads. Design the shear
     reinforcement using 8 mm diameter 2-legged stirrups.   M4/CO4
 (b) Discuss why a minimum value of strain in tensile reinforcement is
     specified for the design of RC beams?   M4/CO4

5(a) Discuss design steps of RCC rectangular footings.   M4/CO5
 (b) Discuss why shear reinforcement is not generally provided for ordinary
     slabs.   M4/CO5

6   Write notes on any two of the following topics.
     (a) Design of beams for torsion
     (b) Concrete mix design
     (c) Manufacture of cement   M8/CO6

300 473

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

1(a) What are the objectives of preliminary survey for highway alignment? Enumerate the details to be collected and the various steps in the conventional method.   [4] [CO1]

(b) Briefly explain with a sketch the Macaday's method of road construction. Why is this method considered better and more scientific compared to the previous methods?   [4] [CO1]

2(a) What are the various requirements of an ideal highway alignment? Discuss briefly?   [4] [CO1]

(b) Explain briefly the various stages of work in a new highway project.   [4] [CO2]

(3) (a) A national highway passing through rolling terrain in heavy rainfall area has a horizontal curve of radius 500 m. Design the length of transition curve assuming ruling speed, V= 80 Kmph and pavement width, W =7.0 m.   [4] [CO1]

(b) Explain 'Flexible and Rigid' pavements and bring out the points of difference.   [4] [CO2]

4(a) What are objective of highway geometric design? List the various geometric elements to be considered in highway design.
                                                            [4] [CO3]

(b) With sketches explain the different types of traffic manoeuvers and their applications.   [4] [CO3]

5 (a) A 5 degree curve diverges from a 3 degree main curve in reverse direction in the layout of a B.G. yard. If the speed on the branch line is restricted to 35 Kmph., determine the restricted speed on the main line.

[4] [CO3]

(b) Discuss different types of rail-joints with the help of neat sketches and given their merits and limitations. [4] [CO4]

6 Write short notes on any four.

(a)Zoning laws   (b) Clear zones   (c) Approach zone

(d) Approach surface (d) Take- off climb surface.   [4X2=8] [CO4]

SIXTH SEMESTER

B.Tech [EVENING]

END TERM EXAMINATION   MAY 2023

COURSE CODE- CCE310   COURSE TITLE- APPLICATIONS OF GEO-INFORMATICS, REMOTE SENSING AND GIS IN ENGINEERING.

Time: 3:00 Hours   Max. Marks: 50

Note : Attempt any five Questions.

Assume suitable missing data, if any.

Q.1 (a) What is GIS? Describe it in detail.   [04][CO1]

(b) Differentiate between Active Microwave remote sensing and Passive Microwave remote sensing.   [06][CO1]

Q.2 (a) What is RADAR? Write down its various applications. [04][CO2]

(b) Write down various other areas in which GIS applications can be used. Numerate these GIS applications in those areas.   [06][CO1]

Q.3 What are various components of Remote sensing?
[10][CO3]

Q.4 (a) What is Orbit and how does Orbit selection vary?   [10][CO2]

(b) Name Various type of orbits.

Q.5 What is Digital Elevation Model (DEM) in GIS? Explain its types.
[10][CO1]

Q.6 What is image processing in GIS? Explain image processing methods.
[10][CO3]

303 476   Roll No.........

IVth SEMESTER

BTECH(EVENING) CIVIL ENGG

END TERM EXAMINATION   **MAY-2023**

CCE314   GEOTECHNICAL PROCESSES

TIME: 3HOURS   **MAX MARKS: 50**

NOTE: Question no.1 is compulsory. Attempt rest of the questions as per instruction given. Draw neat sketches if required.

---

1. What are the types of grouting?

The permeation grouting will be carried out as ascending stage grouting in stages of 2m starting from 9m depth and moving upwards to 7m,5m and 3m depth below the ground surface in dry sandy gravel. What is the maximum permissible grout pressure at 9m depth? By what amount this grout pressure be reduced for each stage of ascent? The sandy gravel has following properties-

Bulk density = 16.5 kN per cubic metre

Angle of shearing resistance = 35^0

Coefficient of earth pressure at rest = 0.45   [10] [CO-2]

2. Attempt any <u>two</u> parts.

a. Explain the factors affecting compaction in field. How the density of soil at the site is measured.   [5] [CO-1]

b. Discuss the procedure of vibro-flotation technique adopted for the deep compaction of the site soil.   [5] [CO-3]

c. What is the mechanism of cement stablisation? How the requirements of cement are estimated for cement stablisation?   [5] [CO-2]

304 477

3.a. What is the role of soil structure in ground improvement techniques? [5][CO-5]

b. What are the basic approaches used to reduce the effects of swelling and shrinkage of the soil on structures? [5] [CO-5]

c. Define collapsible soils. How do these soils differ from expansive soils? [5] [CO-5]

4.a. How the load carrying capacity of stone columns is determined as per IS: 15284(part-I, 2003). [5] [CO-3]

b. Determine the settlement reduction ratio of stone columns for following data:

Stress concentration ratio = 4

Area replacement ratio for triangular pattern = 0.13

If the settlement of the untreated soil is 50 mm, what will be the settlement of the composite soil? [5] [CO-3]

c. What is the principle of electro-osmosis? How the flow rate is determined in this method? [5] [CO-3]

5.a. What are the functions of geotextiles. Explain the uses of geotextiles in water resources projects. [5] [CO-4]

b. How the external stability of reinforced earth retaining wall structure is checked under following conditions-

Overturning, Sliding and Bearing failure [5] [CO-4]

c. Discuss the types of failure of soil nailed walls. [5] [CO-4]

B.TECH.[Eve](CIVIL)

END TERM EXAMINATION   MAY-2023

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 Describe the criteria of zoning of study area with the help of neat sketch. Also show different category of trips that are captured in travel demand survey.   [CO2][5]

Q.2 Calculate travel demand of a city having population of 100,000. The average per capita trip rate is 1.1 per day and average trip length is 5 km.
Also estimate the requirement of public transport in terms of seat kilometre to meet travel demand if seating capacity of bus is 32 and utilisation factor is 0.8.   [CO3][5]

Q.3 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	1500	2500
B	2500	3000
C	3500	2000

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 B and C is known to be 500, calculate the trip interchange between zones A and B, A and C, B and A, C and A, C and B.   [CO4][5]

Q.4 Discuss about the modal split stage in transportation planning. Explain effect of various factors that affect modal split?   [CO1][5]

P.T.O.

Q.5 Compare Probit analysis and Logit analysis. [CO2][5]
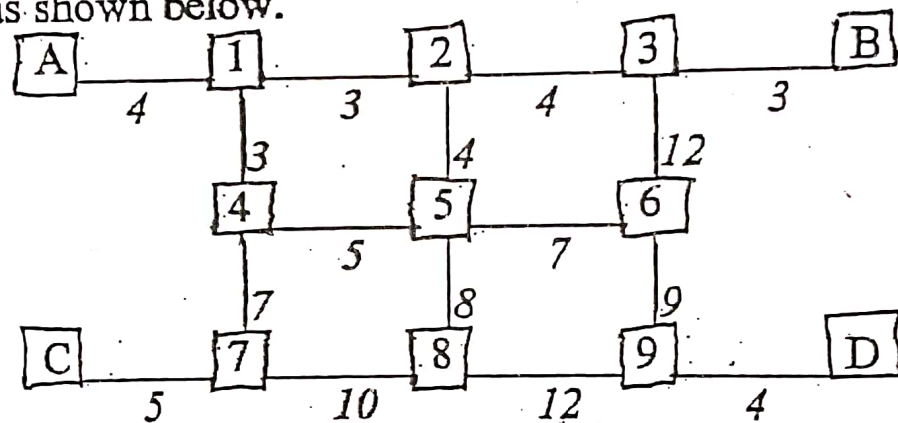
Q.6 Discuss the general principles of traffic assignment. Mention the application of traffic assignment. [CO1][5]

Q.7 Number of trips given in the following table are to be assigned between four zones.

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 travel cost. Assign the trips using all or nothing technique. [CO2][5]

Q.8 Write merits and demerits of any **ONE** of the following:
i) Road side interview method for O-D survey
ii) Synthetic models for trip distribution [CO2][5]

Q.9 Explain any **ONE** of the following:
i) Capacity restrained assignment technique
ii) Impedance factor in trip distribution [CO2][5]

Q.10 Discuss any **ONE** of the following:
i) Moore's algorithm
ii) Lowry model [CO2][5]

VIII SEMESTER

B.Tech. (Eve)

END TERM EXAMINATION

May-2023

CCE-402 Construction Technology and Management

Max. Marks: 50

Time: 03:00 Hours

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

Q.1 Answer all questions in brief. [2x5=10] [2]

(a) What do you mean by depreciation?

(b) What is break-even cost analysis?

(c) What is operational cost?

(d) Write the methods of tunnelling.

(e) Define Earnest money Deposit

Q.2 Draw the network and design the critical path and calculate the completion time of the project whose activities are as follows [10][3]

Activity	Duration	Preceding
A-B	7	-
B-C	10	A-B
B-D	15	A-B
C-D	7	B-C
C-E	12	B-C
D-E	3	B-D,C-D
E-F	5	C-E,D-E

Q.3 Explain various types of contract system with advantages and disadvantages. [10][3]

Q.4 Define the following: [2x5=10] [2]

    (a) Direct cost and indirect cost

    (b) Crash time and crash cost

    (c) Cost slope

    (d) Optimum time and

    (e) Optimum cost

Q.5 Answer the following - [5x2=10] [2]

    (a) Explain the different classifications of scheduling in detail.

    (b) Enumerate the difference between CPM and PERT.

309 482 Roll no................

VIII Semester

B.Tech(Eve.)

End Term Examination   May-2023

CCE-410 Construction and Design Aspects in Transportation Engineering

Time: 03:00 Hours   Marks: 50

Note: All Questions are Compulsory.

Q1. What is superelevation of curves at intersection for design and contruction aspects in highway projects? Discuss merits and demerits   (CO1) (10)

Q2. Explain Area Traffic control systemfor International airports system? Discuss merits and demerits   (CO2) (10)

Q3. Discuss pedestrian over bridge and sub way design? Discuss design and construction aspects in metro rail and mono rail projects   (CO3) (10)

Q4. Enumerate the types of design and contruction of multi storied and surface Parking facilities? Discuss merits and demerits.   (CO4) (10)

Q5 What are

1. Case studies of inter model transfer facilities for port-terminals and harbour terminals

2. Case studies ofintermodel transfer facilities for bus terminals and rail terminals   (CO5) (10)

3+0 0483

8th SEMESTER

B.Tech. (Eve)

END TERM EXAMINATION

May-2023

CCE-414 Geo-Environmental and Geo-Hazards Engineering

Time: 3:00 Hours

Max. Marks: 50

Note : Answer all Questions.
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? Discuss. [5][CO1]

b) What is surface contamination? List the sources of sub-surface contamination? [5][CO2]

Q.2 a) What is Landfill? Explain any one type of landfill with neat diagram. [5][CO3]

b) What is leachate? What are the different ways of monitoring and control of leachate? [5][CO3]

Q.3 a) What is land subsidence? Explain recent Joshimath land subsidence. [5][CO4]

b) Describe flood hazard assessment and mapping. Discuss benefits and the barriers related to it? [5][CO5]

Q.4 a) What is Landslide? List the type of landslide and explain any one of them with neat diagram. [5][CO5]

b) Discuss about landslide remedial measures, prevention and its control. [5][CO6]

Q.5 Write note: (any four): [2.5x4][CO2-CO6]

a) Naturally occurring contaminants
b) Ground heave
c) Waste management
d) Vertical seepage
e) Soil Stabilization
f) Rock bolting

SECOND SEMESTER

B.Tech. (Eve.)

END TERM EXAMINATION   MAY-2023

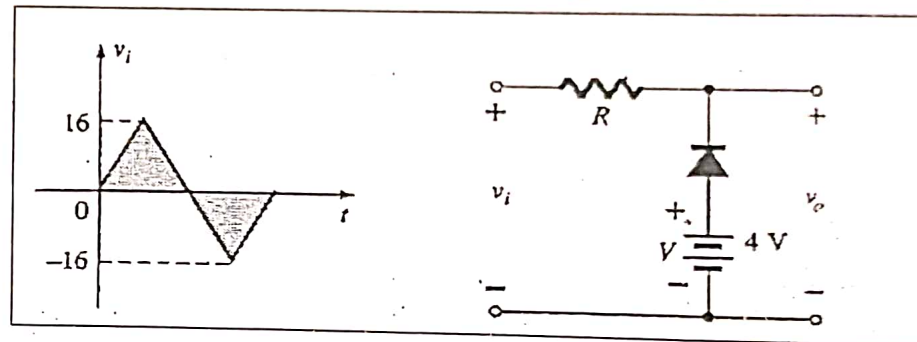### CEC-102   Electronic Devices and Circuits

Time: 3 Hours   Maximum   Marks:

a) Answer any four questions.
b) Assume any missing data.

40

Q1 a) Explain the working of PN junction in forward bias and reverse bias with the help of charge carrier flow (majority carriers and minority carriers).   [CO1,5 marks]

   b) Draw the output voltage of the following circuit, [CO1, 5 marks]

Q2 a) Explain the basic construction, working, and output characteristics of JFET?   [CO3, 5 marks]

   b) Explain the constructional difference in enhancement and depletion type MOSFET. Draw the transfer curve and drain characteristics for n-channel depletion type MOSFET?   [CO3, 5 marks]

Q3 a) Explain the basic principle of working of feedback amplifier (oscillator)? What is Barkhausen criteria? Draw the circuit diagram of phase shift oscillator using BJT.   [CO4, 5 marks]

   b) Determine the voltage gain, input impedance, and output impedance for voltage-series feedback having $A= -100$, $R_i=10k\Omega$, and $R_o=20$ kΩ for feedback $\beta=-0.1$ [CO4, 5 marks]

$$312 \quad 485$$

Q4 a) Explain the working of BJT and draw its input and output characteristics. Also explain in which region BJT should be biased for working as amplifier and why? [CO2, 5 marks]
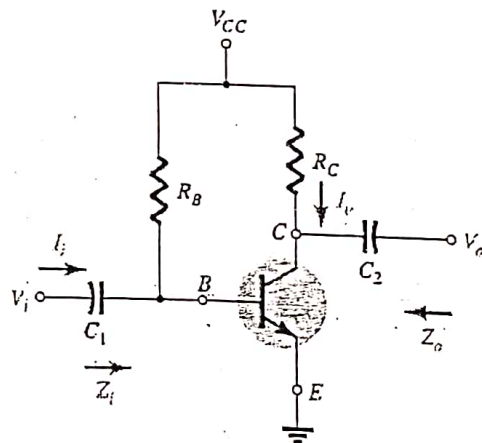
b) For figure given below find $I_{B_Q}, I_{C_Q}, V_{CE_Q}, V_B, V_E$, $\beta = 125$
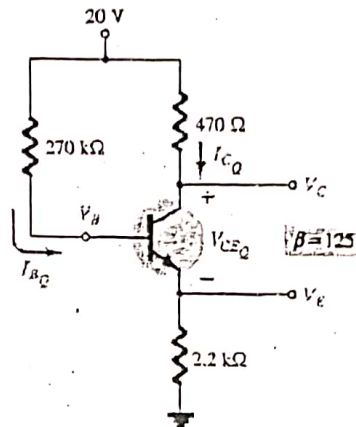
[CO2, 5 marks]

Q5 a) Using βr_e model for ac analysis of BJT, find the ac voltage gain A_v, input impedance Z_i and Output impedance Z_o for figure shown below. [CO5,5 marks]

b) i) Explain the working of differential amplifier through its circuit diagram.

ii) Why do gain of an amplifier falls in low frequency region and high frequency region and remains nearly flat in mid-frequency region.

[CO5, 2.5×2= 5 marks]

__Fourth____ SEMESTER

B.Tech. (Eve)

END TERM EXAMINATION   MAY-2023
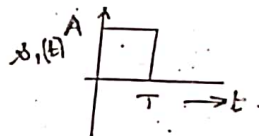
COURSE TITLE _____Digital Communication_

COURSE CODE _CEC-202_

Time: 3 Hours   Max. Marks: 40

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

Q.1   In a PCM System, Binary 0 and 1 are represented by signal $s_0(t)$ and $s_1(t)$ respectively as shown in fig.1.
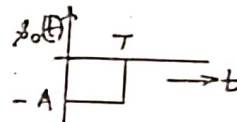
Fig-1

The threshold of the decision making circuit at the receiver is placed symmetrically between the two levels representing 0 and 1
The PCM signals are transmitted through AWGN channel with noise Power Spectral Density (PSD) $N_0/2$ watts/hz. Derive the expressions for the conditional probability of errors P_{e0} and P_{e1} at the receiver.   [8] [CO -2]

Q.2   What is Matched filter? Draw the impulse response of the filter which is matched to the signal s(t) shown in fig.2.
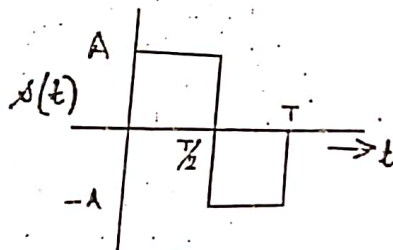
Fig.2

अ 487

Show that the output amplitude of the filter is equal to the total energy content of the input. [8] [CO-5]

Q.3 Explain the geometric structure of signal space. Explain the norm of a signal. What do you understand by inner product of two signals? Explain orthogonal and orthonormal conditions of two signals. [8] [CO-3]

Q.4 Explain with proper block diagram the operation of Differential Pulse Code Modulation (DPCM) transmitter and receiver, [8] [CO-2]

Q.5 Explain the following digital modulation schemes.
(i) ASK (ii) FSK (iii) PSK [8] [CO-3]

Q.6 Explain Gram-Schmidt orthogonalization procedure in signal space. [8] [CO-4]

Q.7 What is Inter Symbol Interference? Explain Nyquist criterion for zero-ISI? Explain EYE diagram. [8] [CO-4]

Q.8 What do you understand by quantization? Explain μ-law and A-law of quantization. A sinusoidal signal $A_m Sin2\pi f_m t$ is quantized using L level uniform quantizer. Each quantized signal is converted to binary code with n bits. Find the signal to Quantization noise ratio. [8] [CO-2]

FOURTH SEMESTER
B.Tech. (Eve)

END TERM EXAMINATION   May-2023

CEC-204   LINEAR INTEGRATED CIRCUITS

Time: 03:00 Hours   Max. Marks: 48

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

Q.1
a) In fig. 1, R_1 = 10 KΩ, R_f = 100 KΩ, V_i = 1V. A load of 25 KΩ is
   connected to the output terminal. Calculate i) i_1 ii) V_o iii) i_L and iv) total
   current i_o into the output pin.   [4][CO1]
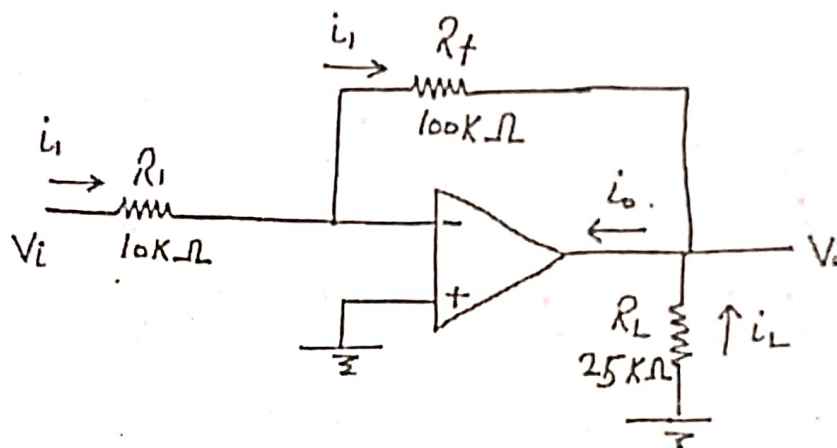

Figure 1

b) For the circuit shown in fig. 2, show that the input resistance is given by

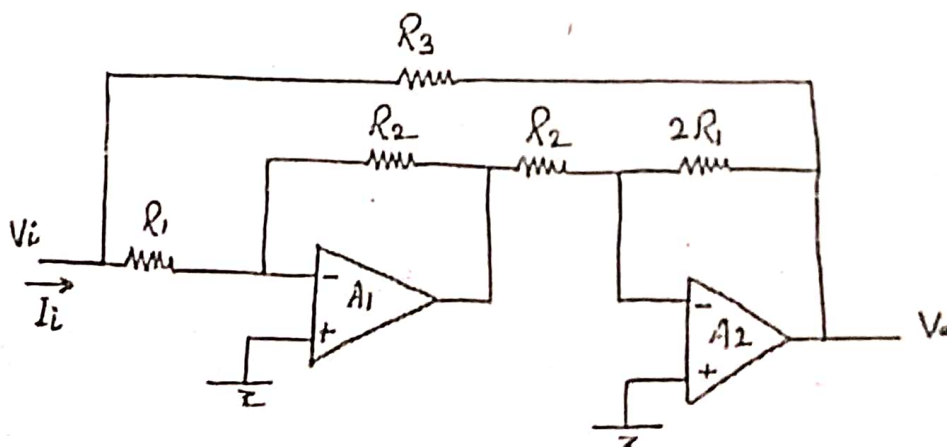$$R_i = \frac{R1*R3}{R3-R1}$$ [4][CO2]

Figure 2

Q.2

a) Design a Schmitt trigger as shown in fig. 3 for $V_{UT} = +0.5$ V and $V_{LT} = -0.5$ V. Take supply voltages $= \pm 14$ V.   [4][CO2]
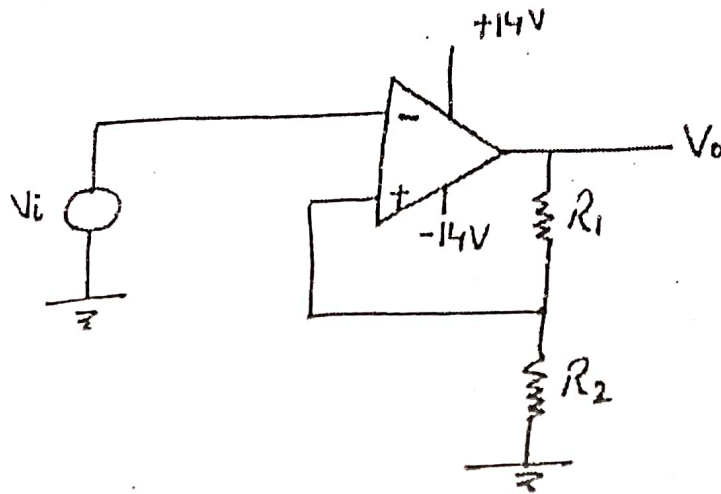

Figure 3

b) Design a Wien Bridge oscillator for $f_o = 1000$ Hz. Take C = 50 uF.

[4][CO3]

Q.3

a) Use minimum number of Operational Trans conductance Amplifier (OTA) to realize the following equation

$$V_o = V_1 + V_2 - V_3 - V_4$$ [4][CO4]

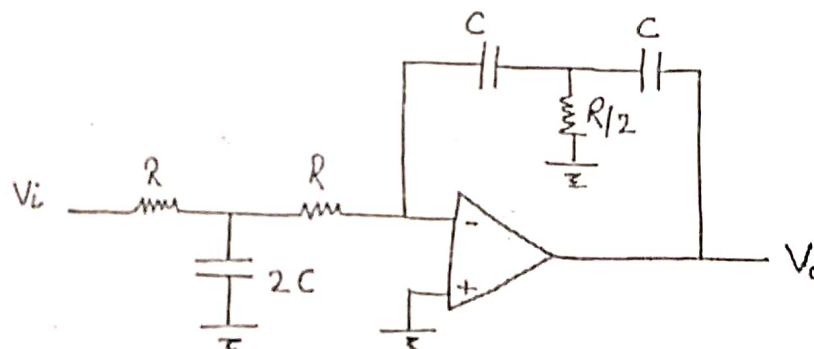b) Show that the circuit of fig.4 is a double integrator.   [4][CO4]

Figure 4

Q.4

a) Explain an astable multivibrator circuit using op-amp and also draw its output waveform across the capacitor and the output pin of op-amp.

[4][CO2]

b) Design the KHN circuit to realize a high-pass function with $f_0 = 10$ KHz and $Q = 2$. Choose $C = 1nF$. What is the value of high-frequency gain obtained? [4][CO3]

Q.5

a) Explain the working of 555 Timer using its internal diagram. [4][CO3]

b) Explain Phase Locked Loop and its three different modes of operation. [4][CO5]

Q.6.

a) Explain different stages of operational ampiifier using its block diagram. [4][CO5]

b) For the circuit shown in fig. 5 determine the value of I_o for $\beta = 100$. Assume $V_{BE} = 0.7$ V. [4][CO5]
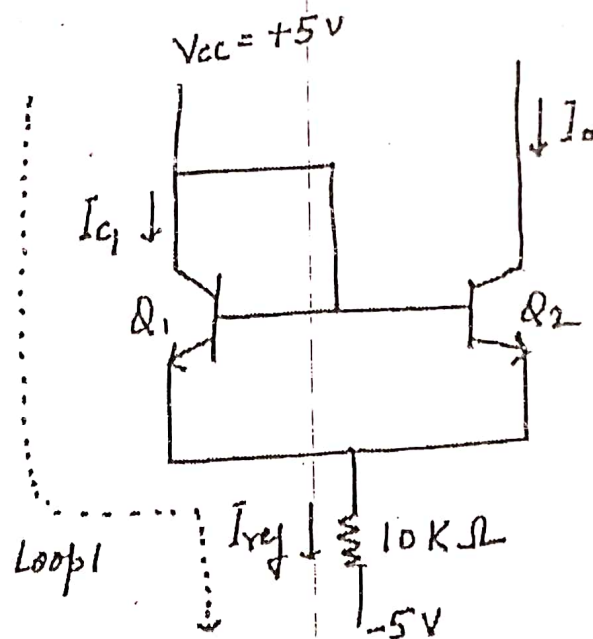

Figure 5

IVᵀᴴ SEMESTER

B.Tech.

END TERM EXAMINATION

May-2023

CEC206 VLSI DESIGN

Max. Marks: 40

Time: 3:00 Hours

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

Q.1 (a) Calculate the equivalent W/L of the two nMOS with W_1/L and W_2/L connected in series as shown below in Fig.1. For simplicity, neglect the body effect, i.e., the threshold voltages of individual transistors are constant and do not depend on the source voltages.
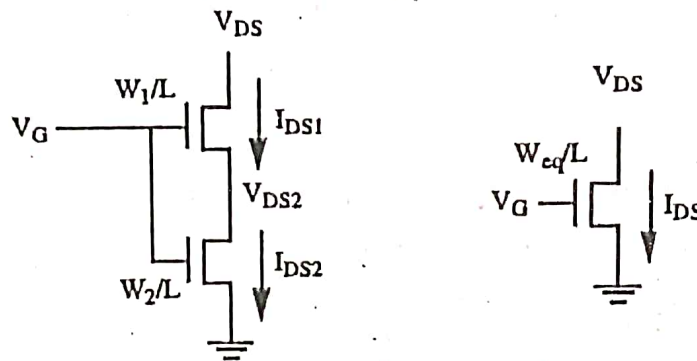

Fig.1   [4][CO3, L3]
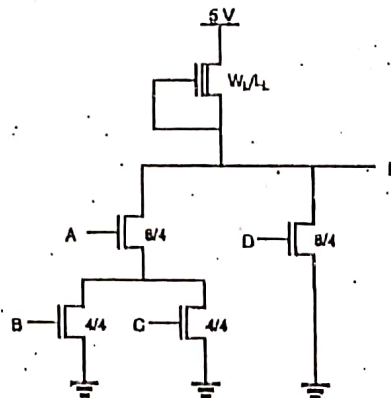
(b) Consider the circuit drawn in Fig.2 shown below:

Fig.2

(i) Determine the logic function F.
(ii) Calculate W_L/L_L, such that V_{OL} does not exceed 0.4 V.

[4][CO3, L3]

Q.2   With the help of energy band diagram and suitable illustrations, explain the operation of the MOS structure under:

(a)   No bias

(b)   External bias operating in
   (i)   Depletion region
   (ii)   Accumulation region
   (iii) Inversion region

[2+2+2+2][CO2, L2]

Q.3 (a) Consider a resistive-load inverter circuit with $V_{DD} = 5\,V$, $k_n' = 20\,\frac{\mu A}{V^2}$, $V_{T0} = 0.8\,V$, $R_L = 200\,k\Omega$ and $W/L = 2$. Calculate the critical voltages (V_{OL}, V_{OH}, V_{IL}, V_{IH}) on the VTC and find the noise margins of the circuit.

[4][CO2, L3]

(b) With the help of suitable diagrams, outline the process flow for the fabrication of an n-type MOSFET on p-type silicon.

[4][CO1, L4]

Q.4 (a) Analyze the phenomenon of channel length modulation in an n-channel MOSFET operating in saturation mode using mathematical equations.

[4][CO1, 43]
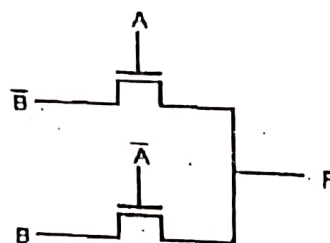
(b) Consider the circuit drawn in Fig.3 shown below:

Fig.3

(i) Determine the logic function F.

(ii) Design a circuit to implement the same logic function, but using an AOI (AND-OR-INVERT) gate. Draw a transistor level schematic and use CMOS technology.

[2+2][CO3, L3,L6]

Q.5 (a) Explain the different constraints on the time period (T) of the clock signal based on the different timing metrices for the design of sequential circuits.

[4][CO4, L2]

(b) Consider a simple example of a sequential circuit: a D flip-flop. A D flip-flop has a data input (D), a clock input (CLK), a Q output, and a Q' (complement of Q) output. The flip-flop transfers the value of the data input (D) to the output (Q) on the rising edge of the clock input (CLK).

Create a timing matrix and analyze the behavior of this circuit with the following input sequence:

Time	D	CLK
0	0	0
1	1	1
2	1	0
3	0	1

[4][CO4, L6]

Q.6 Explain any two of the following :
   (a) VLSI design flow
   (b) Field Programmable Gate Arrays
   (c) Gate Array design
   (d) Layout design rules

[4+4][CO5, L2]

Total no. of Pages:

8th SEMESTER   **B.Tech. (Eve)**

END TERM EXAMINATION   May-2023

COURSE CODE: CEC 302   COURSE TITLE: Microwave Engineering

Max. Marks: 40

Time: 03:00 Hours

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

Q.1 (a) Derive the S-matrix of a directional coupler in standard form and explain the significance of the following terms as applicable to a directional coupler:
(i) Coupling (ii) Directivity (iii) Insertion loss (iv) Isolation.

(b) An isolator has an insertion loss of 1 dB and isolation of 30 dB. Determine the S-Matrix of the isolator. (Assume all port are perfectly matched to the junction).   [4+4][CO2]

Q.2 (a) Determine the S-Matrix of a 3-port circulator given the insertion loss of 0.5 dB, isolation of 40 dB and VSWR of 1.5.

(b) An IMPATT diode has a length of 2 μm and drift velocity for Si is 107 cm/Sec. Determine the following:
(i) Operating Frequency
(ii) Drift time of the carrier   [4+4][CO2]

Q.3 (a) Describe the mechanism of velocity modulation in a two cavity Klystron With the help of Applegate diagram and calculate its efficiency.
(b) What are slow wave structures? Explain how a helical TWT achieve amplification.
                    [4+4][CO3]

Q.4 (a) Draw the band diagram of GaAs and explain the Gunn effect, where by negative resistances and therefore oscillations are obtained under certain conditions from bulk gallium arsenide.
(b) What is a TRAPATT diode? How is it better than IMPATT diode?   [4+4][CO4]

Q.5 Write short note on following:
(i) Waveguide Bends, (ii) Magic Tee, (iii) Waveguide Irises (iv) PIN Diode [8][CO1,CO5]

320 493

SIXTH SEMESTER
B. Tech. (Evening)

END TERM EXAMINATION

MAY-2023

COURSE CODE: CEC 304

Embedded Systems

Time: 3 Hours

Max. Marks: 40

Note: · Attempt *any four* questions.
· Clearly specify any assumptions you make.

1. (a) What is the difference between a microcontroller and a microprocessor? How do you choose one for an embedded application? [2][CO-1]

   (b) What is instruction pipelining (give a dummy example) and why is it used? [2][CO-2]

   (c) What is the function of the following registers in a PIC microcontroller? [4][CO-2]
   (1) STATUS, (2) INDF, (3) FSR, (4) INTCON.

   (d) Describe the working of the *direct* addressing mode in a PIC microcontroller. [2][CO-2]

2. Briefly explain what each of the following PIC instructions does.

   (1) addwf PORTA, 1   (2) clrwdt   (3) decf 0x21
   (4) decfsz PORTB   (5) goto   (6) rlf 0x20, 1
   (7) btfss STATUS, 2   (8) nop   (9) retlw 0x34
   (10) sublw 0x50   [10][CO-2]

3. (a) What is the difference between a privileged and a non-privileged mode in ARM? Which modes are privileged and which are non-privileged? [3][CO-2]

(b) What is the main advantage of (1) a *macro* compared to a *subroutine*, and (2) conditional execution in ARM micro-processors? [2][CO-2]

(c) Briefly explain what each of the following ARM instructions does.

(1) ADD r1, r1, LSL #4

(2) SUBS r1, r0, #33

(3) LDMIA r4!, {r1-r3}

(4) MLA r4, r1, r2, r3

(5) BEQ loop

[5][CO-2]

4. (a) What is saturation arithmetic and why is it so important in DSP? [2][CO-4]

(b) With the help of examples, describe the different *rounding* methods used in DSPs. [3][CO-4]

(c) Draw the schematic of a single cell of SRAM and a single cell of DRAM. How do they differ in their workings? Which one is faster? Where is each of them used in your PC and why? Which type of memory is your USB drive (pen-drive) made of? [5][CO-3]

5. (a) What is *bus arbitration*? Describe the different bus arbitration techniques. [5][CO-5]

(b) Describe the working of Serial Peripheral Interface. [3][CO5]

(c) Compare the SIMD and VLIW architectures. [2][CO-4]

END TERM EXAMINATION   May-2023

CEC312   Software Defined Radio and Cognitive Radio

Time: 3:00 Hours   Max. Marks: 50

Note: All questions are compulsory.
Marks are indicated against each question.
Assume suitable missing data, if any.

1. What is Software Defined Radio (SDR)? Explain the hardware and software structure of a SDR device. How a SDR is different from the Cognitive Radio (CR)?   [5] [CO3]

2. Why is spectrum sensing required in a cognitive radio network? How is the spectrum sensing using cyclostationary detection different from the matched filter technique?   [5] [CO3]

3. How a binary decision is taken for spectrum sensing using the energy detector? Explain the architecture for digital implementation of an energy detector. Compare its advantages/disadvantages over the wavelet detection technique.   [5] [CO3]

4. Why is trust needed in a cognitive radio networks (CRN) other than the security? What is the objective of a trust model in a CRN? Explain the trust model with a flowchart. Explain Trust-Path theorem and Trust processing theorem.   [5] [CO4]

5. Which are the different steps of a spectrum management process? Explain the importance of each step. How is the spectrum pricing important in a CRN?   [5] [CO4]

6. What is Cognitive radio relay network? How is a cooperative relay network different from a tandem relay network? Derive the maximum network

capacity of a cooperative relay network and prove that interference of the cognitive radio (CR) to the primary system (PS) is bounded in a cooperativ relay network. [5] [CO3]

7. Explain the interference property of one hop, tandem and parallel cooperative relay network. Explain the scenario in which the interference is avoidabl and when is it bounded? [4] [CO4]

8. Consider a following network model in a Cognitive Radio Network(CRN). [4*3=12] [CO2]

There is a CRN consisting of M secondary users competing for N channels (Assume M<N). The time slotted communication occurs for T time slots. The probability of a channel being vacant is evolved as a stationary Bernoulli random process across the time slots with an unknown mean.

a) For the above network model, let us assume that the secondary user does not have any information about the number of other secondary users existing the network. Then how can Musical Chair algorithm help in estimating the number of secondary users in the network? If the SUs enter or exit the network dynamically, how the dynamic Musical Chair Algorithm adapt to the changing conditions?

b) Assume that the channel characteristics change with time in the above network. Design an adaptive algorithm which can learn and adapt to the changing channel conditions and access the optimal channel with minimum number of collisions and minimum regret.

c) Assume that the secondary user does not have any information about the number of other secondary users existing in the network as well as the SU can enter or exit the network anytime. How a Trekking Approach can help the M secondary users in settling down in M top channels without estimating the number of secondary users in the network? In addition, how trekking approach be helpful in adapting to the change in the number of seconda users in the network?

9. What is Stable Marriage problem? How can a stable marriage approach help the players in settling down in the best arms in Multi-Player Multi-Arme Bandit (MPMAB) set-up? Explain with an example.

[4] [CO2]

VIth SEMESTER

B.Tech. (Eve)

END TERM EXAMINATION

May-2023

CEC320.. Soft Computing

Max. Marks: 50

Time: 03:00 Hours

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

Q.1 (a) List and explain in brief various uninformed search algorithms used in artificial intelligence.

(b) Explain the depth-first search for the graph shown in Figure 1. Taking starting node as 'S'.
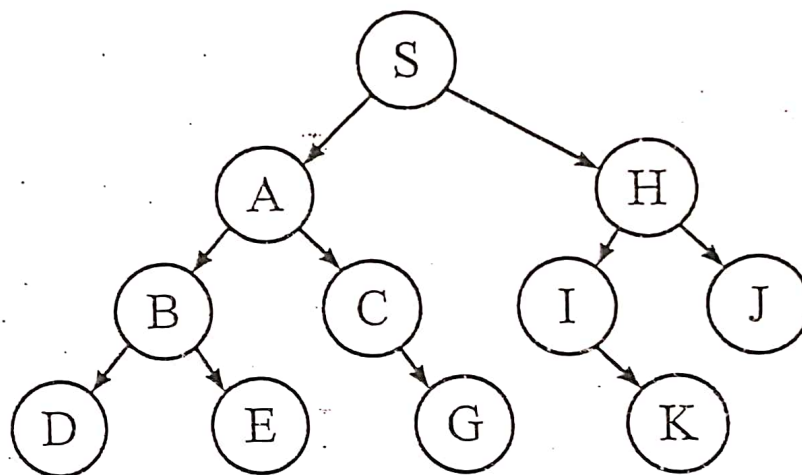
Figure 1

[5+5=10][CO1]

Q.2 (a) Assume a network with single neuron having four input with the initial weight vector as $W = [1\ \text{-}1\ 0\ 0.5]^T$, needs to be trained using set of three input vectors as $x_1 = [1\ \text{-}2\ 0\ \text{-}1]^T$, $x_2 = [0\ 1.5\ \text{-}0.5\ \text{-}1]^T$ and $x_3 = [\text{-}1\ 1\ 0.5\ \text{-}1]^T$, taking learning rate $=0.1$. The teacher's desired responses for x_1, x_2, x_3 are $d_1 = \text{-}1$, $d_2 = \text{-}1$, and $d_3 = 1$, respectively. Find the weight vector after one Epoch of training the neuron through Perceptron learning rule. (Assume neuron to be bipolar binary)

(b) Explain the single layer perceptron in detail. What are its shortcomings?

[5+5=10][CO2]

Q.3 (a) Write the components of a fuzzy logic system and explain them.

(b) Explain min-max method of fuzzy implication with a suitable example.

[5+5=10][CO3]

Q.4 (a) Consider fuzzy relation as follows

$$R = \begin{array}{c} \\ x_1 \\ x_2 \end{array} \begin{array}{cc} y_1 & y_2 \\ \begin{bmatrix} 0.7 & 0.6 \\ 0.8 & 0.3 \end{bmatrix} \end{array} \qquad S = \begin{array}{c} \\ y_1 \\ y_2 \end{array} \begin{array}{cc} z_1 & z_2 \\ \begin{bmatrix} 0.8 & 0.5 \\ 0.1 & 0.6 \end{bmatrix} \end{array}$$

Find the relation $T = R \text{ o } S$ using max-min and max product composition.

(b) Explain the following related to fuzzy set theory:

(i) Core of a set, (ii) Crossover points, (iii) α-cut, (iv) Bounded sum of two sets and (v) Law of Excluded middle.

[5+5=10][CO3]

Q.5 Explain the following related to Genetic algorithm

(a) Fitness function

(b) Encoding

(c) Crossovers

(d) Mutation

(e) Selection

[2*5=10][CO4]

Total no. of Pages:

326 499   Roll no............

8th SEMESTER   B.Tech. (Eve)

END TERM EXAMINATION   May-2023

COURSE CODE: CEC 402   COURSE TITLE: Radar & Satellite Communication

Time: 03:00 Hours   Max. Marks: 40

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

Q.1   (a) Explain the various bands of radar frequencies.

(b) Compare FM CW RADAR with MTI RADAR system on the basis of operating principle and applications.   [4+4][CO2]

Q.2   (a) Draw neat block diagram of MTI radar system and state the function of COHO and STALO blocks.

(b) List different display methods used in RADAR system. Explain the working of any one method with neat sketch.   [4+4][CO2]

Q.3   (a) Draw the block diagram of earth station neatly and explain each block in detail.

(b) Explain how three-axis stabilization is achieved for satellite in space.   [4+4][CO3]

Q.4   (a) What are the various losses to be accounted into the Friis transmission equation for a practical Radio link for calculation of received power and give the altered equation suitably.

(b) A satellite as a distance of 36000 km. from a point on the earth's surface radiates a power of 2W from an antenna with a gain of 16dBW in the direction of the observer and operates at a frequency of 11GHZ. The receiving antenna has a gain of 523dB. Find the received power. Calculate the path loss also.   [4+4][CO4]

Q.5   (a) State and explain different laws, which govern satellite motion and orbital shape for satellite in space.

(b) Explain the basic concept and working of CDMA, FDMA and TDMA.   [4+4][CO5]

VIIIth SEMESTER

B.Tech. (Eve)

END TERM EXAMINATION   May-2023

CEC-412   Machine Learning

Time: 03:00 Hours   Max. Marks: 50

Note: Question No. 1 is compulsory and attempt any other FIVE
      questions.
         Assume suitable missing data, if any.

Q.1 Answer all the following questions:
   a) Distinguish between overfitting and underfitting. How it can affect model
   generalization?   [3] [CO1]
   b) How to compute expected value and variance of a random variable?
                                                                [3] [CO2]

   c) Differentiate between Supervised, Unsupervised and Reinforcement
   Learning?   [3] [CO3]
   d) Calculate the output 'y' of a three-input neuron with bias. The input feature
   vector is (x1, x2, x3) = (0.8,0.6,0.4) and weight values are [w1, w2, w3, b] =
   [0.2, 0.1, -0.3, 0.35]. Use binary Sigmoid function as activation function.
                                                                [3] [CO4]

   e) Discuss any three examples of machine learning applications. [3] [CO5]

Q.2 a) A patient takes a lab test and the result comes back positive. It is known that
      the test returns a correct positive result in only 98% of the cases and a correct
      negative result in only 97% of the cases. Furthermore, only 0.008 of the
      entire population has this disease.
      i.   What is the probability that this patient has cancer?
      ii.   What is the probability that he does not have cancer?
      iii. What is the diagnosis?   [3] [CO2]

b) Find the singular value decomposition of a matrix $A = \begin{bmatrix} -4 & -7 \\ 1 & 4 \end{bmatrix}$.

[4] [CO2]

W8	Windy	No	Rich	Shopping
W9	Windy	Yes	Rich	Cinema
W10	Sunny	No	Rich	Tennis

[7] [CO4]

Q.3 a) Use K Means clustering to cluster the following data into two groups. Assume cluster centroid are m1=2 and m2=4. The distance function used is Euclidean distance. {2, 4, 10, 12, 3, 20, 30, 11, 25}

[4] [CO3]

b) Explain how Support Vector Machine can be used for classification of linearly separable data.

[3] [CO3]

Q.4 Consider the training data in the following table where Play is a class attribute. In the table, the Humidity attribute has values "L" (for low) or "H" (for high). Sunny has values "Y" (for yes) or "N" (for no), Wind has values "S" (for strong) or "W" (for weak), and Play has values "Yes" or "No".

Sol

3 2f

Humidity	Sunny	Wind	Play
L	N	S	No
H	N	W	Yes
H	Y	S	Yes
H	N	W	Yes
L	Y	S	No

What is class label for the following day (Humidity=L, Sunny=N, Wind=W), according to naive Bayesian classification?

[7] [CO4]

Q.5 Contruct a Decision Tree using Gini Index as an attribute selection measure (ASM) for the following given data below:

Weekend	Weather	Parent	Money	Decision
W1	Sunny	Yes	Rich	Cinema
W2	Sunny	No	Rich	Tennis
W3	Windy	Yes	Rich	Cinema
W4	Rainy	Yes	Poor	Cinema
W5	Rainy	No	Rich	Stay In
W6	Rainy	Yes	Poor	Cinema
W7	Windy	No	Poor	Cinema

Q.6 Determine whether the following tasks belong to supervised learning, unsupervised learning, or reinforcement learning.

[7] [CO5]

i. You want to predict whether or not it will be raining at 5pm tomorrow based on previous weather-related database.

ii. Take a collection of notes written on multiple topics of a subject, and find a way to automatically group these topics into a small number of groups of topics that are somehow "similar".

iii. You have given a large database of student records which contains student's performance in different subjects, try to learn whether there might be different clusters of such students which needs a separate teaching strategy.

iv. In stock market, given data on stock prices over the last 25 years, determining the future stock price of a company.

v. Grouping of pixels in an image with similar colors.

vi. To train a robot to find a path in a given scenario.

vii. Inspect a large database of emails that are known to be spam, to discover if there are sub-types of spam.

Q.7 a) What is Reinforcement Learning? Explain the Q function and Q Learning Algorithm.

[3] [CO3]

b) What is a Perceptron? Explain the working of a perceptron with a neat diagram.

[4] [CO2]

Roll no................

VIII SEMESTER

B.Tech. [Eve]

END TERM EXAMINATION

MAY-2023

CEC 436 Advance Microwave and Antenna Design

Time: 3 Hours   Max. Marks : 50M

Note: Question No.1 is compulsory and attempt any 5 from remaining questions. Assume suitable missing data, if any.

Q.1 a) Calculate the physical length of a three-quarter wavelength microstrip transmission line when $\varepsilon_r = 9.8$, filling factor (q)= 0.76 at operating frequency f=10 GHz? [3M] [CO1]

b) Determine the end effect length of a microstrip line having characteristic impedance of 50 Ω, $\varepsilon_{eff} = 9.8$, and fringing capacitance of 1nF.

[3M] [CO2]

c) Determine the optimum gain of a pyramidal horn antenna resonating at 3.5 GHz for 5 G applications with an optimal dimension of A×B=1 mm^2

[3M] [CO3]

d) Draw the physical geometry of rectangular microstrip patch antenna and also field configurations of it in TM_{010}, TM_{001}, TM_{002} and TM_{020}, modes.

[3M] [CO4]

e) Define smart antenna? List out any four potential benefits of smart antenna [3M] [CO5]

Q.2 a) Draw the equivalent circuits of symmetrical and asymmetrical step discontinuities of micro strip line [2M] [CO2]

b) Determine the equivalent circuit parameter (inductance L & Capacitance C) values of a right angled microstrip bend line of 0.75mm width printed on a 0.5 mm thick substrate whose relative permittivity is 9.9? [5M] [CO2]

Q.3 a) Derive the Electric field and Magnetic field expressions of a Z-directed hertzian dipole at far field distance of $r \ll \lambda$. [4M] [CO3]

b) Normalized radiation intensity of an antenna is given by

$$U_n(\theta) = 1, \quad 0 \le \theta < 30°$$

$$= \frac{\cos \theta}{0.866}; \quad 30° \le \theta < 90°$$

$$= 0; \quad 90° \le \theta \le 180°$$

It is independent of ϕ. Determine exact directivity and maximum aperture area at operating frequency of 900 MHz [3M] [CO3]

Q.4 a) Determine the gain of two-dimensional antenna array at $\phi=0°$ on the x-y plane ($\theta=90°$) as shown in Fig.1.
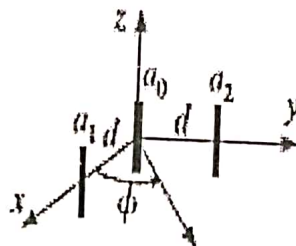
Fig.1. Two-dimensional antenna array

Where $d = \frac{\lambda}{2}$, $a_0 = 1$, $a_1 = 1$, $a_2 = 0$. [3M] [CO3]

b) Explain Huygen's and Babinet's principle in relation to antennas [4M] [CO3]

Q.5 a) Design an edge feed rectangular patch antenna used for linear polarization using RT duroid 5880 substrate with $\varepsilon_r=2.2$ and thickness 1.588mm to work at 2.45GHz for Bluetooth applications [4M][CO4]

b) Explain the transmission line model of rectangular microstrip antenna [3M][CO4]

Q.6 a) Design a circular microstrip antenna using a substrate RT duroid 5880 with $\varepsilon_r=2.2$ and thickness 1.588mm so as to resonate at 5.5 GHz for Wi-Fi 6E applications   [3M][CO4]

b) Explain the i) Microstrip line feed ii) Probe feed iii) aperture coupled feed iv) Proximity coupled feed of a Microstrip patch antenna

[4M][CO4]

Q.7 a) Differentiate analog beam forming and digital beam forming with suitable diagrams   [2M][CO5]

b) Determine the weights for a 3-element array as shown below Fig.2. with the desired signal arriving from $\theta_D= 0^0$ while interfering signals are arriving from $\theta_1= -45^0$ and $\theta_2= 60^0$.   [5M][CO5]
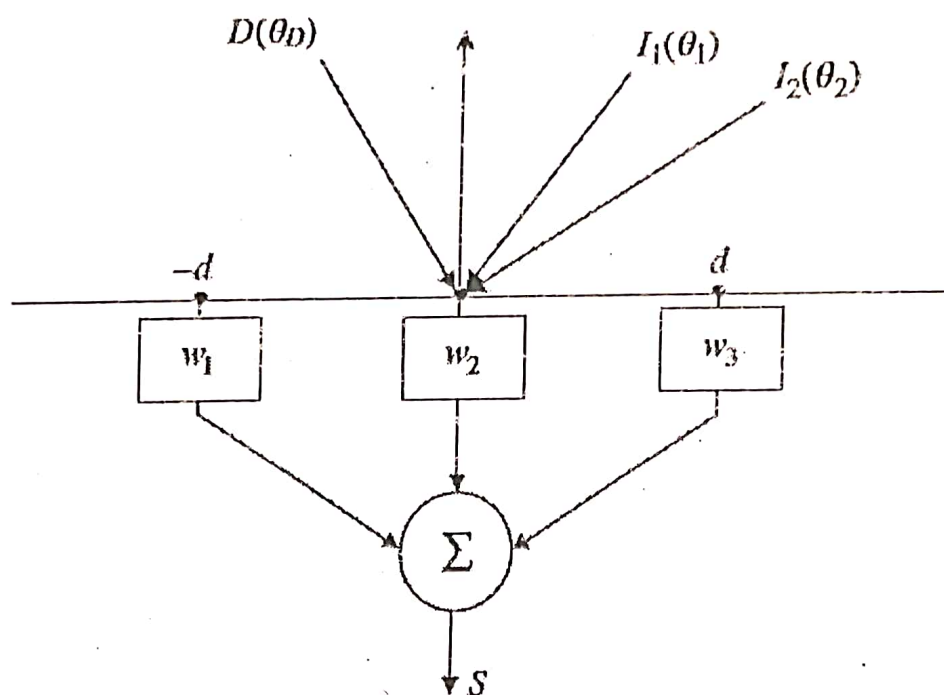

Fig.2. The 3-element array with desired and interfering signals.

*********************************END***

Time: 3hr

Note: Answer all questions. All questions carry marks on the side.
Assume suitable missing data, if any.

Q No 1)

(a) Deduce an expression for e.m.f equation of DC Generator?   [CO3] [3]

(b)An 8-pole lap connected armature has 960 conductors, a flux of 40 m Wb per pole and a speed of 400 r.p.m. Calculate the emf generated on open circuit. If the armature were wave connected, at what speed it must be driven to generate 400 V.   [CO3] [5]

Q No 2)

(a)A 25HP, 250V DC Series motor has armature resistance 0.1Ω and field resistance 0.05Ω and brush Contact drop 3V. When the line current is 80A, the speed is 600rpm. Find the speed when the line Current is 100A. [CO2:4MARKS]

2. Draw and explain the characteristics of DC series and DC Shunt Motors.   [CO3] [4]

QNO3)

(a) Define torque of DC Motor? [CO4: 2MARKS]

(b) If the applied voltage of a DC motor is 230 V, then back emf, for maximum power developed is? [CO2:3 MARKS]

(c) What is the emf generated by a 4 pole lap connected DC motor rotating at 1500 rpn having 200 Conductors and useful flux per pole is 0.4 mwb.   [CO3][2.5]

(d) The speed of a motor falls from 1100 r.p.m at no-load to 1050 r.p.m at rated load. What is the speed regulation of motor   [CO3][2.5]

QNO4) $3\cancel{3}2\ 5o5$

(a)Describe Hopkinson test in detail. What are its advantages and disadvantages?
                                                        [CO4][4]
(b)A Shunt generator delivers 195A at terminal Voltage of 250V. The armature
resistance and shunt Field resistances are 0.02 Ω and 50 Ω respectively. The iron and
friction losses equal 950 W. Find (a) EMF generated (b) Copper losses (c) output of th
prime mover (d) commercial, mechanical and electrical efficiencies.   [CO4][4]

QNO5)

a) In a transformer, derive the condition for maximum efficiency and thus find the loa
current at which the efficiency is maximum.   [CO1][3]

b) A 20KVA, 2000/200V single phase transformer has the following parameters H.V
winding: R1=3Ω , X1=5.3Ω, L.V winding: R2=0.05Ω ,X2=0.1Ω. Find the Voltage
Regulation at (i) p.f of 0.8 lagging (ii) UPF   [CO1][3]

Roll No: ....

II SEMESTER

B.Tech. (Eve)

END TERM EXAMINATION May-2023

CEE104 Electromagnetic Field Theory

Time: 03:00 Hours Max. Marks: 50

Note :
1. All questions carry equal marks.
2. Q. 1 is compulsory.
3. Attempt any four questions from Q. 2 to Q.7.
4. Assume suitable missing data, if any.

Q.1 Answer the following by opting for one out of four options.

a) Livinia, the housefly, finds herself caught in the oven at point $(0, 0, 1)$. The temperature at points in the oven is given by the function $T(x, y, z) = 10(xe^{-y^2} + ze^{-x^2})$, where the units are in degrees Celsius. In what direction should she move in order to cool off as rapidly as possible? [1][CO1]

 (i) $\frac{1}{\sqrt{2}}(\vec{a}_x + \vec{a}_y)$, (ii) $\frac{1}{\sqrt{2}}(-\vec{a}_x + \vec{a}_y)$,

 (iii) $\frac{1}{\sqrt{2}}(\vec{a}_x - \vec{a}_y)$, (iv) $\frac{1}{\sqrt{2}}(-\vec{a}_x - \vec{a}_y)$

b) Find a, b and c such that $\vec{B} = (2x - 3y + az)\vec{a}_x + (bx + 4y - 5z)\vec{a}_y + (6x + cy + 7z)\vec{a}_z$ is irrotational. [1][CO1]

 (i) $a = 7, b = 2, c = 4$ (ii) $a = 6, b = -3, c = -5$

 (ii) $a = 4, b = 2, c = 5$ (iv) $a = 4, b = -3, c = 4$

c) Two vectors are given as $\vec{A} = 2\vec{a}_x + 3\vec{a}_y - 5\vec{a}_z$ and $\vec{B} = -3\vec{a}_x + 4\vec{a}_y + \vec{a}_z$. What is the smaller angle between the two? [1][CO1]

 (i) 71° (ii) 80° (iii) 62° (iv) 88°

d) What is the unit of electric flux density? [1][CO2]

 (i) Wb (ii) Wb/m^2 (iii) C (iv) C/m^2

e) Laplace equation is applicable to [1][CO4]

 (i) Homogeneous medium with no charge density

 (ii) Homogeneous medium with charge density

 (iii) Inhomogeneous medium with no charge density

 (iv) Inhomogeneous medium with charge density

f) For a surface charge distribution electric field intensity is [1][CO2]

(i) $\propto r$ (ii) $\propto \frac{1}{r}$ (iii) $\propto \frac{1}{r^2}$ (iv) None of the above

g) Which of the following Maxwell's equations implies the non-existence of magnetic monopole? [1][CO5]

(i) $\vec{\nabla}.\vec{D} = \rho_v$ (ii) $\vec{\nabla}.\vec{B} = 0$ (iii) $\vec{\nabla} \times \vec{E} = 0$ (iv) $\vec{\nabla} \times \vec{H} = \vec{J}$

h) For a magnetic dipole, the magnetic flux density is proportional to [1][CO5]

(i) r (ii) $\frac{1}{r}$ (iii) $\frac{1}{r^2}$ (iv) $\frac{1}{r^3}$

i) For which of the following materials $\mu_r \leq 1$ [1][CO5]

(i) Diamagnetic (ii) Paramagnetic   (iii) Ferromagnetic   (iv) Non – magnetic

j) Which of the following law states that the effect opposes the cause?

(i) Coloumb's Law   (ii) Biot – Savort Law

(iii) Faraday's Law   (iv) Lenz's Law

[1][CO6]

Q.2 (a) State divergence theorem. A vector field is given as $\vec{A} = 6\rho^2 z \, \vec{a}_\rho$. Verify divergence theorem for a closed surface defined by $0 < \rho < 3$, $0 < \varphi < 360°$ and $0 < z < 5$.   [5][CO1]

(b) Define the following terms :

(i) Scalar field, (ii) vector field, (iii) solenoidal field, (iv) irrotational field, (v) harmonic field.   [5][CO1]

Q.3 (a) State Gauss's law. Obtain the expression of electric field intensity for point charge and surface charge distribution using Gauss law.   [5][CO2]

(b) What is an electric dipole? Obtain the expression for electric potential at an external point due to an electric dipole.   [5][CO2]

Q.4 (a) What is electric current density? Classify different types of current densities.   [5][CO3]

(b) Let $z < 0$ be region 1 with dielectric constant $\varepsilon_{r1} = 4$, while $z > 0$ is region 2 with $\varepsilon_{r2} = 7.5$. Given that $\vec{E}_1 = 60\vec{a}_x - 100\vec{a}_y + 40\vec{a}_z \, V/m$. Calculate $\vec{E}_2$.   [5][CO3]

Q.5 (a) D__ve an expression of magnetic field intensity due to an infinite line current distribution. [5][CO5]

(b) Find the magnetic field strength at O for the filamentary loop shown in Fig. 1. [5][CO5]
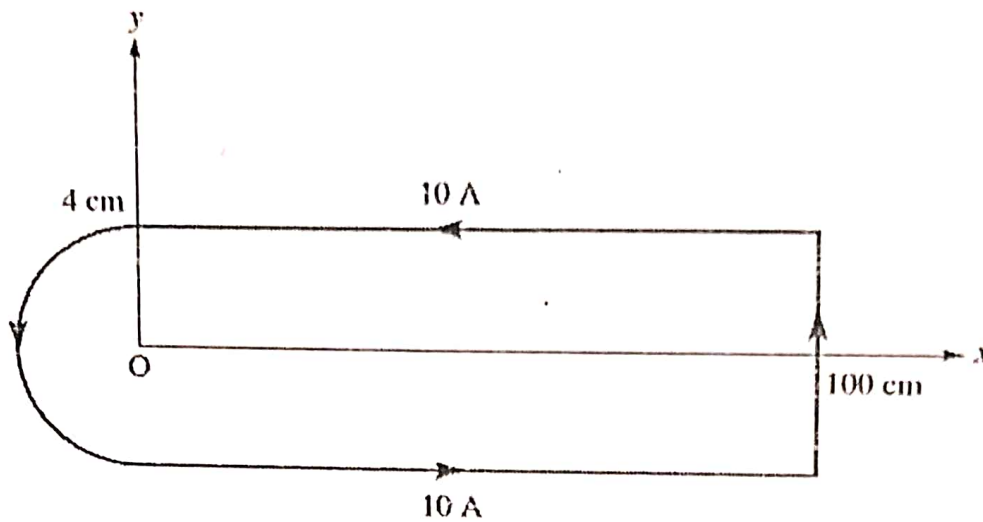

Fig. 1

Q.6 (a) What do you understand by magnetization in materials? Classify different magnetic materials. [5][CO5]

(b) What do you understand by transformer emf and motion emf? [5][CO6]

Q.7 Write a short note on any two of the following :

(a) Curl of a vector field [5][CO1]

(b) Uniqueness theorem [5][CO4]

(c) Biot – Savort law [5][CO5]

(d) Faraday's law [5][CO6]

ʒ̣ɪ̣ʄ ̇ S̄ʋ̇8

IV SEMESTER
B.TECH. ELECTRICAL ENGINEERING (EVENING)
END TERM EXAMINATION   **May 2023**
CEE-202 Power Transmission & Distribution

Time: 3.Hrs.   Max. Marks: 40

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

                                                  2X4 [CO1]
1. Explain
   a. EHV lines are constructed using bundled conductors.
   b. Long lines generally use reactive power compensation equipment for proper operation.
   c. The current rating of a cable buried in the soil is less than that of a similar cable in air.
   d. Power cables are provided with a metal sheath

2. (a) Draw the cross section of a 3-core cable. Discuss the significance of each part. What materials are used for insulation of cables?   4 [CO4]
   (b) What do you understand by dielectric loss in underground cables? Explain loss angle 'δ' and its significance.   4 [CO4]

3. (a) What is Ferranti Effect? Deduce a simple expression for the voltage rise of an unloaded line.   4[CO3]
   (b) Find the no load sending end voltage and the voltage rise from sending to receiving end for a 50Hz, 300 km long line if the receiving end voltage is 220 kV.   4 [CO3]

4. Draw phasor diagram for a nominal T-circuit of a medium transmission line. Derive expressions for sending end voltage and current.
                                                  8 [CO2]

5. (a) Name different types of insulators used in power systems. Give the application of each insulator. Describe the main constructional features of suspension type insulators. 4 [CO1]

(b) A 3-unit insulator string is fitted with a guard ring. The capacitances of the link pins to metal work and guard ring can be assumed to be 15% and 5% of the capacitance of each unit. Determine the voltage distribution and the string efficiency.

4 [CO1]

6. Write short notes on any two of the following: 4
   (a) Disruptive critical voltage and visual critical voltage [CO2]
   (b) Factors affecting corona loss [CO2]
   (c) Lightening arresters and Surge diverters [CO5]

IVth Semester

B.Tech (Eve.)

End Term Examination

May-2023

CEE-204 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]

   (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]
   (ii) Voltage [2][CO1]

Q.2 (a) An accuracy error of +/-0.5% of reading +/- one digit, is reflected by a 3 ½ digital voltmeter. If full scale reading is 10 V and instrument is displaying 2 V as the output, what should be the possible error in volts? [4][CO3]

   (b) Draw the full waveform formation, with procedure, in the following connections on a CRO.

   (i) At both X & Y inputs, a 1000 Hz sinusoidal voltage is connected. [2][CO4]
   (ii) A sinusoidal signal is applied to vertical deflection plate and no signal is applied to horizontal deflection plate. [2][CO4]

Q.3 (a) An accuracy error of +/-0.5% of reading +/- two digits, is reflected by a 3 ½ digital voltmeter. If full scale reading is 10 V and instrument is displaying 0.1 V as the output, what should be the possible percentage error? [4][CO3]

$3\cancel{7}8\ S||$

(b) A 2 kHz sinusoidal waveform is given to x-deflection plate and 1 kHz saw tooth waveform to y-deflection plate of a CRO. Draw the waveform displayed on the screen of CRO in the connection. [4][CO4]

Q.4 (a) Draw neat and clean diagram of attraction type Moving Iron Instrument. Derive the equation for deflection angle in moving iron instruments. Explain its working, show if the scale is linear or non-linear? [1+1+2][CO2]

(b) 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? [1+1+2][CO2]

Q.5 (a) Draw neat and clean diagram of a CRT. 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 300 degrees. [3+2][CO4]

(b) 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?

    (i) Capital "C"   [1][CO4]
    (ii) Sign of "INFINITY"   [1][CO4]
    (iii) Sleeping "Eight"   [1][CO4]

Q.6 Write Short notes on any two of the following: [4+4]

    (i) 3 ½ digital voltmeter   [CO4]
    (ii) Owen's Bridge   [CO2]
    (iii) Anderson's Bridge   [CO2]
    (iv) Schring's Bridge   [CO2]
    (v) Kelvin's Double Bridge   [CO2]
                                     [CO2]

33q512

FOURTH SEMESTER
B.TECH (CEEE)

END TERM EXAMINATION

MAY-2023

CEE-206 MICROPROCESSORS AND MICROCONTROLLERS APPLICATIONS

TIME:3HRS

MAX. MARKS:40

NOTE: ATTEMPT ANY FIVE QUESTION.

1. (a) Draw internal architecture of 8085 microprocessor. [4][CO1]
   (b) What is addressing mode? Explain types of addressing modes of 8085 [4][CO1]
   microprocessor with one example each.

2. a) Draw timing diagram for OUT 01H instruction [4][CO2]
   (b) Differentiate between following instructions:
   (i) CALL and RET instruction [4][CO2]
   (ii) PUSH and POP instruction

3. a) Write an assembly language program to find largest number from a
   series of six 8-bit numbers. [4][CO2]
   (b) Write an assembly language program to generate a time delay of
   109 ms with 2MHzclock frequency. [4][CO2

4. (a) The memory address of last location of 8KX8 R/W memory and [4[CO1]
   ROM chip of size 8kX8 are 1FFF H and 83FFH respectively. Find
   the starting address of these memory chips. Draw logic diagram of
   the memory interfacing of these memory chips using 3 to 8 decoder
   to verify the address range.
   (b) For Fig-1 identify port A and port B as input or output port. What [4][CO1]
   are the addresses of port A and Port B.
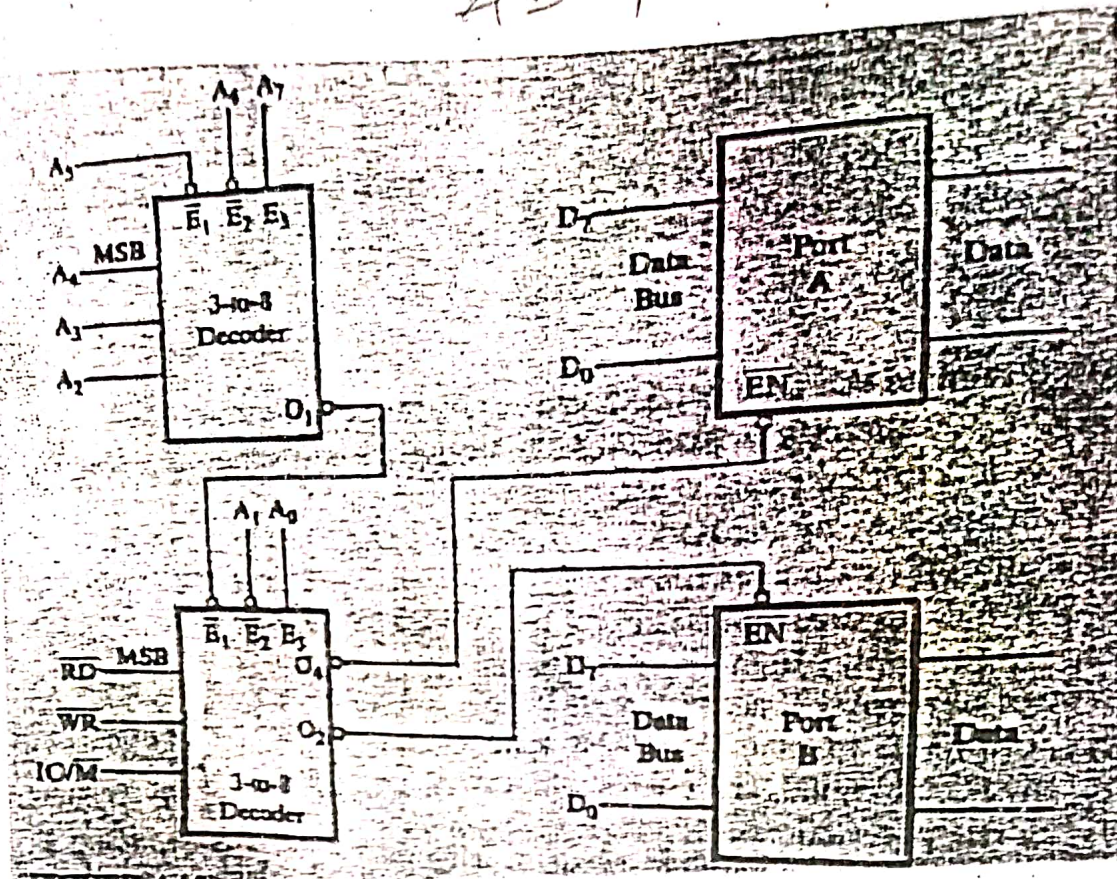
Fig-1

5. (a) With wave form explain mode 3 operation of 8254 timer. Also introduce the effect of gate signal on output of the timer [4][CO3]

   (b) Explain different modes of operation of PPI 8255. Find BSR control word to set and reset PC5. [4][CO3]

6. (a) Draw interfacing circuit to connect ADC 0809 to 8085 microprocessor through PPI 8255. Explain how this circuit can be extended for measurement of deflection. Write the instructions to monitor temperature continuously at Port A of 8255-1. [4][CO4]

   (b) Draw microprocessor based interfacing circuit to measure phase angle between voltage and current flowing through inductive load when connected across single phase, 230 volt, 50 Hz ac supply. Write the instructions to display phase angle at Port A of 8255. [4][CO4]

7. Write short notes on **any two** of the following
   (a) USART 8251
   (b) 8051 microcontroller architecture
   (c) Vectored interrupt
   (d) Memory mapped IO and peripheral IO interfacing.

   [CO3]
   [CO5]
   [CO2]
   [CO1]
   [4+4]

34/514

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

SIXTH SEMESTER

B. Tech. (EE) Continuing Education

END SEMESTER EXAMINATION   MAY-2023

CEE302   RENEWABLE ENERGY SYSTEMS

Time: 3.00 Hours   Max. Marks: 40

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.   [8x1=8]

(a) Calculate the power generated from solar cell of 10 cm x 10 cm at an efficiency 20% under STC.   [CO-1]

(b) What are the different types of solar cells? Mention the advantages and disadvantages of each.   [CO-1]

(c) What is the purpose of bypass and blocking diode in solar PV systems?   [CO-1]

(d) Define the depth of discharge, state of charge and self-discharge w.r.t battery energy storage systems.   [CO-5]

(e) Discuss the significance of Betz's limit in wind energy conversion system.   [CO-2]

(f) In wind energy conversion system which type of turbine is widely used and why?   [CO-2]

(g) The wind speed at a height of 15 m is 5 m/sec. Calculate the wind speed at a height of 40 m. The value of α is 0.12.   [CO-2]

(h) Define the calorific value of the biomass. What are the factors, which affects the calorific value of biomass?   [CO-4]

2. (a) What are the major renewable energy resources for power generation in India? Mention their contribution in the present power sector. Also, discuss the projected demand by 2030 and how it can be fulfilled with the help of renewable energy resources. Mention the limitations in achieving this, if any.
                                                  [4] [CO-1]

(b) With the help of block diagram, explain the different grid connected and off grid configurations of solar PV systems. Mention the advantages and limitations of each configuration. Discuss the necessity of hybrid renewable energy systems with the help of suitable example. [4] [CO-1]

3. (a) With the help of block diagram, explain the various components of wind energy conversion system (WECS). Also, explain the yaw controlling mechanism of WECS. [4] [CO-2]

(b) What are the different types of wind turbines. Draw and explain the C_p vs λ characteristics for different wind turbines. Also, mention the name of generators utilized in WECS. [4] [CO-2]

4. (a) What are the main sources of biomass energy? Mention the energy contents of major biomass with different ash and moisture contents. [4] [CO-3]

(b) With the help of neat diagram, explain the construction of digester for biogas plant. Also mention the advantages and limitations of biogas plants implementation in India. [4] [CO-3]

5. (a) Name the various components of small hydro power plant. A hydro electric plant has a catchment area of 120 km². The available run off is 50% with annual rain fall of 100 cm. The average head of 250 m is available with power plant efficiency of 70%. Determine the average power produced, capacity of the power plant. Assume a load factor of 0.6. [4] [CO-4]

(b) Compare different types of secondary batteries? Also describe the significance of C rating. Mention the parameters for the selection of appropriate sizing of battery for various applications. [4] [CO-5]

6. Answer *any four* of the following: [4x2]

(a) Solar water pumping system with suitable example [CO-1]

(b) Role of renewable energy-based technologies in the reduction of greenhouse gases [CO-1]

(c) Specifications of PV module, battery and inverter [CO-1]

(d) Solar energy is the energy for future in India [CO-1]

(e) Advantages and limitations of small hydro power plants [CO-4]

6th SEMESTER

B.Tech. (Eve)

END TERM EXAMINATION   May-2023

CEE304   Power System Operation and Control

Time: 03:00 Hours   Max. Marks: 40

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

Q.1 (a) An isolated power station has the following parameters: turbine time constant =0.5s, governor time constant=0.2s, generator inertia constant H=5s, governor speed regulation=R p.u. The load varies by 0.8% for a 1% change in frequency. Use Routh-Herwitz array to find range of R for control system stability.   [4] [CO1]

(b) What are the effects of load damping coefficient, and governor droop on the steady state frequency change in a single area system? How can the frequency error be reduced to zero? Explain with the help of a block diagram.   [4] [CO1]

Q.2 (a) A two area system connected by a tie line has the following parameters on common base:

Area	1	2
Speed regulation	0.05	0.0625
Freq.-load coefficient	0.6	0.9
Inertia constant	5s	4s
Base power	1000MVA	1000MVA
Governor time constant	0.2s	0.3
Turbine time constant	0.5s	0.6s

The units are operating in parallel on nominal frequency of 50Hz. The synchronizing power coefficient is given to be 2pu. A load change of 187.5MW occurs in Area 1. Determine the new steady state frequency of the system (Hz), change in mechanical power in each area (MW), and the change in tie line flow.   [4] [CO2]

(b) Draw the block diagram for the above mentioned (Q.2(a)) two area system, generating ACE, and incorporating controller for Automatic Generation Control (AGC), in order to make the frequency and tie line power error zero. Label all blocks.

[4] [CO2]

Q.3 (a) A 60 Hz synchronous generator having inertia constant H=9.94MJ/MVA and a transient reactance $X_d{}'$=0.3pu is connected to an infinite bus through a purely reactive circuit as shown in Fig. 1. The generator is delivering real power of 0.6pu, at 0.8pf lag, to the infinite bus of V=1pu. Consider a small disturbance occurs in rotor angle, find the undamped angular frequency of oscillation.
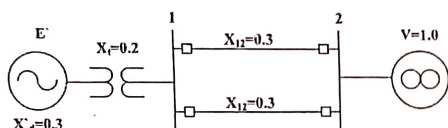

Fig. 1

[4] [CO3]

(b) A 50Hz, 4-pole turbo-generator, rated 100MVA, 13.8kV has inertia constant of 10MJ/MVA. If the input to generator is suddenly raised to 60MW for an electrical load of 50MW, find the rotor speed (in rpm) after 12 cycles. [4] [CO3]

Q.4 (a) Consider the same generator as given Q.3 (a). Find the maximum power input that can be applied without loss of synchronism.

[4] [CO4]

(b) A 50 Hz synchronous generator having inertia constant H=5MJ/MVA and a direct axis transient reactance $X{}'_d$=0.3pu, is connected to an infinite bus through a purely reactive circuit as shown in Fig. 1. The generator is delivering real power Pe=0.8pu and Q=0.074pu to the infinite bus at a voltage of V=1pu. A temporary three-phase fault occurs at bus 1. When the fault is cleared and the system is restored, both the lines are intact as original. Determine the critical clearing angle and the critical fault clearing time.

[4] [CO4]

Q.5 (a) Briefly explain the different types of methods employed for regulating the voltage in power system. [4] [CO5]

(b) The AVR system of a generator has following parameters:

	Gain	Time constant
Amplifier	K_A	0.1
Excitor	1	0.4
Generator	1	1.0
Sensor	1	0.05

Use Routh Hurwitz array to find the range of K_A for control system stability. [4][CO5]

Q.6 (a) A single area consists of two units with following characteristics:

Unit	Rating (MVA)	Speed Regulation R (pu on unit MVA base)
1	600	6%
2	500	4%

The units are operating in parallel sharing 900MW at nominal frequency. Unit-1 supplies 500MW and unit-2 supplies 400MW at 50Hz. The load is increased by 90MW. If the load varies 1.5% for every 1% change in frequency, find (i) the steady state frequency generation (ii) the new generation on each unit (iii) change in load power requirement because of change in frequency. Select 1000MVA as new common base for all parameters. [4] [CO1]

(b) How many types of excitation systems are used for generator? Discuss in brief. [4] [CO5]

VI SEMESTER

B.Tech. (Eve.)

END TERM EXAMINATION   **MAY-2023**

CEE-306 POWER SYSTEM OPTIMIZATION

Time: 3 hours   **Marks: 50**

Note: Attempt any FIVE

      All questions carry equal marks

      Assume suitable missing data, if any

1. Formulate Y_{bus} matrix for the power network shown in Fig. 1. The relevant p.u. admittances are indicated on the diagram.   **[CO1]**
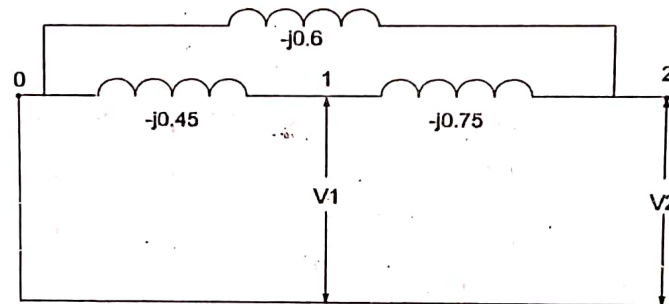
Fig. 1

2. Determine nodal admittance matrix for the power system represented by single line diagram as shown in Fig. 2.   **[CO2]**
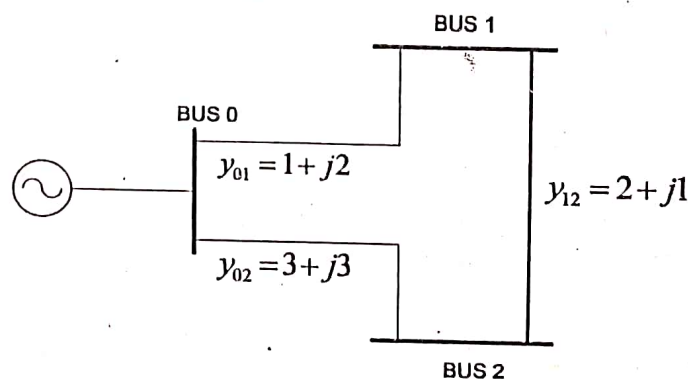
Fig. 2

3. A 4-bus system is shown in Fig.3. The magnitudes of the bus voltages at all the buses are 1 p.u. each. The per unit values of line admittances, loads and active power generated at different buses are indicated on the figure. Determine (i) reactive power generated at buses (ii) active power and reactive power losses (iii) power flow in each of the transmission lines in the network **[CO2]**

$S_{G2} = 0 + jQ_{G2}$

$S_{G1} = P_{G1} + jQ_{G1}$

$S_{D2} = 2 + j0.5$

$S_{D1} = 1.5 + j1$

$S_{G4} = 0 + jQ_{G4}$

$S_{D3} = 2 + j0.8$

$S_{G3} = 3.5 + jQ_{G3}$
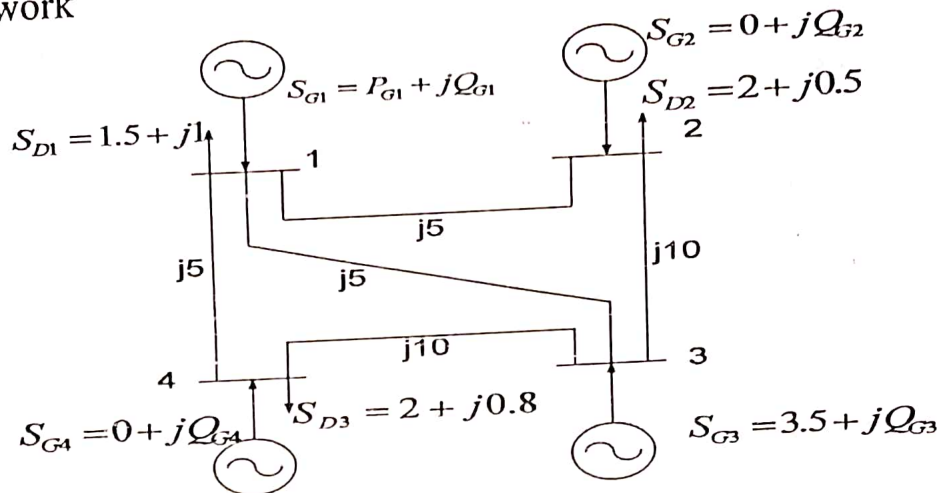
Fig.3

4. The following is the system data for load flow solution. The line admittance

Bus Code	Admittance
1-2	2-j0.8
1-3	1- j4.0
2-3	0.666-j2.664
2-4	1- j4.0
3-4	2-j.80

The schedule of active and reactive powers:

Bus Code	P	Q	V	Remarks
1	-	-	1.06	Slack
2	0.5	0.2	1+j0.0	PQ
3	0.4	0.3	1+j0.0	PQ
4	0.3	0.1	1+j0.0	PQ

Determine the voltages at the end of first iteration using Gauss-Siedel method. Take $\alpha = 1.6$ **[CO3]**

5. The heat-rate of a 50 MW fuel-fired generator unit is measured as follows:

25% of rating: 10 MKCal/MWhr
40% of rating: 8.6 MKCal/MWhr
100% of rating: 8 MKCal/MWhr
Cost of fuel is Rs. 4 per MKCal. Calculate
(a) $C(P_g)$
(b)   Find the fuel cost when 100% loaded and 25% loaded
(c) The incremental cost
(d)   The cost of fuel to deliver 1 MW.   [CO4]

6. Incremental fuel costs (Rs/MWhr) for a power plant consisting two generating units are as

$$\frac{dC_1}{dP_{g1}} = 0.18P_{g1} + 41$$

$$\frac{dC_2}{dP_{g2}} = 0.36P_{g2} + 32$$

And generator limits are: $32 \le P_{g1} \le 180$ MW, $22 \le P_{g2} \le 130$ MW

Determine P_{g1}, P_{g2} and values of λ for the variation of load from 54 MW to 310 MW. Assume that both generating units are operating at all times.   [CO4]

7. A two bus power system is shown in Fig. 4. Incremental fuel costs of the two generators are given as: $IC_1 = (0.35P_{g1} + 41)$ Rs./MWhr, and $IC_2 = (0.35P_{g2} + 41)$ Rs./MWhr and loss expression is $P_L = 0.001(P_{g2} - 70)^2$ MW. Determine the optimal scheduling and power loss of the transmission link.   [CO5]
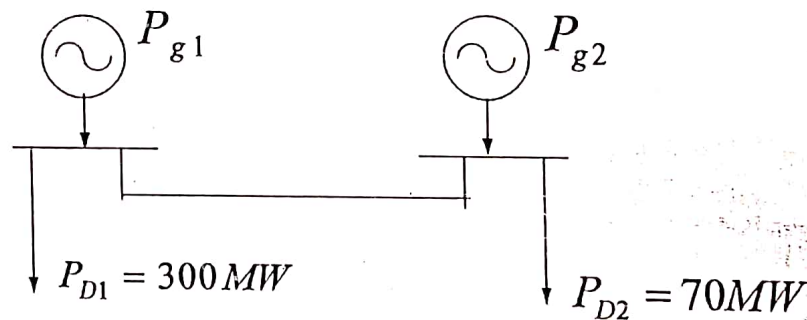

$P_{D1} = 300 MW$

$P_{D2} = 70MW$

Fig. 4

347 520

Roll no..........

Total no. of Pages 01

6th SEMESTER
B.TECH. (EVENING)

END TERM EXAMINATIONS

May-2023

CEE-308   Power Electronics Application to Power System

TIME 3:00 Hours

Max. Marks: 50

NOTE: All questions carry equal marks
Q.1 is compulsory
Attempt any four questions from remaining

Q.1 Explain   [10]

  a) Inverter operation in HVDC system   [CO1]

  b) THD analysis of nonlinear current   [CO2]

  c) DSTATCOM   [CO3]

  d) Modes of TCSC   [CO4]

  e) Difference between SSSC and STATCOM   [CO5]

Q.2 a) Compare Series and shunt compensation in detail.   [5] [CO4]

  b) Explain any one series or shunt compensating FACTS device in detail. [5]

                                                                                    [CO4, CO5]

Q.3 Explain the following (with neat and clean diagram)   [10]

  a) HVDC converter station   [CO1]

  b) IRPT control scheme for DSTATCOM   [CO3]

Q.4 a) Explain dynamic and steady state characteristics of Static Var
Compensator in detail.   [5] [CO4]

  b) Explain the working principle and operation of SSSC.   [5] [CO5]

Q.5 a) Classify Power System Stability. Explain each classification in detail.

                                                                                    [5] [CO5]

  b) Why SVC is better in operation as compared to TCR? Support your
solution with the help of suitable diagrams.   [5] [CO4]

Q.6 a) What is combined series-parallel compensation? Explain any one FACTS
device operating on this principle in detail.   [5] [CO5]

  b) What are the problems associated with distribution system?   [5] [CO2]

348-521

Total No. of Pages:01

EIGHTH SEMESTER

B.Tech. (EVE.)

END SEMESTER EXAMINATION   MAY-2023

CEE402 Switchgear and Protection

Time: 3:00 Hours   Maximum Marks : 40

Note : Attempt any FIVE the questions.
Assume suitable missing data, if any. The symbols used
are having their usual meaning.

1. Explain the Reactance Relay and IDMT Relay with operating characteristics.   (4+4)(CO1)

2. Define the following terms w.r.t. protective relay: (i)Primary relay, (ii) Secondary Relay, (iii) Auxiliary Relay, (iv) Pick up value, (v) Reset value, (vi) Operating time, (vii) Under-reach, & (viii) Over-reach.   (8)(CO1)

3. Explain clearly the impedance relay with directional unit. Also explain and draw its characteristics.   (4+4)(CO2)

4. What is meant by 3-zone protection? Give such scheme of protection for medium length lines.   (4+4)(CO4)

5. What are various methods of neutral grounding? Explain scheme of star-delta transformer grounding.   (4+4)(CO2)

6. Explain any two schemes of protection for feeders and compare their performance.   (4+4)(CO3)

7. Write short notes on the following basic functional characteristics w.r.t. protective relays: (i) Selectivity, (ii) Reliability, (iii) Speed, and (iv) Sensitivity.   (8)(CO1,2)

349 522

VIII SEMESTER B.Tech. (Eve)

END TERM EXAMINATION   May-2023

COURSE CODE: CEE 424

COURSE TITLE: FLEXIBLE AC TRANSMISSION SYSTEMS

Time: 3:00 Hours   Max.Marks: 50

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

Q1. Explain briefly how FACTS technology has led to performance improvement of power transmission systems.   [2][CO#1]

Q2. Draw the schematic diagram of a TCR. Also plot the TCR reactance versus firing angle in degrees.   [5][CO#2]

Q3. Draw the schematic diagrams of a SVC and a STATCOM. Explain using V-I characteristics and P-δ curves, how a STATCOM is better than a SVC ?   [5][CO#2,3]

Q4. Draw the 3 phase physical connection diagram of a STATCOM with a power system load bus.   [6][CO#3]

Q5. (a) Draw the schematic diagrams of a TCSC and a SSSC. Which one would you prefer – TCSC or SSSC and why ?   [4][CO#4,5]
     (b) Plot the TCSC reactance versus firing angle in degrees   [3][CO#4]

Q6. Explain with neat diagrams how a SSSC can be made to operate in the (a) inductive mode and (b) capacitive mode ?   [6][CO#5]

Q7. Draw the 3 phase physical connection diagram of a SSSC connected at the sending end of a transmission line.   [6][CO#5]

Q8. Explain briefly, how a UPFC improves the performance of a power system ?
[3][CO#6]

Q 9. With neat diagrams, explain how a UPFC is better than a SSSC.   [5][CO#5,6]

Q10. Give the locations and ratings of some FACTS devices installed in India.
[5][CO#1]

ᴈ5 524

8Th SEMESTER

B.Tech.(Evening) EED

End TERM EXAMINATION   May-2023

COURSE CODE CEE-426   COURSE TITLE Micro Grid and Smart Grid

Time: 03:00 Hours   Max. Marks: 50

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

Q.1 Discuss the concept of microgrid. Draw a conceptual configuration of AC microgrid based on a case study involving at least a wind energy source, Solar photovoltaic system, battery energy storage system and diesel set. Also discuss its operation in grid tied as well as islanded mode of operation   [3+3+4 = 10]

Q.2 What do you mean by active distribution network. Elaborate the various issues related to net metering and protection in active distribution network.   [4+3+3 = 10]

Q3. What do you mean by resilient and self-healing grid? Discuss the role of IED's in the transformation of conventional grid into a smart grid while accommodating the distributed energy resources.
                    [5+5 = 10]

Q.4 Discuss the systematic approach in managing the domestic load requirement through microgrid concept powered by SPV system. A computer and TV set are connected to the PV system. The computer, which has rated power 40 W, runs 2 hours per day and the TV set with rated power of 60 W runs for 3 hours per day in operation. If these loads are to be fed at 12V, then calculate the daily energy requirements of the devices expressed in DC Ah while considering 15% overall losses in system. If the equivalent sun hour on the same location are 3 hours, then determine the no. of solar panels required

while assuming the rated current of 3.15 A at 12 V for each panel.

[5+5 = 10]

Q.5 Discuss the grid integration of variable speed wind energy conversion system supported with suitable control diagram. What kind of modification in the control of grid tied inverter is required to make it smart in terms of regulating its active as well as reactive power while compensating the load harmonics if any at the PCC.

[5+5 = 10]

Q.6 Write short note on any two:

I   Advance metering infrastructure
II Demand side management and Load shaping
III PHEV

[5+5 = 10]

-----*****----

FOURTH SEMESTER   B.Tech. (Cont. Edu.)   (Branch -ME-)

END SEMESTER EXAMINATION MAY 2023

CME 202   THERMAL ENGINEERING-II

Time : 3 hr   Max Marks: 40

Answer any **FIVE** questions. Assume missing data suitably if any.

1(a). Explain the comparison of otto , diesel and dual cycles for same compression ratio and heat rejection with pV and Ts diagrams.

(b)   A SI engine operating on the ideal otto cycle has a compression ratio of 7. The pressure and temperature at the beginning of compression are 1 bar and 300 K . The heat added during combustion process is 1190 kJ per kg. Determine the pressure and temperature at all salient points, work output / kg of air, air standard cycle efficiency and mean effective pressure of the cycle.   (3,5) [CO1]

2(a) Discuss the effect of pressure ratio on thermal efficiency of gas turbine cycle.

(b)   A gas turbine power plant consists of two stage compressors with perfect intercooling in between them and single stage turbine. The air is taken to the compressor at 1 bar and 300 K and the maximum temperature in the cycle is limited to 1173 K. The pressure ratio is 6. Assuming the following data, find (i) air fuel ratio (ii) thermal efficiency of plant (iii) fuel flow rate in kg / hr (iv) power developed. Take m_a=210 kg/s ;both compressor efficiency 85% ; turbine efficiency 90%; calorific value of fuel : 36850 kJ / kg   (3,5) [CO2]

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 through a pressure ratio of 10 from a pressure at 1 bar. Determine the power required for a FAD of 3 m³ / min. Determine the speed if the swept volume is 14.2 litres and the clearance volume is 6% of swept volume. Assume n= 1.3   (4,4) [CO3]

4(a)   Explain the working principle of centrifugal compressor with a neat sketch.

(b)   Explain the combustion in SI engine briefly   (4,4) [CO4]

5(a)   Define Mach number. What is Adiabatic Energy Equation ? Derive the Adiabatic Energy Equation from first principles.

(b)   An air jet at 500 K has sonic velocity. Determine (i) jet velocity (ii) stagnation temperature of jet (iii) maximum velocity of jet (iv) velocity of sound at stagnation conditions (v) stagnation enthalpy.   (4,4) [CO5]

6(a)   Derive the expression for area ratio dA / A as function of mach number and explain the expansion and compression in nozzle and diffuser.

(b)   Discuss the merits and demerits of turbo jet and turbo prop engines.

                                                              (5,3) [CO6]

7   Explain the following

       (a) Gas turbine cycle with intercooler and reheater
       (b) Reciprocating compressor with clearance & volumetric efficiency
                                                    (4,4) [CO2,CO3]

FOURTH SEMESTER
B.Tech. (ME)(EVE.)

END SEMESTER EXAMINATION   MAY-2023
CME204 PRODUCTION TECHNOLOGY-II

Time: 3 Hrs.   Max. Marks: 40

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

1[a] What is tool wear? Briefly discuss the mechanism of abrasion adhesion and diffusion wear.   5 [CO1]

[b] Sketch three views of a 30 mm square single point RH turning tool having tool signature of 15, 15, 6, 6, 15, 10, 1.5. Also discuss the various elements and significance of various angles.   5 [CO1]

2[a] Explain the concept of location and sketch and explain the 3-2-1 principle of location.   5 [CO3]

[b] With neat sketches explain the construction and working of the following.

(i) Leaf Jig

(ii) Wedge type Jack pin   5[CO3]

3[a] A hole and shafting system has following dimensions.

70 H_7/m_6

The standard tolerance unit is given by

$i = 0.45\sqrt[3]{D} + 0.001D$ where D comes within the step of 50-80 mm.

Multiplier for the grade 7 is 16 and for 6 is 10. The fundamental deviation for shaft m is given by

FD=+ (IT7-IT6) Find out actual dimensions of hole and the shaft and the type of fit.   5[CO4]

357 S29

[b] What are slip and angle gauges? Select the sizes of the gauges required to build the following.

[i] 51° 49' 24" (Use 13 pieces angle gauge set)

[ii] 59.361mm (Use 88 pieces slip gauge set)   5 [CO4]

4[a] What are the important elements of involute gear? Discuss and draw a line diagram showing all the elements.   5[CO5]

[b] Prove that theoretical chordal height (h_c) of the involute gear tooth can be expressed by the expression

$$h_c = mT/2[\ 1+2/T-\cos 90/T \ ]$$

Where m= Module of the gear

T= Total number of teeth on gear

5[CO5]

[5] Write short notes on the following (*Any four*)

[i] Capstan and turret lathes

[ii] Types of fits

[iii] Line standard and end standard

[iv] Floating carriage micrometer

[v] Alignment testing of machine tools   10 [CO1,2,3,4,5]

357 530

B Tech Mech Engg (Evening)   Fourth Semester

End Semester Exam   (May - 2023)

CME – 206   INSTRUMENTATION

Time: : 03 Hrs   Max Marks. 40

Note: Question No. 1 is Compulsory.
Attempt four Questions more from the rest of the Question Paper.
In total attempt Five Questions.
Assume missing data, if any.

Q No. 01   Differentiate between.   (02x4=08)
[CO 01,
(i) – Balanced and Unbalanced bridge.   02 & 03]

(ii) – Quartile and Decile

(iii) – Amplification and Filter

(iv) – Bonded & Unbonded Strain Gauges

Q No. 02 (a)   What do you understand by Generalized measurement system?   (04)
Explain with an example showing its elements.   [CO 04]

Q No. 02 (b)   Differentiate between Static and Dynamic characteristics of   (04)
measuring instruments. Also explain any one dynamic   [CO 03]
characteristics?

Q No. 03 (a)   Differentiating between Repeatability and Reproducibility, also   (04)
discuss their significance in brief.   [CO 01]

Q No. 03 (b)   What do you understand by Systematic errors? Discuss its various   (04)
types in brief.   [CO 02]

Q No. 04 (a)   What is Signal Conditioning? Explain various functions under it, in   (04)
brief.   [CO 04]

Q No. 04 (b)   What are various types of output Display devices? Describe in brief.   (04)
[CO 03]

Q No. 05 (a) Explain various Measurements of Statistical Distribution in brief. (04) [CO 05]

Q No. 05 (b) For the following statistical table, calculate the moments about mean (up to fourth moment). (04) [CO 02]

Class of Marks	No. of Students	Class of Marks	No. of Students
5-10	5	25-30	5
10-15	6	30-35	4
15-20	15	35-40	2
20-25	10	40-45	2

Q No. 06 (a) Derive expression for dynamic response of a first order system to a step input. Also show variation of output response with time. (04) [CO 05]

Q No. 06 (b) A thermometer is suddenly subjected to input of 500^0C from 25^0C. Calculate temperature indicated by thermometer after 1 second. The time constant for thermometer is 2 seconds. (04) [CO 02]

Q No. 07 (a) Derive expression for dynamic response of a first order system to a ramp input. Also write the expressions for transient and steady state errors. (04) [CO ..]

Q No. 07 (b) A weather balloon carrying a temperature sensitive device with time. constant of 10s, rises through the atmosphere at 6m/s. The balloon transmits information's about temperature and altitudes through radios signals. At 3000 meter height, a temperature indication of 35^0C has been received. Determine the true altitude at which 35^0C temperature occurs. It may be presumed that the temperature sensing is of the first order and temperature varies with altitude at a uniform rate of $0.01^0C/m$. (04) [CO 04]

Q No. 08 Write short notes on any two of the following.
(i) – Standards in Measurement   (ii) – Calibration
(iii) – Hysteresis
(iv) – Random Errors
(2x04=08) [CO 02 & 03]

2

399 532

VI SEMESTER
B.Tech. (Evening)

END TERM EXAMINATION   *May-2023*

CME-302   PRODUCTION MANAGEMENT
Time: 3:00 Hours   *Max. Marks: 40*

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

Q.1 a) Explain the scientific theories of management. How is scientific theory helpful in managing the activities of business?   [5] (CO1)

b) Describe the various techniques of improving productivity. What are the benefits of increasing productivity to the workers and management?

[5] (CO1)

Q.2 a) Which production system will be suitable for a small-car manufacturing plant? Explain with the example.   [5](CO2)

b) Define Production function. How can a producer find it usefulness? Illustrate.   [5] (CO2)

Q.3. a) What are the principles of good wage system? And differentiate between wages and salary?   [5] (CO3)

b) Discuss the pro's and con's of promotion policy based on merit, seniority and meritcum-seniority.   [5] (CO3)

Q.4 a) "Human resource management is a proactive approach and personnel management is a relative approach to perform the same set of function related to managing human resource"- Do you agree with this statement. If yes explain.   [5] (CO4)

b) Briefly explain the Project Management Process? What are the types of projects a company execute?   [5] (CO5)

Q.5 a) Illustrate the different dimensions of personality. Describe the A type & B type Personality theory.   [5] (CO4)

b) What do you mean by job analysis? Explain the process of job analysis. Explain various methods of collecting information for job analysis.

[5] (CO3)

Q.6. Write short note on
a) Job evolution
b) Types of contracts   [5] (CO3)

[5] (CO3)
[5] (CO5)

760 533

Roll no..............

B.Tech. (Eve)

END TERM EXAMINATION

May-2023

CME-306   NON-CONVENTIONAL ENERGY SOURCES

Time: 03:00 Hours

Max. Marks: 50

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

Q.1 Discuss the main features of various types of renewable and non-renewable energy sources and explain the importance of non-conventional energy sources in the context of global warming.

[10][CO#01]

OR

Q.1 Use following data to calculate the overall loss coefficient of the flat plate collector: [10][CO#1]
Size of absorber plate: 2.15m ×1.15 m
Spacing between absorber plate and 1st glass cover: 5 cm
Spacing between 1st and 2nd glass cover: 5 cm
Glass cover emissivity: 0.85
Plate emissivity: 0.90
Mean plate temperature: 75°C
Ambient air temperature: 20°C
Collector tilt: 30°
Wind speed: 3 m/s
Back insulation thickness: 8 cm
Side insulation thickness: 4 cm
Thermal conductivity of insulation: 0.035 W/m-K

Q.2 What is the principle of solar photovoltaic power generation? What is I-V characteristics of solar cell and define fill factor. What are the main elements of PV system?   [10][CO#2]

OR

Q.2a A p-type silicon has effective density of states in valance band as 1×10^{22} per cm³ and impurity from third group with concentration of 1×10^{19} per cm³ is added. If band gap for silicon is 1.12 electron volt, find the closeness of the Fermi level with valance band at the temperature of 27 °C. [5][CO#2]

Q.2b A Si sample is doped with 1×10^{17} atoms/cm³ phosphorous atom. What will be minority hole concentrated (p_o) at room temperature? [5][CO#2]

Q.3 Using Betz model of wind turbine, drive expression for power extraction from wind. What maximum theoretical power that can be extracted and under what condition? [10][CO#3]

OR

Q.3 Describe various energy extraction technologies used with hydrothermal resources. [10][CO#3]

Q.4 With the help of neat diagram explain the layout of a typical micro hydro plant. [10][CO#4]

OR

Q.4 Calculate the volume of a cow dung based biogas plant required for cooking needs of a family of 5 adults and lighting need with two 100 C.P. lamps for three hours daily. Also calculate the required number of cows to feed the plant .Assume standard values of data where required? [10][CO:4]

Q.5a A deep ocean wave of 2.5m peak to peak appears at a period of 8sec. Find the wavelength, phase velocity and power associated with the wave. At this power rate, what is the average annual wave energy in MWh/m? [5][CO:5]

Q5b. Draw a schematic layout of linked basin tidal plant and explain its operation. [5][CO:5]

VI Semester B. Tech (Evening)

END SEMESTER EXAMINATION MAY 2023

CME-308   I C Engines

Time: 3 Hours   Max. Marks: 100

Note: Answer ANY FIVE Questions.
Answer to each question (or its part) must start on a fresh page.
Draw properly labelled diagrams, wherever required
All questions carry equal marks.

1. a. What are the material, manufacturing method and functions of Piston rings, Connecting rod, Engine cylinder, Engine valves, and Crank shaft of an IC engine?   [5] [CO1]

   b. Explain the valve timing diagram for slow and high-speed IC Engines.   [5] [CO1]

2. a. What is knocking? Discuss theories of knocking and explain how it can be prevented?   [5] [CO2]

   b. What is swirl? Explain the effect of the swirl on the combustion in SI Engines.   [5] [CO2]

3. a. Differentiate IDI and DI Engines. Discuss the various stages of combustion in CI Engines.   [5] [CO3]

   b. What is ignition delay? Discuss the effect of various engine operating and fuel quality parameters on ignition delay   [5] [CO3]

4. a. Discuss the necessity of cooling in an IC engine. Explain the working of engine cooling system.   [5] [CO5]

   b. Explain the requirement of various A/F ratios in SI engines? Explain how these are achieved with a suitable diagram?   [5] [CO4]

5. Discuss the   requirements of alternative fuel for IC engines. Explain with examples of biodiesel and CNG.   [5][CO6]

   b. Describe in brief the engine performance testing setup with short description of various measurement systems.   [5] [CO5]

6. Explain the following in brief: ANY FIVE   [2x5] [CO1-6]
   i) Fuel Injector ii) PUC test iii) Supercharging   iv) Knock rating
   v) Pre-ignition   vi) GDI   vii) Biogas   viii)Glow plug

Total No.of pages 2   Roll No.............

6th SEM

B. TECH (C)   MAR 2023
END SEMESTER EXAMINATION
     CME 314 SUPPLY CHAIN MANAGEMENT

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

Note: Question no. 6 is compulsory
Answer ANY FOUR from remaining
     Assume suitable missing data, if any

1. "Many innovations on technology-based approaches are well-suited to the enhancement of Supply Chain Management." Explain the information and technology applications for SCM. (Marks 10) (CO#1,2)

2. What is the purpose of supply chain Integration. Discuss in detail. (Marks 10) (CO#1,2)

3. What are some of the reasons for wanting to process the records in an MRP system frequently? Provide examples and consequences of delaying the processing of the information. (Marks 10) (CO#3)

4. Discuss situations in which each of these supply chain might be the appropriate choice for a firm: (Marks 10) (CO#4)
   (a)International suppliers
   (b) Fully integrated global supply chain

5. Write short notes on (Marks 10) (CO#5)

(a) Bullwhip effect (b) Customer relationship management

6. John's discount store stocks toy bikes. Recently, the store has been given a quantity discount schedule for these toy bikes. This quantity schedule is shown below. Also, ordering cost is 50 per order, annual demand is 5,000 toy bikes, and inventory carrying charge as a percent of cost is 0.3. What order quantity will minimize the total inventory cost? (Marks 10) (CO#4,5)

Discount number	Unit Price	Order quantity
1	5.00	0-999
2	4.75	1000-1999
3	4.50	2000 and above

364 537

END SEMESTER EXAMINATION   MAY-2023

CME-402, Total Quality Management

Time: 3:00 Hours

Max. Marks : 40

Note: Answer ANY FIVE questions.
   Assume suitable missing data, if any.
   Use of Statistical Table is allowed

1(a) What are the reasons for mass inspection not being a feasible alternative for quality improvement?
(b) Discuss the Garvin's 8-dimensions of products quality

[CO1][4×2=8]

2(a) What are the advantages and disadvantages of variable control charts over attribute control charts?
(b) Differentiate Average sample number and average total inspection considering an example.

[Co2][4×2=8]

3. Light bulbs are tested for their luminance, with the intensity of brightness desired to be within a certain range. Random samples of five bulbs are chosen from the output and their luminance values measured. The sample mean $\bar{x}$ and standard deviation s are found. After 30 samples, the following summary information is obtained:

$$\sum_{i=1}^{30} \bar{X}_i = 2550; \qquad \sum_{i=1}^{30} S_i = 195$$

The specifications are 90 ± 15 lumens.
(a) Find the control limits for the $\bar{X}$ - and s-charts.
(b) Assuming that the process in control, estimate the process mean and process standard deviation. Find the process capability indices C_p and C_{pk} and comment on their values.

[CO3][4×2=8]

365538

4. The number of dietary errors is found from a random sample of 100 trays chosen on a daily basis in a health care facility. The data for 25 such samples are shown in Table 1.

Table 1

Sample Number	Number of Dietary Errors	Sample Number	Number of Dietary Errors
1	9	14	8
2	6	15	8
3	4	16	7
4	7	17	6
5	5	18	4
6	6	19	12
7	16	20	7
8	8	21	6
9	7	22	8
10	9	23	6
11	3	24	8
12	6	25	5
13	10		

(a) Construct an appropriate control chart and comment on the process.

(b) How many dietary errors do you predict if no changes are made in the process?

[CO4][4×2=8]

5. Consider a single sampling plan with a lot size of 1500, sample size of 150, and acceptance number of 3. Construct the OC curve. If the acceptable quality level is 0.05% nonconforming and the limiting quality level is 6% nonconforming, describe the protection offered by the plan at these quality levels.

[CO5][4×2=8]

6. Write short notes on the following [CO6][2×4=8]
(a) Philosophies of Total Quality Management
(b) Quality Function Deployment
(c) Six Sigma and its applications
(d) Implementation steps for ISO 9000 certification.

366 539

B.Tech. (Eve)

END TERM EXAMINATION   *May-2023*

CME 406   Robotics & Automation

Time: 3:00 Hours   Max. Marks : 50

Note : Answer any FIVE full questions.
Assume suitable missing-data, if any.

Q.1a. Explain with neat sketch Cylindrical coordinate robot and
Articulated Joint robot configurations.   [06][CO1]

b. With neat diagram explain any two end effectors as grippers and any
two end effectors as tools used in robotic application.   [04][CO1]

Q.2.a. Differentiate between forward and inverse kinematics of robots

[03][CO2,5]

b. With neat diagram explain Denavit-Hartenberg method of solving
forward kinematic equation for n-d.o.f robotic system. [07[CO2,5]

Q.3.a. Explain with example Joint space trajectory planning of a robot.
[04][CO 3]

b. Derive 3rd order trajectory planning when initial and final velocities
are zero.   [06][CO3]

367 540

Q.4.a. Differentiate between touch sensors and proximity sensors. Giver
examples.   [03][CO4]
b. With neat diagrams explain (i) Inductance Sensor (ii) Optical sensor.
                                                                       [07][CO4]

Q.5.a. Explain Lagranigain - Euler formulation for solving Robot arm
Dynamics problems.   [05][CO5]
b. Write a note on Electric, Hydraulic and Pneumatic drive system used
in robots driving system.   [05][CO1,2]

Q.6.a. Explain (i) Walk through programming (ii) online programming
of robots.   [06][CO 5,6]
b. Write a note on Robot Safety system   [04][CO 5,6]

Q.7. Write short notes on:
a. Force and Torque sensor
b. Work Volume of a robot
c. Matrix representation of Translation and rotation
d. Offline programming

                                                                       [10][CO 1- 6]

EIGHT SEMESTER

B. Tech.

END-TERM EXAMINATION   MAY-2023

CME-412   MATERIALS MANAGEMENT

Max. Marks: 50

Time: 3:00 Hours

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?   [5]   CO1
    (b) What are the reasons of low materials productivity?   [5]   CO1
    Explain.

2   (a) What are the need and rationale of physical verification?   [4]   CO3
    (b) A company has the annual requirement of the 15 items as   [6]   CO5
    given below:

Item	Annual usage	Unit cost (Rs.)
1	30000	1
2	2800	10
3	300	10
4	1100	5
5	400	7
6	2200	3
7	1500	2
8	8000	3
9	3000	4
10	800	8
11	20000	2
12	500	4
13	7000	3
14	5000	6
15	10000	3

Use the ABC analysis to categorize the items and draw the
ABC curve.

3   (a) Explain finite replenishment rate model and calculate   [6]   CO4
optimum system cost, economic lot size.

(b) Suppose a manager is placing one-monthly order for each   [4]   CO5
of the following five items:

Item	Annual demand	Unit price (Rs.)	Orders per year
1	600	3	12
2	900	10	12
3	2400	5	12
4	12000	5	12
5	18000	1	12

Can this policy be improved? How much inventory
reduction is possible by rationalization? Use Optimal policy
curve.

4   (a) What are the various vendor rating plans? Explain.   [5]   CO4

(b) A trading company starts its operations on March 1,   [5]   CO5
2023. Its stock register reveals the following data
regarding goods in March, 2023.

(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
FIFO method

5   (a) What are the basic assumptions of Wilson EOQ model?   [5]   CO3

(b) A hardware store procures and sells hardware items. The   [5]   CO5
following information is available:

Expected annual sales   − 2000 units
Ordering cost   − Rs. 300 per order
Holding cost   − 20% of average inventory value

The item can be purchased in the following schedule:

Lot size	Unit price (Rs.)
1 − 999	30.00
1000 and above	25.00

Determine order size.

6   Write short notes on any FOUR of the following: [10]   CO2

     (a)   Color coding of ABC analysis

     (b)   JIT

     (c)   Advantages of decentralized

     (d)   Cost consideration in making

     (e)   MISS model

269542

370 543

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

Note: Attempt any five questions.
   Draw neat and labelled diagrams wherever necessary.
   Assume suitable missing data.

Q.1(a) Enumerate the two general methods adopted for sewage disposal; and discuss their merits and demerits explaining the conditions favorable for their adoption.   [4] [CO1, CO2]

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]

Q.2(a) Explain how domestic sewage is different from industrial effluents.   [4] [CO2]

Q.2(b) Describe the purpose of following sewage treatment methods (i)Bar Screens (ii) Grit Chamber (iii) Activated Sludge Process

[4] [CO1, CO2]

Q.3(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]

Q.3(b) What is meant by 'Activated Sludge' ? describe using a sketch sewage treatment using activated sludge process. Mention the advantages and disadvantages of the system.   [4] [CO1, CO2]

Q.4(a) Discuss the operational troubles of a standard rate trickling filter and their remedies. [4] [CO2]

Q.4(b) Calculate the diameter of circular trickling filter for 250 users. Dry weather flow is 120 lcpd. Rate of filtration of trickling filter units may be assumed as 10 Million Litres/hectare/m. [4] [CO4]

Q.5(a) Calculate the volume and number of aeration tanks and the rate of air supply for following data for activated sludge process, population =35000, rate of water supply = 180 lcpd, BOD of raw sewage = 220 mg/L, BOD removed in primary treatment = 85%

[4] [CO4]

Q.5(b) Differentiate between (i)Step aeration and Tapered aeration in Activated Sludge Process (ii) Oxidation Pond and Oxidation Ditch

[4] [CO3]

Q.6(a) Explain construction and functioning of Septic Tank.

[4] [CO2]

Q.6(b) Design a septic tank for 200 users. Water allowance is 120 lcpd. Detention period may be assumed as 8 hours. [4] [CO4]

Q.7(a) What do you understand by digestion of sewage sludge ? Discuss the construction and functioning of sludge digestion tank.

[4] [CO1, CO2]

Q.7(b) 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]

Total no. of page —1

Roll no. _____

MID TERM EXAMINATION   *May-2023*

COURSE CODE - CHU 202 COURSE TITLE – Engineering Economics

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

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

Q.1   Define:
  a) Cash Reserve Ratio
  b) Statutory Liquidity Ratio
  c) Repo Rate
  d) Reverse Repo Rate   [2.5 *4 = 10] [CO1]

Q.2 Attempt both parts:
  a. Define the concept of credit creation.
  b. Define monopoly market with its characteristics. [5*2 = 10][CO3]

Q.3   Define different functions of RBI.   [10]   [CO2]

Q.4   Define elasticity of demand with appropriate examples.
                                          [10] [CO4]

Q.5   Define inflation and its causes.   [10]   [CO2 & 3]

II Semester

B.TECH. (Eve] [CECE/CEEE]

END TERM EXAMINATION   May-2023

CMG-102   FUNDAMENTALS OF MANAGEMENT

Time: 03:00 Hours   Max. Marks: 50

> Note : **Answer** *any five* **questions.**
> - Assume suitable missing data, if any.

Q1. (a) Discuss the various characteristics of business environment. How the business environment has improved in last few years which contributed in the improvement in ranking of India in ease of doing business? [CO1,2,3] [5]

(b) You being a software engineer want to start a business. What kind of management style you would adopt for your business and why? Explain the pros and cons of adopted management style.

[CO1,2,3] [5]

Q2. (a) Discuss various behavioural school of management thoughts. Are these thoughts relevant in today's business scenario? [CO1,2] [5]

(b) Define marketing. Write the 4Ps of marketing for a pharmaceutical company and explain. [CO1,2] [5]

Q3. 'Hayaram' is a famous chain selling a large variety of products in the Indian market. Their products include chips, biscuits, sweets and squashes. It charges a comparatively higher price than its competitors as it sells quality products. Besides, it offers regular discounts to its customers and easy credit terms to its retailers. It has five of its own retail shops. It also sells its products through various grocery stores so that the products are made available to customers at the right place, in the right quantity and at the right time. It regularly uses different communication tools to increase its sales.

The above para describes the combination of variables used by Hayaram to prepare its market offering. Identify and explain the variables.

[CO1,2] [10]

Q4. (a) Financial management is based on three broad financial decisions. What are these? [CO3] [5]

(b) What is Initial Public Offering (IPO)? How it differs from secondary market? Explain. [CO3] [5]

Q5. (a) The understanding of business environment helps the managers to identify threats. What is meant by 'threats' here? [CO1,2] [5]

(b) Why has the emphasis on good Corporate Governance grown in the 21st century? [CO1,2] [5]

Q6. What is knowledge management? Discuss key drivers behind knowledge management. How this concept may be helpful in making a proto call for covid treatment all over the country. [CO2,3] [10]

Q7. Write the short notes on *any two* of the following. [CO1] [10]
   (a)   New Product Development
   (b)   Corporate Social Responsibility
   (c)   Capital Budgeting
   (d)   Limited Liability Partnership

Total Number of Pages 2
SECOND SEMESTER
MID SEMESTER EXAMINATION

Roll. No.....................
B.TECH (All Groups)
May 2023

AP 102: Physics-II

Time: 1:30 Hours

Max. Marks: 20

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

Q1. [a] The relation between angular frequency ω and wave number k for a given type of waves is $\omega^2 = \alpha k + \beta k^3$. Calculate the wave number k_0 for which the phase velocity equals the group velocity.
[2.5][CO#2,5]

[b] An electron is confined in a cubical box of each side 1.0 Å. Calculate the energies of the electron in the ground state and the first excited state.
[2.5][CO#1,2]

Q2. [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 Schrödinger equations for the boundary conditions, and eigenvalues and eigenfunctions for the particle. Draw the probability densities for the first three wave functions.
[2.5][CO#2,5]

[b] X-rays of wavelength 10.0 pm are scattered from a target. (i) Find the wavelength of the x-rays scattered through 45°. (ii) Find the maximum wavelength present in the scattered X-rays. (iii) Find the maximum kinetic energy of the recoil electrons.
[2.5][CO#1,2]

Q3. [a] Show that the electric and magnetic field vectors, $\vec{E}$ and $\vec{B}$ in plan electromagnetic waves are mutually perpendicular in a plane normal to the direction of propagation.
[2.5][CO#1,2]

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

SECOND SEMESTER
B.Tech.

MID TERM EXAMINATION   MAY-2023

AC102   CHEMISTRY

Time: 1:30 Hours   Max. Marks: 20

Note : Attempt all the questions,
Question 1 carries 10 (5×2) marks,
Question 2 to 5 each carry 2.5 marks,
Assume suitable missing data, if any.

Q.1 [a] Write four criteria for titrimetric analysis.   [CO1]

[b] What is the wavelength range for UV and Visible regions? Explain whether water molecule will absorb in the IR fingerprint region or not?   [CO2]

[c] What is meant by red shift and blue shift in the UV-Visible spectrum? Explain with an example.   [CO2]

[d] Categories the following processes showing Minima and Maxima in DTA. Crystallization, Polymerization, Vaporization, Reduction.   [CO2]

[e] Define Lambert-Beer Law.   [CO2]

[5×2=10 Marks]

Q.2 [a] In which type of titration fluorescein indicator is used? Explain how it works.   [CO1]

[b] Write the principle of TGA and explain a thermogram of a binary-alloy material.   [CO2]

[2.5 Marks]

Q3 [a] Illustrate parts of double beam spectrophotometer with an appropriate sketch.   [CO2]

[b] Is there a difference in the vibrational frequency of O−H and O−D vibrations in the IR spectrum? Explain.   [CO2]

[2.5 Marks]

Q5. (a) What will be the output of the following, justify your answer
[CO2][1]

```
void main()
{    int i=5, j= 6, z;
     printf("%d", i+++j);
}
```

(b) What will happen if a function called but the called function is defined later in the program source file. What is the solution to this problem. [CO4][1]

(c) Name three different sorting techniques and apply them on the array {7,5,23,41,3,9,20,19,2,11} and show the step by step outcome for each.

[CO6][2]

Note: Attempt all questions.
   Give suitable code, example, syntax, wherever applicable
   Assume missing data , if any

Q1. (a) Explain the difference between algorithm, flowchart and computer program. Draw flowchart to print sum of 10 natural numbers. [CO1][2]
(b) Convert (show steps used for conversion) [CO1][2]
$(AA)_{16} = (\ )_{10} = (\ )_8 = (\ )_2 = (\ )_5$

Q2. (a) Differentiate between keywords and identifiers ? Explain any five keywords with suitable code [CO2][2]
(b) What is the difference between NULL and zero? Give suitable uses of NULL with code/example. [CO2][1]
(c) Identify following tokens with justification [CO2][1]
(i) 50U   (ii) b50   (iii) "A1"   (iv) 50a

Q3. (a) Write a C program to print the first n terms (n ≥ 1) of the Fibonacci series. [CO5][2]
(b) Explain precedence and associativity of operators with examples and uses. Name 6 groups of operators in order of their precedence. [CO2][2]

Q4. (a) What is the purpose of loops? What are infinite loops? Make flowchart of the 3 loops available in C. [CO4][2]
(b) Write a program in C to find largest element, smallest element and average in an array. [CO6][2]

581

II SEMESTER

B.Tech

MID TERM EXAMINATION
MAY-2023

EE-102   Basics of Electrical Engineering

Time: 1:30 Hours   *Max. Marks : 20*

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

Q.1   (a) Find current I in the circuit shown in Fig. 1.

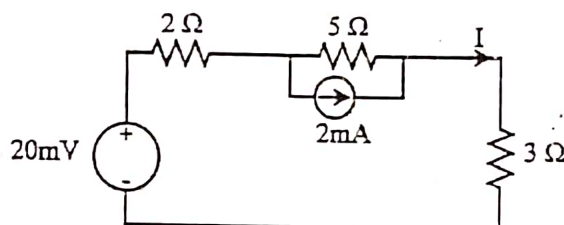(b) Find the voltage across and current through the 5Ω resistor for circuit given in Fig. 2.   [1+3] [CO1]
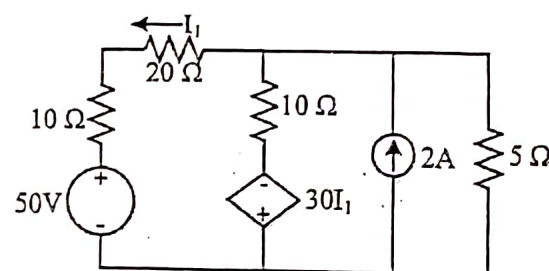

Fig. 1   Fig. 2

Q.2   (a) The current flowing through a 10mH inductor is shown in Fig. 3. Draw the voltage induced across it.

(b) Find the current delivered by each source using mesh analysis for circuit given in Fig. 4. Take all E=1V; and all R=1Ω.   [1+3] [CO1]
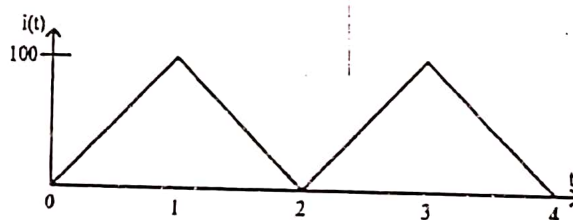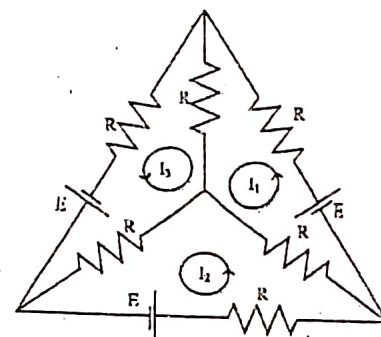

Fig. 3

Fig. 4

B.Tech
III SEMESTER
(Summer Semester)

END TERM EXAMINATION

July-2023

EC-205: SIGNALS & SYSTEMS

Time: 03 Hours

Max Marks: 40

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

Q.1[a] Find the Fourier transform of following:
(i) $t\, e^{-2t}\, u(t)$ (ii) $e^{-4t}\, u(t-3)$ [2 + 2][EC205.3]

[b] Prove following properties of Fourier transform: -
(i) Time Scaling Property (ii) Modulation Property   [2 + 2][EC205.3]

Q.2[a] Find the inverse Fourier transform of following:
(i) $X(\omega) = e^{-4\omega}\, U(\omega)$
(ii) $X(\omega) = [4(j\omega) + 6] / [(j\omega)^2 + 6(j\omega) + 8]$ [2 + 2][EC205.3]

[b] Determine whether the following signals are periodic or not. If periodic, determine the fundamental period.
(i) $\sin(4n\pi/3) + \cos(2n/3)$ (ii) $e^{j5t}\cos(2t)$ [2 + 2][EC205.1]

Q.3[a] Find the Laplace transform and ROC of the following:
(i) $x(t) = t\, e^{-2t}\, \sin(2t)\, u(t)$
(ii) $x(t) = \cos(at)/t$ [2 + 2][EC205.3]

[b] Prove following properties of Laplace transform: -
(i) Conjugate Symmetry Property (ii) Final Value Theorem   [2 + 2][EC205.3]

Q.4[a] Find the inverse Laplace transform of following: -
(i) $X(s) = s^2 / (s-1)^4$
(ii) $X(s) = (s-1)/[(s+1)(s^2 + 2s + 5)]$ [2 + 2][EC205.3]

[b] Determine whether the following systems are linear or not.
(i) $y(n) = 2\, x(n) + 1/[x(n-3)]$ (ii) $[dy(t)/dt] + y^2(t) = 3\, x(t)$ [2 + 2][EC205.2]

Q.5 [a] Find the z-transform of following: -
(i) $n\,[u(n) - u(n-3)]$ (ii) $3(2)^n\, u(-n)$ [2 + 2][EC205.3]

[b] Solve the following difference equation for the given initial conditions and input

$$y(n) - y(n-2)/9 = x(n-2)$$
with $y(-1) = 0$, $y(-2) = 1$ and $x(n) = 3u(n)$ [4][EC205.2]

Q.6 [a] Find the inverse z-transform of
$$X(z) = (3 z^{-1})/[(1-z^{-1})(1-2 z^{-1})]$$

(i)   If ROC: $|Z| < 1$ (ii) If ROC: $|Z| > 2$ [2 + 2][EC205.3]

[b] Prove following properties of z- transform: -
(i) Accumulation Property (ii) Correlation Property [2 + 2][EC205.3]

MID TERM EXAMINATION

May-2023

COURSE CODE: <u>MA102</u>   COURSE TITLE: <u>Mathematics - II</u>

Time: 1:30 Hours

Max. Marks: 25

Note : All questions are compulsory.
       All questions carry equal marks.
       Use of programmable calculator is prohibited.
       Assume suitable missing data, if any.

Q.1 Find the values of λ for which the following system of equations has non-trivial solution: [5][CO1, CO2]

$$(\lambda - 1)x + (3\lambda + 1)y + 2\lambda z = 0$$

$$(\lambda - 1)x + (4\lambda - 2)y + (\lambda + 3)z = 0$$

$$2x + (3\lambda + 1)y + 3(\lambda - 1)z = 0$$

Find the ratio of $x:y:z$ when λ has the smallest of these values. What happens when λ has the greatest of these values?

Q.2 Verify Cayley-Hamilton theorem for the given matrix: [5][CO1]

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$$

Hence, compute A^{-1} and the matrix represented by the polynomial:
$A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$.

Q.3 Solve $x^2 \dfrac{d^2y}{dx^2} + 4x \dfrac{dy}{dx} + 2y = e^x$.   [5][CO2]

Q.4 Solve the simultaneous equations, being given $x = y = 0$ when $t = 0$
$\dfrac{dx}{dt} + 5x - 2y = t$, $\dfrac{dy}{dt} + 2x + y = 0$ [5][CO2]

Q.5 Find the power series solution of $(1 - x^2)y'' - 2xy' + 2y = 0$ about $x = 0$.   [5][CO3]

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

IInd SEMESTER
B.Tech.

MID TERM EXAMINATION   MAY-2023

ME104 BASIC MECHANICAL ENGG.
Time: 1.5 Hours   Max. Marks: 25

> **Note:** Part-A and Part-B are to be answered in the same answer sheet separetaly .
>
> Do not mix the answer of part A and Part B.
>
> Answer all questions from each part. Assume suitable missing data, if any.

Part A

1. Explain briefly the following: (i) Thermodynamic system (ii) property (iii) path function (iv) point function. [2] [CO1]

2. State first law of thermodynamics for a process and cycle. Show that energy is a property of system. [2] [CO1]

3. Derive steady flow energy equation for a flow system and apply the same for heat exchanger. State assumptions made.

   [2] [CO2]

4. An ideal gas 0.15 m^3 volume and pressure 21 bar and temperature 327^0 C expands isothermally till its volume becomes 6 times of its original volume. The gas is cooled at constant volume till its temperature becomes 33^0 C and compressed polytropically to its initial state. Find the workdone during the cycle. [3.5] [CO1]