QUESTION PAPERS FOR END TERM THEORY EXAMINATIONS
November/ December-2024

B.Tech, B.Tech (Evening) & B.Design
1st, 3rd, 5th & 7th SEMESTER

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B.Tech. (3rd SEMESTER)
AE-201 THEORY OF MACHINES

END TERM EXAMINATION **November 2024**

Time: 03:00 Hours Max. Marks: 40

Note: Answer all the questions.
Assume suitable missing data.

Q.1 Attempt any four of the following questions. **[4*2.5 =10 Marks]**

(a) Classify kinematic pairs on the basis of nature of contacts **CO-1 [BTL-1]**

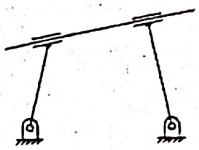
(b) Explain the functioning of centrifugal governor with the help of suitable diagram. **CO-6 [BTL-3]**

(c) Define Circular pitch, Module, Diametral pitch, Velocity ratio. **CO-4 [BTL-2]**

(d) Define gruebler's criterion for degree of freedom of plane mechanisms. **CO-1 [BTL-4]**

(e) Describe the functions of a flywheel. **CO-5 [BTL-2]**

(f) Determine the number of links, kinematic pair, and degree of freedom for the following mechanism. **CO-1 [BTL-5]**



Q.2 Discuss the gyroscopic effect on aeroplanes in detail with the help of vector diagrams. **[5 Marks] CO-6 [BTL-5]**

OR

Draw and discuss the turning moment diagram for single-cylinder four stroke engine and multi-cylinder engine. **[5 Marks] CO-5 [BTL-4]**

Q.3 Classify and describe the cams on the basis of follower movement with the help of neat sketches. **[3 Marks] CO-2 [BTL-2]**

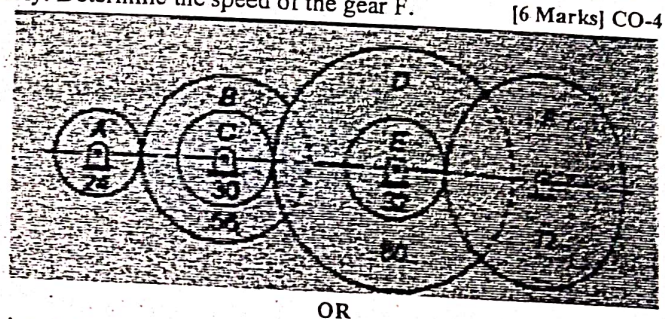
Q.4 A cam with a minimum radius of 25 mm is to be designed for a roller follower with the following data. To raise the follower through 35 mm during 60° rotation of the cam. Dwell for next 40° of the cam rotation. Descending of

the follower during the next 90° of the cam rotation. Dwell during the rest of the cam rotation. Draw the profile of the cam if the ascending and descending of the cam is with simple harmonic motion. Determine the maximum velocity and acceleration of the follower during the ascent and descent if the cam rotates at 150 rpm

[8 Marks] CO-2 [BTL-6]

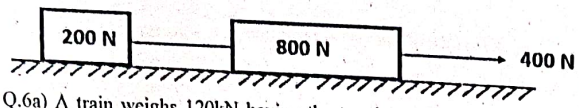
Q.5 Define logarithmic decrement. A vibrating system consists of a mass of 50 kg, a spring with a stiffness of 30 kN/m and a damper. The damping provided is only 20% of the critical value. Determine the (a) damping factor (b) critical damping coefficient (c) natural frequency of damped vibrations (d) logarithmic decrement (e) ratio of two consecutive amplitudes. [8 Marks] CO-3 [BTL-5]

Q.6 A compound gear train as shown in figure consists of compound gear B-C and D-E. All gears are mounted on parallel shafts. The motor shaft rotating at 800 rpm is connected to the gear A and the output shaft to the gear F. the number of the teeth on gears A, B, C, D, E, and F are 24, 56, 30, 80, 32, and 72 respectively. Determine the speed of the gear F. [6 Marks] CO-4 [BTL-3]



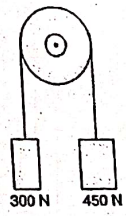
OR

Differentiate between static and dynamic balancing. A flywheel with a mass of 3 kN has a radius of gyration of 1.6 m. Find energy stored in the flywheel when its speed increases from 315 rpm to 340 rpm. [6 Marks] CO-5 [BTL-3]

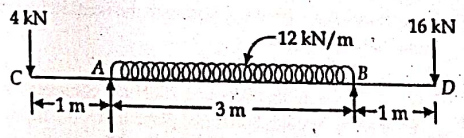


Q.6a) A train weighs 120kN having the tractive resistance of 5 N/kN. What will be the power of the motor required to propel the train at a uniform speed of 20 km/h when train in running: **a)** on a level surface, **b)** up an inclination of 1 in 300, **c)** down an inclination 1 in 300. Take the efficiency of motor of the train as 80%. [4][CO2]

Q.6b) Two bodies weighing 300 N and 450 N are hung to the ends of a rope passing over an ideal pulley as shown. How much distance the blocks will move in increasing the velocity of the system from 2 m/s to 4 m/s? How much is the tension in the string? [4][CO2]



Q.7) Draw the Shear Force and Bending Moment diagram for the Simply supported overhanging beam as shown in figure. [8][CO2]



Total No. Pages 04

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3RD SEMESTER (B.Tech.)

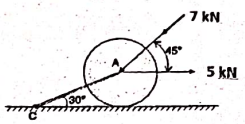
END TERM EXAMINATION ***NOV-2024***

AE201 ENGINEERING MECHANICS

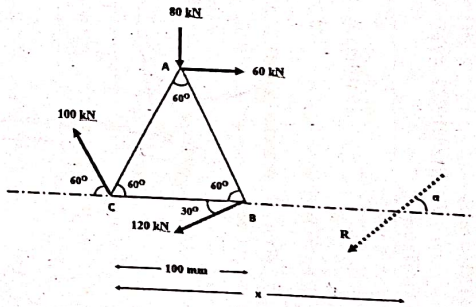
Time: 3:00 Hours ***Max. Marks: 40***

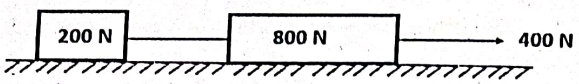
Note : All questions are compulsory. All questions carry equal marks. Assume suitable missing data, if any.

Q.1a) A roller weighing 10 kN rests on a smooth horizontal floor and is connected to the floor by bar **AC** as shown in figure. Determine the force in the bar **AC** and reaction from the floor, if the roller is subjected to a horizontal force of 5kN and an inclined force of 7kN. [4][CO1]



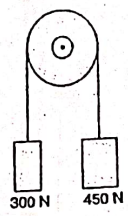
Q.1b) Determine the resultant [Magnitude(R), direction (α) and position (x)] of the system of forces acting on a lamina of an equilateral triangle (ABC) as shown in figure. [4][CO1]



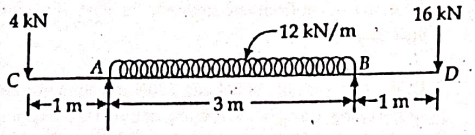


Q.6a) A train weighs 120kN having the tractive resistance of 5 N/kN. What will be the power of the motor required to propel the train at a uniform speed of 20 km/h when train in running: **a)** on a level surface, **b)** up an inclination of 1 in 300, **c)** down an inclination 1 in 300. Take the efficiency of motor of the train as 80%. [4][CO2]

Q.6b) Two bodies weighing 300 N and 450 N are hung to the ends of a rope passing over an ideal pulley as shown. How much distance the blocks will move in increasing the velocity of the system from 2 m/s to 4 m/s? How much is the tension in the string? [4][CO2]



Q.7) Draw the Shear Force and Bending Moment diagram for the Simply supported overhanging beam as shown in figure. [8][CO2]



Total No. Pages 04

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3RD SEMESTER (B.Tech.)

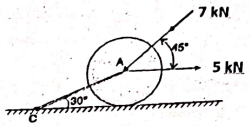
END TERM EXAMINATION **NOV-2024**

AE201 ENGINEERING MECHANICS

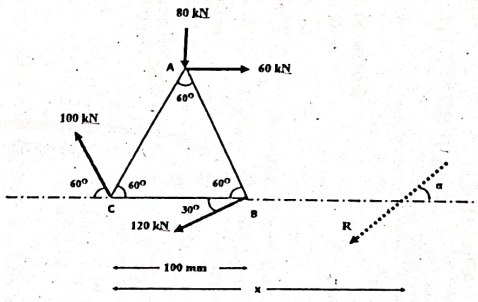
Time: 3:00 Hours *Max. Marks: 40*

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

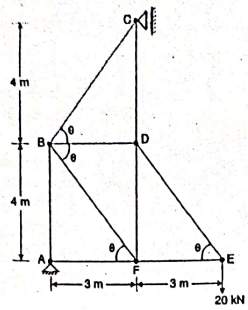
Q.1a) A roller weighing 10 kN rests on a smooth horizontal floor and is connected to the floor by bar AC as shown in figure. Determine the force in the bar AC and reaction from the floor, if the roller is subjected to a horizontal force of 5kN and an inclined force of 7kN. [4][CO1]



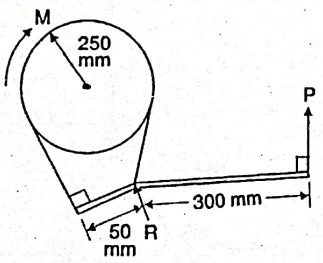
Q.1b) Determine the resultant [Magnitude(R), direction (α) and position (x)] of the system of forces acting on a lamina of an equilateral triangle (ABC) as shown in figure. [4][CO1]



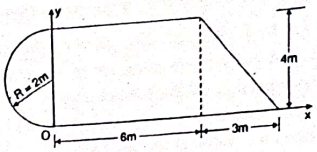
Q.2 Find the forces [magnitude & nature] in all the members [AB, BC, CD, BD, BF, AF, FD, DE, EF] of the truss as shown. [8][CO2]



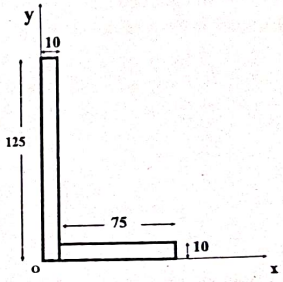
Q.3a)A torque (M) of 300 N-m acts on a brake drum shown in figure. If brake band is in contact with the brake drum through 250° and the coefficient of friction is 0.3. Determine the force (P) applied at the end of the brake lever for the position shown in figure. [4][CO2]



Q.3b) Determine the centroid of the area as shown. 'O' is origin. [4][CO2]



Q4) Determine the moment of inertia of the L-section as shown in figure about its centroidal axes parallel to the legs. Also find the polar moment of inertia. 'O' is origin. All dimensions are in *mm*. [8][CO2]



Q.5a) The greatest possible acceleration or deceleration that a train may have is **'a'** and its maximum speed is **'v'**. Find the minimum time in which the train can get from one station to the next, if the total distance between the stations is **'s'**. [4][CO2]

Q.5b) Two weights 800N and 200N are connected by a thread and they move along a rough horizontal plane under the action of a force of 400N applied to the 800N weight as shown. The coefficient of friction between the sliding surface of the weights and the plane is 0.3. Determine the acceleration of the weight and tension in the thread. [4][CO2]

Total no. of pages: 2 *Roll No.* 5

THIRD SEMESTER **B. Tech (AE)**

END SEMESTER EXAMINATION **NOV. 2024**

AE/201/ PE-261 QUANTITATIVE TECHNIQUES

Time: 3 Hours Max. Marks: 50

Note: Attempt any five questions.
Use of statistical table is permitted.
Assume missing data , if any

1 (a) Define ordinary moments and central moments of a frequency distribution. Obtain the relationship between the two types of moments. 5[CO1]

(b) Find first four moments for the following frequency distribution about the mean. Also comment upon nature of frequency distribution. 5[CO3]

X	-4	-3	-2	-1	0	1	2	3	4
f	3	4	5	7	12	7	5	4	3

2 (a) Define Bernoulli trials. Find mean and variance of Binomial distribution. 5[CO2]

(b) The probability that a patient recovers from a rare blood disease is 0.4. if 15 people are known to have contracted this disease, what is the probability that (i) at least 10 survive (b) from 3 to 8 survive (c) exactly 5 survive. 5[CO2]

3 (a) Define distribution function of a random variable. State its important properties. 5[CO1]

(b) The density function of a random variable X is given by $f(x)= a+bx^2$ for $0\le x\le 1$ 5[CO3]
otherwise 0 If $E(X) =3/5$, find a, b

4. Solve the following transportation problem by Vogel's approximation method. Then find optimal solution. 10[CO5]

	A	B	C	D	E	F	Capacity
1	9	12	9	6	9	10	5
2	7	3	7	7	5	5	8
3	6	5	9	11	3	11	2
4	6	8	11	2	2	10	9
Demand	4	4	6	2	4	2	

5 (a) There are five jobs, each of which is to be processed through two machines M1, M2 in order M1M2. The processing hours are given below: 5[CO3]

Jobs	1	2	3	4	5
Machine M1	3	8	5	7	4
Machine M2	4	10	6	5	8

Find optimum sequence of jobs and minimum elapsed time.

(b) Four new machines M1, M2, M3 and M4 are to be installed in machine shop. There are five vacant places A, B, C, D and E that are available. Because of limited space, machine M2 cannot be placed at C and M3 cannot be placed at A. The cost matrix is shown below: 5[CO3]

Machines/Places	A	B	C	D	E
M1	4	6	10	5	4
M2	7	4	-	5	4
M3	-	6	9	6	2
M4	9	3	7	2	3

Find optimal assignment schedule.

6. Write short notes on any four of the following: 10[CO1]

(a) Hypothesis testing
(b) Normal distribution
(c) Decision tree
(d) Duality
(e) Role of statistics in management
(f) Regression analysis

	A	B	C	D	E	F	Capacity
1	9	12	9	6	9	10	5
2	7	3	7	7	5	5	6
3	6	5	9	11	3	11	2
4	6	8	11	2	2	10	9
Demand	4	4	6	2	4	2	

5 (a) There are five jobs, each of which is to be processed through two machines M1, M2 in order M1M2. The processing hours are given below: 5[CO3]

Jobs	1	2	3	4	5
Machine M1	3	8	5	7	4
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Find optimum sequence of jobs and minimum elapsed time.

(b) Four new machines M1, M2, M3 and M4 are to be installed in machine shop. There are five vacant places A, B, C, D and E that are available. Because of limited space, machine M2 cannot be placed at C and M3 cannot be placed at A. The cost matrix is shown below: 5[CO3]

Machines/Places	A	B	C	D	E
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M2	7	4	-	5	4
M3	-	6	9	6	2
M4	9	3	7	2	3

Find optimal assignment schedule.

6. Write short notes on any four of the following: 10[CO1]

(a) Hypothesis testing
(b) Normal distribution
(c) Decision tree
(d) Duality
(e) Role of statistics in management
(f) Regression analysis

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Total no. of pages 2 Roll no. .....

3rd Semester B.Tech.

END TERM EXAMINATION November 2024

AE-202 NUMERICAL TECHNIQUES & COMPUTER PROGRAMMING

Time: 3 hr Max Marks:70

Note:

1. Answer any 5 questions.
2. All questions carry equal marks.
3. Assume suitable missing data, if any.

Q.1

a) Using Bisection method find a real root of the equation $x^3 - x - 1 = 0$.

b) Use Newton-Raphson method to find the value of $\frac{1}{18}$, correct up to four decimal places.

Q.2

a) Define the diagonally dominant system. Solve the following system of linear of equations by Gauss-Jordan method.
$x + y + z = 9, \quad 2x - 3y + 4z = 13, \quad 3x + 4y + 5z = 40$

b) Use Newton's forward interpolation formula to find the value of y when x = 2.75 from the following table.

x	2.5	3	3.5	4	4.5	5
y	24.145	22.043	20.225	18.644	17.262	16.047

Q.3

a) Evaluate f(8)and f(15) using Newton's divided difference formula from the given values

x	4	5	7	10	11	13
f(x)	48	100	294	900	1210	2028

b) Using Lagrange's Interpolation formula, find f(x) as a polynomial in x which passes through the points (0, -12), (1,0), (3,6) and (4, 12)

8

Q.4

a) Evaluate $\int_0^1 \sqrt{1-x^2}\,dx$ by using Simpson's 1/3 rule

b) Using Runge-Kutta method of order four, find $y(0.8)$ correct to four decimal places, if $y' = y - x^2$, $y(0.6) = 1.737$

Q.5

a) Draw a flow chart for computing the roots of the quadratic equation $ax^2 + bx + c = 0$.

b) Write a program(WAP) in C to solve the system of linear equations by Gauss Jordan method

Q.6

a) Using Euler's method, solve the initial value problem $\frac{dy}{dx} = x + y, y(0) = 1$ in the interval [0,1] taking h=0.2. Compare the values obtained with the exact solution at each step.

b) Solve the following system of linear of equations by Gauss elimination method.
$2x - 6y + 8z = 24, 5x + 4y - 3z = 2, \quad 3x + y + 2z = 16$

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Total No of Pages..04..

Roll No.....

B Tech Third Semester

Automobile Engineering

End Semester Examination

(November – 2024)

AE – 203:

Engineering Mechanics

Paper Code

Title of the Subject

Time: 3:00 Hrs.

Max Marks. 70

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.1 (a)- Differentiate between **(2x7=14)**

(i) – Conditions of Equilibrium, for a Particle and a Rigid Body.

(ii) – Coefficient of Friction & Coefficient of Restitution.

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

(iv) – Absolute Motion and Relative Motion.

(v) – Plane Motion and Rotation.

(vi) – Direct & Oblique Impact.

(vii) – Linear Translation and Curvilinear Translation.

Q 2(a) Two cables are tied together at A and loaded as shown in the following figure. Knowing that P = 640 N, determine the tension in each cable. **07**

Q 2(b) In the following figure the angle θ is such that the vector sum of the three forces is zero. Determine the moment of the three forces about A. **07**

Q 3(a) Reduce the force couple system, shown in the following figure, to a single system. Also find out the perpendicular distance of the line of action o single force from O. **07**

Q 3(b) A double pendulum is held in equilibrium in the position as shown in the following figure, by a horizontal force F. The balls B and C each weighs 15 N. Determine the force F, the tensions in the strings AB and BC and the angle θ. **07**

Q 4(a) Find the moment of inertia of the following cross section of a Beam, about it's centroidal axis. **07**

Q 4(b) A particle moves in a straight line with the velocity shown in the following figure. Knowing that x = - 8 m at t = 0, draw the a-t and x-t curves for $0<t<20$ s and determine (a) – the maximum value of the position coordinate of the particle, (b) the value of t for which the particle is at a distance of 18 m from the origin. **07**

10

Q 5(a) Three blocks of masses 120 kg, 160 kg and 200 kg are arranged on the top of a rough, rigid surface as shown in the following figure. The top block is retained against horizontal motion by a surrounding cap. Find the maximum value that the horizontal force P may have before motion begins. **07**

Q 5(b) A projectile is projected from a point on the level of the ground and it's height is h when it is at a horizontal distance l and 2l from it's point of projection. Prove that the velocity of projection u is given by

$$u^2 = \frac{g}{4}\left(\frac{4l^2}{h} + 9h\right)$$ **07**

Q 6(a) A ball of mass 2 kg moving with a velocity of 3m/s impinges directly on a ball of mass 4 kg at rest. After impact the 2 kg mass ball comes to rest. Determine the velocity of 4 kg ball after striking and the co-efficient of restitution between the two balls. **07**

Q 6(b) A load of 10 kN is raised by means of a screw jack, having a square threaded screw of 12 mm pitch, and of mean diameter 50 mm. If an effort of 100 N is applied at the end of a lever to raise the load, what should be the length of the lever used? Co-efficient of friction is 0.15. Also state whether the screw is self locking? **07**

Q 7(a) What do you understand by Tensile test? Explain the various regions of the Tensile test Diagram of mild steel. **07**

Q 7(b) A tensile test is carried out on a bar of mild steel of diameter 2 cm. The bar yields under a load of 90 kN. It reaches a maximum load of 150 kN, and breaks finally at a load of 70 kN. Estimate: **07**

(i) - the Tensile stress at the yield point;

(ii) - the Maximum value of Tensile stress

Q 8 Write short notes on any four of the following. (4x3.5=1

(a) – Equivalent force system

(b) – Varignon's theorem

(c) – Rolling friction

(d) – Mohr's circle

(e) – Method of Sections of Truss analysis.

(f) – Combined stress

Figure for Q No. 2 (a)

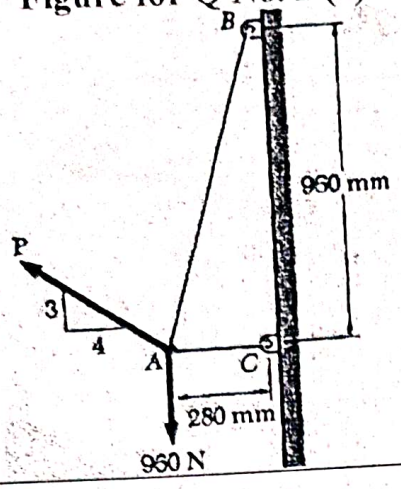


Figure for Q No. 2 (b)

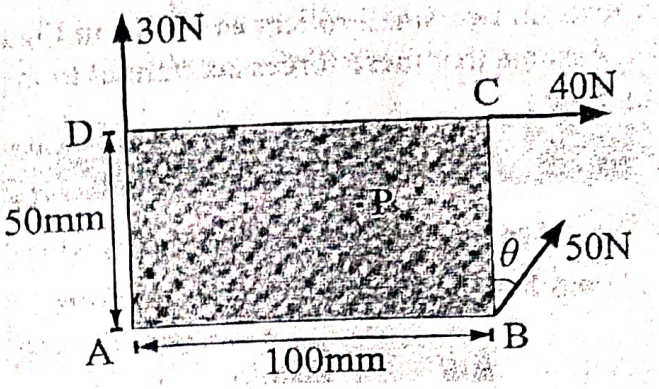
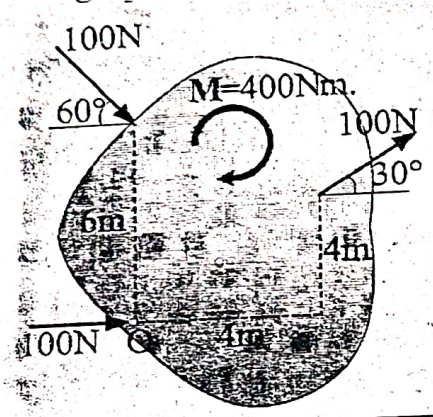


Figure for Q No. 3 (a)



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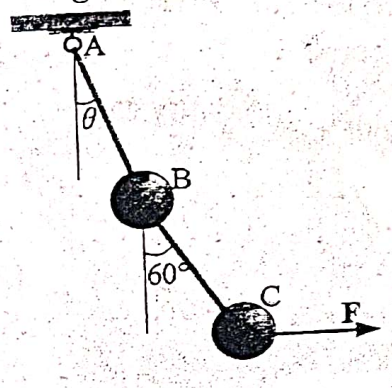

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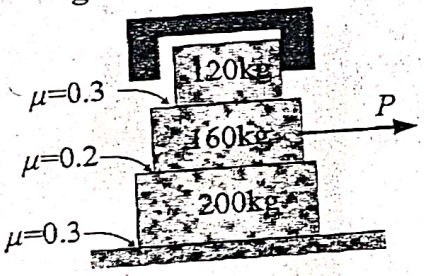

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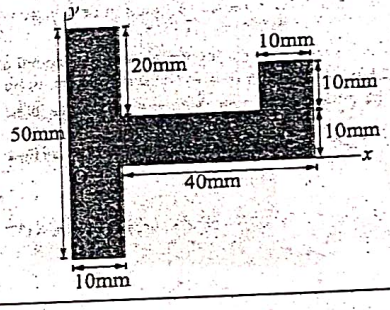

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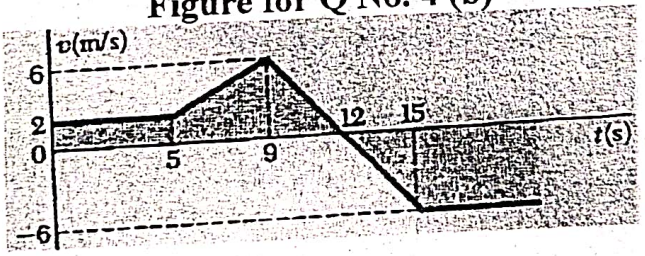

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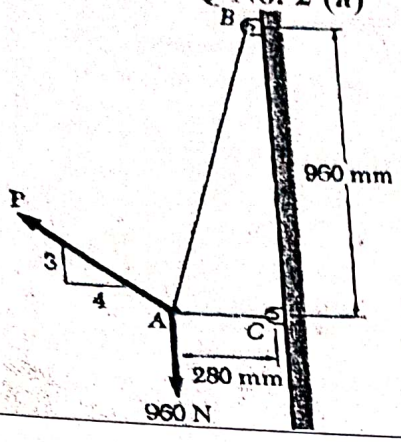
Figure for Q No. 2 (a)



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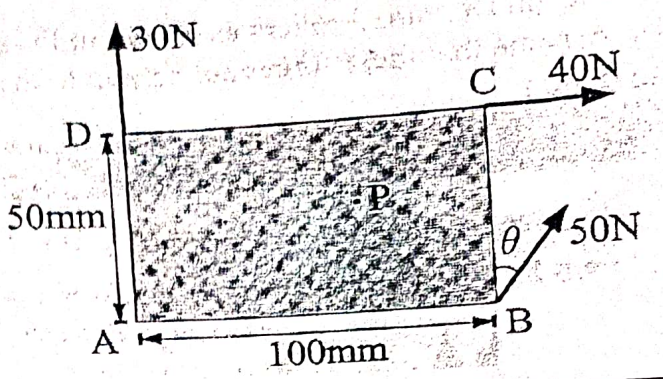

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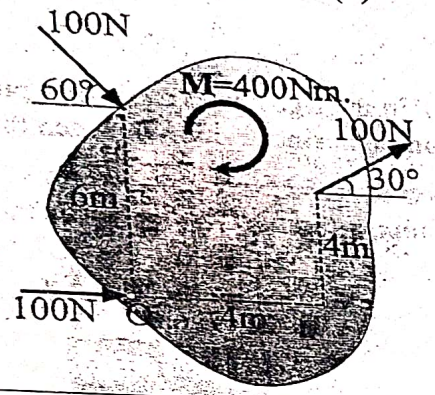

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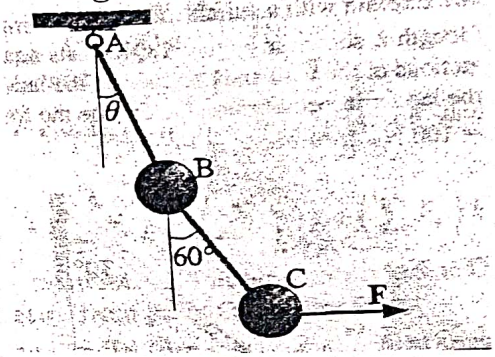

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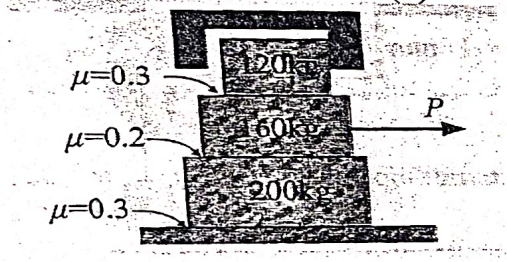

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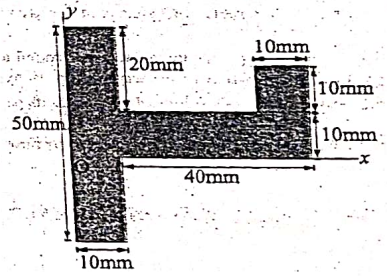

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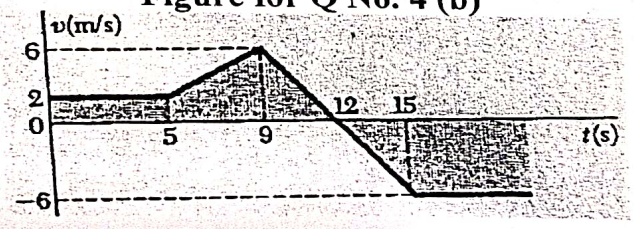

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III SEMESTER

B.Tech.

ÉND TERM EXAMINATION *November-2024*

AE203 THERMODYNAMICS

Time: 3 Hours *Max. Marks : 40*

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

Q-1(a):Define boiler. How boilers are classified. Enumerate the factors which should be considered while selecting a boiler. What are the essentials of a good steam boiler (Marks :6) (CO:4)

(b) Explained the methods for increasing thermodynamic efficiency of vapour power (Rankine) cycle. (Marks : 2) (CO:4)

Q-2(a): Define first law(energy) efficiency and second law (exergy)efficiency of the cycle. How you can calculate exergy destruction ratio and exergy destruction in each component in the vapour compression cycle. (Marks :2) (CO:2)

(b):Air enters the compressor of an Joule/Brayton cycle at 100kPa, 300K, with mass flow rate of 5.807kg/sec at 1 state . The compressor pressure ratio is 10 and enthalpy at state 2, is 579.9 kJ/kg. At state-3 , the turbine inlet temperature is 1400K, pressure is 450 bar, enthalpy=1515kJ/kg, At state-4 , the pressure is 45.05 bar, enthalpy=808.5 kJ/kg. Determine, (i) the thermal efficiency of the cycle, (ii) Back work ratio (iii)the net power developed in kW.(Marks:4)(CO:2)

(c) Define heating value of fuel. What is the difference between higher heating value and lower heating value of fuel (Marks :2) (CO:5)

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Q-3(a) What are the limitation of Carnot engine. Why Rankine cycle is u
Vapour power plant. Explained the methods for obtaining (i) thermal effi
(ii) back work ratio (iii)the net power developed in kW.(iv) heat rate o
Rankine cycle. (Marks : 4) (

(b) What are the primary and secondary fuels. List some important fuels.
(Marks: 2) (

(c) In the water heating processes, explain following terms
(i)sensible heat , hidden (latent) heat in evaporation and super heat . How
dryness faction is defined. Also draw temperature-entropy diagram for defi
dryness fraction. (Marks :2) ((

Q-4 (a)Explain the utility of followings with physical significance
(i) the generalized compressibility factor(ii) ideal gas equation of state (i
Vander Waals equation of state (iv) the Redlich Kwong equation of state.
(Marks :2) (C

(b) .Determine the air fuel ratio on both a molar and mass basis for the con
combustion of Octane (C_8H_{18}) with (i) the theoretical amount of air (ii)
theoretical air (50% excess air) (Marks :3) (C

(b)A heat pump operates between two identical bodies which are at tempe
T_1 and cools one of the bodies to a temperature T_2 (if $T_2 < T_1$), Find ou
minimum work required by the heat pump (Marks: 3) (C

Q-5(a) in the P-T chart for pure substance, draw sublimation curve, fusion
curve and vapourization curve and explain triple point, critical point,
(Marks :3) (C

(b)A mass m of fluid at temperature T_1 is mixed with an equal mass of the
fluid at T_2 .Derive the expression for resultant change of entropy of universe.
(Marks:3) (C

(c) What are the assumptions involved in Steady flow energy equation. Deriv
expression for steady flow energy equation. Give eight example (Marks:2) (C

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

THIRD SEMESTER **B. Tech (AE)**

END SEMESTER EXAMINATION *[NOV 2024]*

AE-205 MACHINE TOOLS AND MANUFACTURING

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

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

1[a] Sketch and explain the essential elements and angles of a single point, RH turning tool having tool signature 20, 16, 7, 7, 14, 12, 1.5. **5 [CO2]**

[b] List various types of drilling machines. Also sketch and explain the construction and working of a radial drilling machine. **5 [CO3]**

2[a] Drive the expressions to find out the machining time and metal removal rate in terms of machining parameters for the drilling operations. **5 [CO3]**

[b] Explain the construction and functioning of the automatic feed mechanism in a mechanical shaper, supported by a neatly labelled sketch. **5 [CO4]**

3[a] A mild steel plate 400 mm×300 mm×25 mm is to be shaped along the longer side with cutting speed of 26 m/minute for roughing and 32 m/minute for finishing. The ratio of return time to cutting time is 2:3. The feed per stroke is 1.1 mm for roughing and 0.2 mm for finishing. The maximum depth of cut may be taken as 2 mm for roughing and 0.5 mm for the finishing. Tool over-travel and approach are 15 mm each. Calculate the machining time and metal removal rate for the given plate having final thickness 21 mm. **5 [CO4]**

[b] List various milling operations Also sketch and differentiate the following milling operations.
(i) Up and down milling (ii) Straddle and gang milling **5 [CO5]**

PTO

4[a] With a neat sketch discuss the construction and working of a horizontal spindle, reciprocating table type surface grinder. **5 [CO6]**

[b] Explain the following terms with reference to grinding.
(i) Loading (ii) Glazing (iii) Dressing (iv) Trueing (v) Lapping **5 [CO6]**

[5] Write short notes on the following *[Any Four]*
(i) Cutting tool materials
(ii) CNC programming
(iii) Differences in shaper and planer
(iv) Various operations on a drilling machine
(v) Universal dividing head **10 [CO1,2,3,4,5]**

END

Total no. of Pages: 03

Roll no.....

III SEMESTER

B.Tech. (AE)

END TERM EXAMINATION NOV-2024

COURSE CODE AE207 (Heat Transfer)

Time: 1:30 Hours

Max. Marks: 40

Note : All questions are compulsory. Attempt any two parts from the given three parts in each question. All questions carry equal marks. Assume suitable missing data, if any.

Q.1(a) It is required to heat the oil to 300°C for frying purpose. A *long laddle* is used in a frying pan. The section of the laddle is 5 mm × 18 mm. The surrounding air is at 30°C. The thermal conductivity of the material is 205 W/m.K. If the temperature at a distance of 380 mm from the oil should not exceed 40°C, determine convective heat transfer coefficient. (Hint : Assume laddle as fin). [4][CO1]

(b) A hollow spherical shell ($r_i = 0.5$ m, $r_0 = 0.7$ m, $k = 40\ (1 + 0.001t)$ W/m°C where t is in °C) stores a liquid at 250°C, while the outside surface temperature of the sphere is 100°C. The ambient air is at 30°C. Calculate the heat flux through the shell and the outside heat transfer coefficient h_0. [4][CO1]

(c) A plane wall ($k = 45$ W/m.K), 10 cm thick, has heat generation at a uniform rate of 8×10^6 W/m^3. The two sides of the wall are maintained at 180°C and 120°C. Calculate

(i) temperature distribution across the plate and

(ii) position and magnitude of maximum temperature [4][CO2]

2(a) Briefly explain the various regimes of pool boiling with the help of a neat sketch. [4][CO5]

(b) Nitrogen gas at 0°C is flowing over a 1.2 m long, 2 m wide plate maintained at 80°C with a velocity of 2.5 m/s. For nitrogen, $\rho = 1.142$ kg/m^3, Cp = 1.04 kJ/kgK, $\nu = 15.63 \times 10^{-6}$ m^2/s and k = 0.0262 W/mK. Calculate (a) The average heat transfer coefficient and (b) the total heat transfer from the plate. [4][CO3]

(c) Define the following non dimensional numbers: (i) Nusselt Number (ii) Prandtl Number (iii) Grashof Number (iv) Biot Number

[4][CO2][CO3]

Q3(a) Air at 20°C and at atmospheric pressure flows at a velocity of 4.5 m/s past a flat plate with a sharp leading edge. The entire plate surface is maintained at a temperature of 60°C. Assuming that the transition occurs at a critical Reynolds number of 5×10^5, find the distance from the leading edge at which the boundary layer changes from laminar to turbulent. At the location, calculate the following:

(i) Thickness of thermal boundary layer and (ii) Local convective heat transfer coefficient, assume thermophysical properties of air at mean film temperature of 40°C are: $\rho = 1.128$ kg/m^3, $\nu = 16.96 \times 10^{-6}$ m^2/s, k = 0.02755 W/mK and Pr = 0.7. [4][CO3]

(b) A rectangular plate 0.2 m × 0.4 m is maintained at a uniform temperature of 80°C. It is placed in atmospheric air at 24°C. Calculate the heat transfer rate from the plate for the case when the vertical height is 0.2 m. Properties of air at the mean temperature of 52°C are $\nu = 1.822 \times 10^{-5}$ m^2/s, k = 0.02814 W/mK, Pr = 0.703.

Use $Nu_L = 0.59\ (Ra_L)^{0.25}$ for Ra between 10^4 to 10^9 and $Nu_L = 0.13\ (Ra_L)^{0.33}$ for Ra between 10^9 to 10^{13}. [4] [CO3]

(c) 0.5 kg of water per minute heated from 20°C to 50°C on passing it through a tube of 20 mm diameter maintained at a constant temperature of 85°C. Determine the length of tube required considering fully developed flow conditions through the tube. The thermophysical properties of properties of water at 60°C {[85 + (20+50)/2]°C} as ρ= 983.2 kg/m^3, $C_p = 4.178$ kJ/kg K, k = 0.659 W/m°C, $\nu = 0.478 \times 10^{-6}$ m^2/s. [4][CO3]

Q4(a) Derive an expression for the LMTD of a parallel flow heat exchanger. [4][CO6]

(b) A heat exchanger is required to cool 55,000 kg/h of alcohol from 66°C to 40°C using 40,000 kg/h of water entering at 5°C. Calculate (i) exit temperature of water, (ii) heat transfer rate, (iii) surface area required for a parallel flow type and counter flow type heat exchanger. Take overall heat transfer coefficient, U = 580 W/m^2.K, Cp (alcohol) = 3760 J/kg.K, Cp (water) = 4180 J/kg.K. [4][CO6]

(c) Define and explain the following terms (i) NTU (ii) Effectiveness of heat exchanger [4][CO6]

5(a) Define and explain (i) Spectral emissive power (ii) Wein's Displacement law. [4][CO4]

(b) Calculate the following quantities for an industrial furnace (black body) emitting radiation at 2650°C.

(i) Wavelength at which the emissive power is maximum

(ii) Total emissive power [4][CO4]

(c) What is the meaning of hemispherical, monochromatic and total quantities in radiation? Explain with example. [4][CO4]

Total no of Pages: 03 Roll No .....

III SEMESTER B.Tech. (AE)

END TERM EXAMINATION NOV-2024

AE209*n*: (Heat Transfer)

Time: 3:00 Hours Max. Marks:40

Note: All questions are compulsory. Attempt any two parts from the given three parts in a question. All questions carry equal marks. Assume suitable missing data, if any.

Q.1(a) A tube 2 cm outside diameter is maintained at uniform temperature of T_i is covered with insulation (k = 0.20 W/mK) to reduce heat loss to the ambient air at T_o with h_o = 15 W/m^{2}K. Calculate ((i)The critical thickness of insulation (ii) the ratio of heat loss from the tube with insulation to that without insulation if the thickness of insulation is (rc + 2) cm where rc is critical radius of insulation. [4][CO1]

(b) Two long rods of the same diameter, one of brass (k = 85 W/mK) and the other of copper (k = 375 W/mK) have one of their ends inserted in a furnace and the other ends exposed to the same atmosphere. At a distance of 105 mm away from the furnace the temperature of the brass rod is 120°C. Find the distance from the furnace end at which the copper rod would have attained the same temperature. [4][CO1]

(c) A load of peas at a temperature of 25°C is to be cooled down in a room at a constant air temperature of 1°C. (i) How long the peas will require to cool down to 2°C when the surface heat transfer coefficient of the peas is 5.81 W/m^2 K? (ii) What is the temperature of the peas after a lapse of 10 min from the start of cooling? The peas are supposed to have an average diameter of 8 mm. Their density is 750 kg/m^3 and specific heat 3.35 kJ/kg K. [4][CO2]

2(a) Water at 10°C flows over a flat plate (at 90°C) measuring 1m x 1 m, with a velocity of 2 m/s. Properties of water at 50°C are ρ = 988.1kg/m^3, ν = 0.556 X 10^{-6} m^2/s, Pr = 3.54 and k = 0.648 W/mK. Find (i) The length of plate over which the flow is laminar, (b) the rate of heat transfer from the plate for laminar flow region only.

[4][CO3]

(b) Explain salient features of pool boiling phenomenon with the help of a neat sketch.

[4][CO5]

(c) Define the following non dimensional numbers: (i) Reynolds Number (ii) Stanton Number (iii) Rayleigh Number (iv) Prandtl Number

[4][CO2][CO3]

Q3(a) Air flows over a plate at a free stream velocity of 5 m/s. The plate temperature is 100°C and the air temperature is 20°C. If the average value of convective heat transfer coefficient is 15 W/m^{2}K, determine the length of the plate in the direction of flow. The property values at film temperature of (100 + 20)/2 = 60°C are k = 28.96 × 10^{-3} W/m-K, v = 18.97 × 10^{-6} m^2/s, Pr = 0.696.

[4][CO3]

(b) A metal plate 0.609 m in height forms the vertical wall of an oven and is at a temperature of 171 °C. Within the oven, air is at a temperature of 93.4°C at atmospheric pressure. Assuming that natural convection conditions hold near the plate, and that for this case

Nu = 0.548 (Gr Pr)$^{1/4}$. Calculate the mean heat transfer coefficient and the heat taken up by air per second per metre width. For air at 132.2°C, take k = 33.2 x 10^{-6} kW/m K, dynamic viscosity = 0.232 x 10^{-4} kg/ms, C_p = 1.005 kJ/kg K. Assume air as an ideal gas and R = 0.287 kJ/kg K.

[4] [CO3]

(c) Water at 20°C flowing at the rate of 0.015 kg/s enters a 25 mm ID tube which is maintained at a temperature of 90°C. Assuming hydrodynamically and thermally fully developed flow determine the heat transfer coefficient and the tube length required to heat the water to 70°C. Given: water properties at 20°C: density = 1000.5 kg/m^3, C_p = 4181.8 J/kgK, kinematic viscosity = 1.006 x 10^{-6} m^2/s; properties of water at 45°C: density = 992 kg/m^3, C_p = 4180 J/kgK, k = 0.638 W/mK, kinematic viscosity = 0.613x 10^{-6} m^2/s; the average Nusselt number for the tube Nu_d = 3.657.

[4][CO3]

Q4(a) Derive an expression for the LMTD of a Parallel flow heat exchanger.

[4][CO6]

(b) In an open heart surgery under hypothermic conditions, the patient's blood is cooled before the surgery and rewarmed after wards. It is proposed that a concentric tube counterflow heat exchanger of length 0.5 m is to be used for this purpose, with a thin-walled inner tube having a diameter of 55 mm. If water at 60C and 0.1 kg/s is used to heat blood entering the exchanger at 18C and 0.05 kg/s, what is the temperature of the blood leaving the exchanger and the heat flow rate. Take U_0 = 500 W/m^2 K, C_p of blood = 3.5 kJ/kg K and C_p of water = 4.183 kJ/kg K.

[4][CO6]

(c) Derive an expression for the effectiveness of a parallel flow heat exchanger in terms of NTU and capacity ratio.

[4][CO6]

5(a) Draw a plot of black body spectral emissive power $E_{b\lambda}$ versus wavelength and explain various features.

[4][CO4]

(b) Define irradiation, monochromatic irradiation, spectral absorptivity and spectral transmissivity.

[4][CO4]

(c) Assuming the sun to be a black body having a surface temperature of 5800 K, calculate (i) the total emissive power, (b) the wavelength at which the maximum spectral intensity occurs, (c) the maximum value of $E_{b\lambda}$.

[4][CO4]

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

FIFTH SEMESTER **B. Tech (AE)**

END SEM EXAMINATION **[NOV. 2024]**

AE301 MANUFACTURING TECHNOLOGY

Time: 3 Hours *Max. Marks: 40*

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

1 [a] With reference to USM, briefly discuss the following.
(i) Working principle with schematic diagram (ii) Parametric analysis (iii) Applications and limitations **5 [CO2]**

[b] With reference to AJM, briefly discuss the following.
(i) Working principle with schematic diagram (ii) Effect of process parameters on MRR and surface finish (iii) Applications and limitations. **5 [CO2]**

2 [a] Draw a Merchant's circle diagram and derive the expressions to show relationships among the different forces acting on the single point cutting tool during orthogonal cutting. **5 [CO3]**

[b] The following data were recorded while turning the workpiece on a lathe.
Cutting speed: 30 m/min
Depth of cut: 1.5 mm
Feed: 0.15 mm/rev
Tool life: 90 minutes.
The tool life equation is given for this operation: $VT^{0.12}f^{0.75}d^{0.3} = C$
If cutting speed, feed and depth of cut are all increased by 30% each individually, what will be their effects on the tool life? **5 [CO3]**

PTO

3[a] What are the main the differences between jigs and fixtures? Explain the concept of location and sketch and explain the 3-2-1 principle of location. 5 [CO4]

[b] With neat sketches explain the construction and working of the following. 5 [CO4]

(i) Leaf jig (ii) Wedge type Jack pin

4 [a] What are the various measuring instruments and gauges available for linear and angular measurements? Discuss the working of slip gauges and angle gauges briefly. 5 [CO5]

[b] Sketch and explain the essential elements and angles of a single point, RH turning tool having tool signature 20, 16, 7, 7, 15, 13, 1.5. 5 [CO3]

[5] Write short notes on the following [*ANY FOUR]*

(i) Types of machine tool drives

(ii) Various operations on a drilling machine

(iii) Various standards of measurements

(iv) Comparison of conventional and non-conventional machining processes

(v) Cutting fluids and their applications 10 [CO 1,2,3,4,5]

END

Roll no.....

Total No. Pages 03

V[th] SEMESTER [B.Tech.]

END TERM EXAMINATION *November-2024*

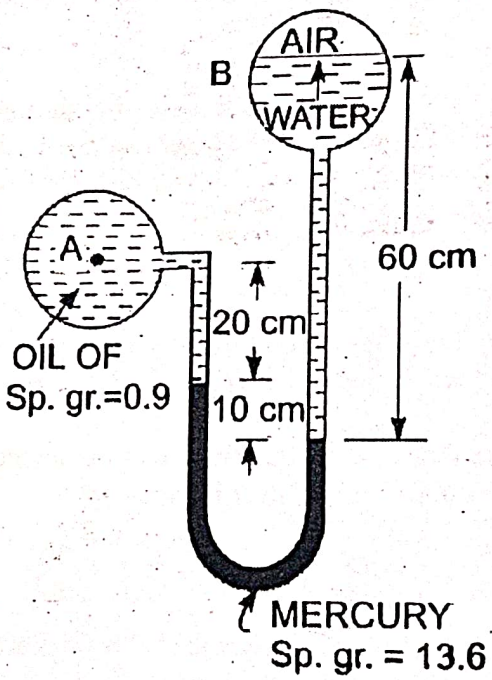
AE303 FLUID MECHANICS AND HYDRAULIC MACHINES

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) A 15.00 cm diameter vertical cylinder rotates concentrically inside another cylinder of diameter 15.10 cm. Both cylinders are 25 cm high. The space between the cylinders is filled with a liquid whose viscosity is unknown. If a torque of 12.0 N-m is required to rotate the inner cylinder at 100 r.p.m., determine the viscosity of the fluid. [4] [CO1]

Q.1 **b)** A differential manometer is connected at two points **'A'** and **'B'** as shown in figure, The air pressure at B is 98100N/m^2(absolute), find the absolute pressure at **'A'**. [4][CO1]



Q.2a) Determine the position of centre of pressure and total pressure force on a circular plate of diameter 1.5 m which is placed vertically in water in such a way that the centre of the plate is 3 m below the free surface of water. [4][CO2]

Q.2b) The stream function for a two-dimensional flow is given by $\Psi=2xy$. Calculate the velocity at the point P(2,3). Also find the potential function. [4][CO2]

Q3 a) A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10cm is used to measure the flow of water. The gauge pressure at inlet is 17.658 N/cm^2 and the vacuum pressure at throat is 30 cm of mercury. Find the flow rate of water through the venturimeter (in m^3/s). [4][CO3]

Q3 b) The fluid of viscosity 0.7 N-s/m^2 and specific gravity 1.3 is flowing through a circular pipe of diameter 100 mm. The maximum shear stress at the pipe wall is 196.2 N/m^2. Find pressure gradient and average velocity of flow. [4][CO3]

Q.4a) An oil of specific gravity 0.7 is flowing through a pipe of diameter 300 mm at the rate of 500 litres/s. Find the head lost due to friction and power required to maintain the flow for a length of 1.0 km. Kinematic viscosity of oil is 0.29 Stokes. Coefficient of friction $= f = \frac{0.08}{Re^{0.25}}$ [4][CO3]

Q.4b) Explain the physical significance of the following dimensionless numbers: Reynolds Number, Froude Number, Euler Number, Mach Number. [4][CO3]

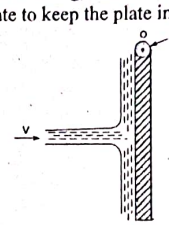
Q5 a) Find the displacement thickness and momentum thickness for the velocity distribution in the boundary layer is given by

$$\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$$

Where, 'u' is the velocity at a distance 'y' from plate, and 'U' is the velocity at $y = \delta$(boundary layer thickness). [4] [CO4]

Q5 b) Find the drag force exerted on square flat plate of side 2.0 m when plate is moving at a speed of 4 m/s normal to its plane in: a) water, b) air. Density of air =1.24 kg /m^3 and coefficient of drag=1.15. [4][CO4]

Q6 a) A jet of water of 30 mm diameter strikes a hinged square plate at its centre with a velocity of 20 m/s. The plate is deflected through an angle of 20°. Find the weight of the plate.
If the plate is not allowed to swing, what will be the horizontal force required at the lower edge of the plate to keep the plate in vertical position. [2+2][CO5]



Q6 b) The penstock supplies water from a reservoir to the Pelton wheel with a gross head of 500 m. One third of the gross head is lost in friction in the Penstock. The rate of flow of water through the nozzle fitted at the end of penstock is 2.0 m^3/s. the angle of deflection of the jet is 165°. Determine the power given by the water to the runner and also hydraulic efficiency of the Pelton wheel. Take speed ratio as 0.45 and coefficient of velocity as 1.0. [4][CO5]

Q7 a) With the help of suitable schematic diagram, explain the working of main parts of a Centrifugal Pump. [4][CO5]

Q7 b) With the help of suitable schematic diagram, explain the working of main parts of a Reciprocating Pump. Also classify the reciprocating Pumps. [4] [CO5]

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

VI SEMESTER

B.Tech: Automobile Engineering

END TERM EXAMINATION **Nov-2024**

AE 307 Combustion Generated Pollution

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

Note: *i) Answer all questions.*
ii) Start the new question or part thereof at a new page.
iii) Attempt all parts of a question at one place.
iv) Draw neat diagrams (appropriately labeled), wherever required.

Q. 1 (a) What is the significance of ASTM distillation curve of gasoline? [5] [CO 2,3]
Explain how i) vapour lock, ii) ease of starting the engine and iii) engine warm up are related to ASTM distillation curve.

Or,

Compare various properties of natural gas (CNG) and gasoline as fuels for SI engines.
Explain how CNG can be used in existing gasoline engines in dual-fuel mode. Discuss the modifications required for optimum performance when an existing gasoline engine is converted to a dedicated CNG engine.

Q.1 (b) What is octane number of gasoline? Why octane number is one of the important properties when gasoline is used in Spark ignition (SI) engines? [5] [CO 1,2]
List other desirable properties of SI engine fuels.

Q. 2 (a) What are the main sources of pollutants in a car powered by gasoline engine? [5] [CO 1,3]
Explain the term 'evaporative emissions' in a spark gasoline engine.
With a help of neat sketch and explain how evaporative emissions can be controlled.

Q.2 (b) What is the mechanism of formation of photochemical smog? Discuss the effects of photochemical smog in atmosphere. [5] [CO 2,4]

Or,

What are the various reasons of CO formation during combustion in SI engines? Explain how human health is affected due to presence of CO in the atmosphere.

Q.3 (a) List various pollutants which are emitted by diesel engines. What is the cause of NOx formation in diesel engines? Explain how NOx can be controlled using EGR. [5] [CO 1,4]

Q.3 (b) Discuss various mechanisms of formation of HC emissions in CI engines. Explain the terms 'Soot' and 'Particulate Matters (PM)' [5] [CO 1,4]

Q.4 (a) What is a three way catalytic convertor? With a help of neat sketch explain the construction, different components and working of a three way catalytic convertor. [5] [CO 3]

Q.4 (b) What is a stratified charge engine? Describe the Honda CVCC engine and explain its advantages over other type of stratified engine. [5] [CO 3,5]

Q.5(a) What is the operating principle of a Non-dispersive Infrared Analyzer (NDIR)? With a help of a neat sketch explain how carbon monoxide emissions from IC engines can be measured using NDIR. [5] [CO 3,4]

Q. 5(b) What chemical reaction is utilized in Chemiluminescence method for measuring NOx? Also explain how NO and NO_2 can be measured by this method. [5] [CO 3,4]

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Total No. of Pages: 02

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FIFTH SEMESTER

B. Tech. (AE)

END SEMESTER EXAMINATION ***Nov - 2024***

AE-317 Power Unit and Transmission

Time: 3 Hours

Max. Marks: 50

Note: Attempt any **TEN** Questions.

Assume suitable missing data, if any.

Q.1 What are the requirements of Transmission system in an Automobile? [CO-1] [5]

Q.2 What are the performance parameters. Discuss them in details. [CO-1] [5]

Q.3 With the help of a neat sketch, describe the construction and working principle of the multi plate clutch. [CO-2] [5]

Q.4 What is the difference between constant mesh and synchromesh transmission? Describe any one of them. [CO-2] [5]

Q.5 Name the different types of gears boxes used in the automotive vehicle. Explain with the help of a neat sketch, the working of synchromesh gear box. [CO-3] [5]

Q.6 Explain with the help of a neat sketch, the working of synchromesh gear box. [CO-3] [5]

Q7. What do you mean by fluid coupling? Write its principle and operation torque capacity performance characteristic. [CO-4] [5]

Q.8 Write the torque converter construction and principle of operation fluid coupling. [CO-4] [5]

Q.9 How does semi – automatic transmission differ from automatic transmission? [CO-5] [5]

Q.10 Explain briefly: (i) Overdrive (ii) Automatic Transmission. [CO-5] [5]

Q.11 Explain the construction and working of a differential gear box with a neat sketch. [CO-6] [5]

Q.12 Explain briefly, with neat sketches of three quarter floating and fully floating rear axles [CO-6] [5]

Total No. Of pages: 02.
Fifth Semester (AE|ME|PE--)

Roll No. 29 -------
B. Tech.

End Semester Examination – November, 2024.

AE-321 Advanced Strength Of Materials.

Time: 03 Hours

Max. Marks: 50

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

Q.1:(a): Derive equilibrium equations, Strain Compatibility relation and stress compatibility relation, ignoring body forces, for a two-dimensional problem in T.O.E. (7)

(b): If Airy's stress function, representing a problem, is $[4y^3 + 3y^2 \cdot x - 40x + 2y + 16]$, determine σ_x, σ_y and τ_{xy}. (3)

Q2:(a): Discuss the stress-situation, which develops when two spheres of different diameters and materials are pressed against each other by a force P, passing through their centers. (6)

(b): Explain the following: (2)

(i) Two different types of elastic foundations. (2)

(ii) The method of classifying beams as short, medium and long.

Q3: (a): Define endurance limit for steels. Does the definition remain same for non-ferrous materials also? How can the endurance limit be obtained, using a cantilever specimen on a rotating bending type machine? Why is a specimen, under four point bending considered superior? (2+4+1)

(b): For designing under fatigue loads, where both σ_a and σ_m exist, sketch and discuss Goodman's failure line. (3)

Q4:(a): How can the magnitude and direction of shear stress, and the value of applied torque, in case of shafts of non-circular sections, be obtained through membrane analogy? (5)

---Contd. p.2.

(b): A symmetric I-section, shown in Fig 1, is subjected to a torque. What is the value of torsional rigidity (NJ)? What would have been the error in assessing torsional rigidity, if warping is neglected, and this shaft is also treated with the formulae, used for shafts of circular sections?

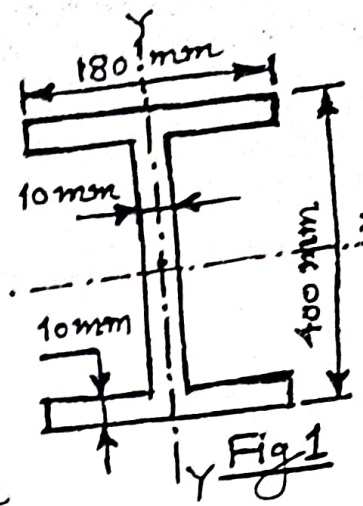

Fig 1 (5)

Q5: (a): What is understood by favourable residual stresses in beams, subjected to pure moment, and in internally pressurized thick cylinders? How can these be developed? (3+3)

(b): A solid steel shaft is 50 mm in diameter and 450 mm in length. It is subjected to a torque, causing yielding in the shaft upto a radius of 18 mm. If the yield stress in shear is 110 $MN.m^{-2}$ and shear modulus is 82 $GN.m^{-2}$, determine the torque and the angle of twist? (2+2)

Q6: (a): Discuss Creep strain – time plots, drawn at a constant temperature and four different stresses. Explain minimum creep strain rate. (3)

(b) Explain the effect of creep on the bending stresses, induced at various distances from the neutral axis of a cross-section, subjected to pure bending moment.

Q7: Answer any <u>two</u> of the following:

(a). Prove that curvature, developed in cylindrical bending of a rectangular plate, equals $\left[-\frac{M}{D}\right]$. M being the bending moment and D being $E.I.(1-\nu^2)^{-1}$. (5)

(b). A C.I. column of hollow circular section, 18 cm external diameter, thickness of metal 1.8 cm, length 5 m, has to take a load of 12 tonnef at an eccetricity of 1.8 cm from the geometrical axis. For fixed ends, calculate the maximum and minimum stresses, induced in the section, taking $E = 1 \times 10^6$ kgf.cm^{-2}. (5)

(c). Discuss theoretical S.C.F., fatigue S.C.F. and notch sensitivity factor. (5)

—x—x—

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

VII Semester

B.Tech.

END-SEMESTER EXAMINATION **November-2024**

AE407: Production and operations management

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

Note: Answer Any *FOUR questions*

Q1.(a) Explain the strategic role of technology. (3)

(b) Is any organisation adopt all competitive dimensions together? Justify your answer. (3)

(c) What are the advantages and disadvantages of a conglomerate Integration? (4)

Q2. (a) Which stage of the product life cycle show focused effort on promotional activities? (3)

(b) What metrics are used to measure process performance? (3)

(c) Explain with graph about the 'S-curve' and the 'complex learning curve' (No requirement of Graph paper) (4)

Q3. (a) Following data shows fixed and variable cost for a particular product which can be manufactured at two locations. The demand for this product was estimated to be constant at 8800 units annually. Also, it was assumed that per unit of the product sells at Rs.6. Determine which location would yield highest profit. (3)

Alternative locations	Fixed Cost (Rs.)	Variable cost (Rs.)
A	8000	44,000
B	9400	35,200

(b) For a manufacturing line, the data below on the task precedence relationships exist (assume the tasks cannot be split)

TASK	A	B	C	D	E	F	G	H
performance time (min)	3	6	7	2	2	4	5	5
Preceded by	-	A	A	A	A	C,B	C	D,E,F,G

(i) Construct the precedence diagram for the tasks.

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(ii) What is the theoretical minimum cycle time?
(iii) To balance the line to the cycle time determined above, what is the minimum number of work stations?
(iv) Use the "longest-operation-time" rule to balance the line to the theoretical minimum cycle time determined above.
(v) Calculate the efficiency of the balanced line. (7

Q4. (a) What are the key components of time series analysis? (3

(b) A food processor uses Moving average to forecast next month's dem
Past actual demand (in units) is shown below;

Month	43	44	45	46	47	48	49	50	51
Actual Demand(in units)	105	106	110	110	114	121	130	128	137

(a) Compute a simple five month moving average to forecast demand for month 52
(b) Compute a weighted three-month moving average where the weights highest for the latest months and descend in the order of 3,2,1.

Q5. (a) How the trade-offs between overstocking and understocking are balanced?

(b) The following data has been provided for an inventory, find E.O.Q reorder point; Annual Demand : 1000 units; Ordering Costs: ₹ 5 per o Holding cost: ₹ 1.25 per unit per year; cost per unit: ₹12.5; Lead time days; Average daily demand: 1000/365.

Q6. Write Very Short Notes on: (1x10

(i) Mechatronics
(ii) Flexible Manufacturing System
(iii) Industry 4.0
(iv) Seven Intangible Wastes
(v) KANBAN
(vi) Why ABC analysis?
(vii) Group Technology
(viii) Enterprise Resource Planning
(ix) Process Capability
(x) Mean Squared Error

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VII SEMESTER

B.Tech (Automotive/Other Branches)

END TERM EXAMINATION ***NOV/DEC-2024***

AE-411 **Vehicle Maintenance & Tribology**

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

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

Q.1	(a)	Trace the historical development of tribology, examining how the field has progressed over time and identifying significant milestones that have shaped its evolution.	10 marks (5+5)	CO-1
	(b)	Provide a detailed explanation of solid lubricants, describing their nature and examining how they work to reduce friction and wear between surfaces.		
Q.2	(a)	Explain the importance of regular maintenance in transport systems, focusing on how routine maintenance practices contribute to extending the lifespan and improving the reliability of transport vehicles.	10 marks (5+5)	CO-2
	(b)	Evaluate how comprehensive maintenance records assist in identifying recurring issues and predicting potential problems. Discuss how this data can enhance maintenance strategies and optimize system performance.		
Q.3	(a)	Explain the procedure for dismantling engine components for maintenance, outlining the key steps involved and detailing the proper handling methods for each component during the process.	10 marks (5+5)	CO-3
	(b)	Explain the specialized tools used in engine maintenance and overhauling, describing the functions of tools like micrometers, torque wrenches, and valve seat grinders. Discuss how these tools support accuracy and efficiency in the maintenance process.		

Please Turn Over for remaining four questions

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Q.4	(a)	Outline the steps involved in the maintenance and servicing of a differential system, explaining how each step is performed. Discuss how proper servicing of the differential system enhances the vehicle's handling and stability.	10 marks (5+5)	CO-4
	(b)	Explain the steps in conducting a thorough maintenance check for the steering system, detailing each procedure. Discuss how wheel alignment and balancing influence the performance and efficiency of the steering system.		
Q.5	(a)	Describe the different testing methods employed to assess the condition and performance of automotive electrical components. Highlight the key indicators that signal potential failures in these components.	10 marks (5+5)	CO-5
	(b)	Explain the maintenance practices necessary to ensure the proper functioning of dashboard instruments. Discuss how the integration of modern technology impacts these maintenance practices.		
Q.6	(a)	Outline the significance of engine calibration and tuning in achieving optimum fuel supply. Explain the key steps in this process and their impact on engine performance and efficiency.	10 marks (5+5)	CO-6
	(b)	Explain the role of the thermostat in a vehicle's cooling system. Describe the maintenance procedures for the thermostat and outline the common signs that indicate its failure.		
Q.7	Write short notes on any two of the following: a) Abrasive Wear b) Testing of Fuel injectors c) Checking & Servicing a vehicle battery		10 marks (5+5)	CO-1, 3, 5

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VII SEMESTER

B.Tech (Automotive/Other Branches)

END TERM EXAMINATION *NOV/DEC-2024*

AE-413 **Vehicle Transport Management**

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

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

Q.1	(a)	Explain the key objectives and functions of personnel management in an organization. How do these functions enhance the overall effectiveness of the organization?	10 marks (5+5)	CO-1
	(b)	Compare various employee training methods. How can organizations identify the most suitable training methods to meet their specific needs?		
Q.2	(a)	Discuss the advantages of motor transport compared to other modes of transportation. In which scenarios is motor transport especially advantageous?	10 marks (5+5)	CO-2
	(b)	Examine the role of the secretarial division in a transport organization. How does this division assist in supporting the administrative and legal functions of the organization?		
Q.3	(a)	Analyze the factors that influence the fare structure of public transport systems. What key considerations should be taken into account when balancing affordability with cost recovery?	10 marks (5+5)	CO-3
	(b)	Compare various fare collection methods and explore how technological advancements are transforming modern fare collection systems in public transport.		

Please Turn Over for remaining four questions

Q.4	(a)	Describe the importance of vehicle fitness certificates. How do they contribute to road safety and ensure vehicle reliability under the Motor Vehicle Act?	10 marks (5+5)	CO-4
	(b)	Contrast the constructional requirements for standard and specialized vehicles (such as tankers and firefighting vehicles) under the Motor Vehicle Act. How do these requirements affect the design and functionality of the vehicles?		
Q.5	(a)	Describe the role of a preventive maintenance schedule in the transport industry. How does it contribute to reducing vehicle downtime and maintenance costs?	10 marks (5+5)	CO-5
	(b)	Examine the relationship between tire maintenance and fuel economy. How does maintaining proper tire inflation and alignment help reduce fuel consumption in commercial vehicles?		
Q.6	Write short notes on any two of the following: a) psychological tests b) chain of responsibility c) bus scheduling		10 marks (5+5)	CO-1, 2, 3
Q.7	Provide brief explanations on any two of the following topics: a) MV Act recent Amendments b) test for competence to drive c) Design of bus depot layout		10 marks (5+5)	CO-4, 5

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FIRST SEMESTER B.Tech.(ALL)

END SEMESTER EXAMINATION NOVEMBER 2024

AM101/MA101 (MATHEMATICS I)

Time: 3 hours Maximum Marks: 50

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

Q1(i) Given $u = e^{rcos\theta}\cos(rsin\theta)$, $v = e^{rcos\theta}\sin(rsin\theta)$, Prove that $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}$ and $\frac{\partial v}{\partial r} = -\frac{1}{r}\frac{\partial u}{\partial \theta}$ (CO3)

(ii) If $u = \cos^{-1}\frac{x+y}{\sqrt{x}+\sqrt{y}}$ then show by Euler's theorem that

$$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = -\frac{1}{2}cotu$$ (CO3)

Q2(i) A rectangular box which is open at the top, has a capacity of 256 cubic feet. Determine the dimensions of the box such that the least material is required for the construction of the box. (CO3)

(ii) Use Gauss Divergence theorem to evaluate

$$\iint_S [(x^3 - yz)i - 2x^2y\,j + 2k].\hat{n}\,ds$$

Where S denotes the surface of the cube bounded by the planes $x = 0, x = a, y = 0, y = a, z = a, z = a.$ (CO5)

Q3(i) Evaluate the double integral $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2\,dy\,dx$ by changing the order of integration. (CO4)

(ii) Find by double integration, the area lying inside the circle $r = a\sin\theta$ and outside the cardioid $r = a(1 - \cos\theta)$. (CO4)

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Q4(i) Evaluate $\int_0^{\pi/2}\int_0^{a\sin\theta}\int_0^{(a^2-r^2)/a} r\,dr\,d\theta\,dz$ (CO4)

(ii) Find the directional derivative of $\nabla.(\nabla\emptyset)$ at the point (1,-2,1) in the direction of the normal to the surface (CO5)

$xy^2z = 3x + z^2$, *where* $\emptyset = 2x^3y^2z^4$.

Q5(i) A vector field is given by $\vec{F} = (x^2 - y^2 + x)i - (2xy + y)j$. Show that the field is irrotational and find its scalar potential. (CO5)

(ii) Verify Stoke's theorem for the vector point function $\vec{F} = (x + y)i + (2x - z)j + (y + z)k$ over the surface of a triangular lamina with vertices (2,0,0), (0,3,0) and (0,0,6). (CO5)

Q6(i) Test the convergence of the series (CO1)

$$1 + \frac{2x}{2!} + \frac{3^2x^2}{3!} + \frac{4^3x^3}{4!} + \text{-------}$$

(ii) Find the perimeter of the loop of the curve (CO2)

$$3ay^2 = x^2(a - x)$$

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Total No. of Pages: 02

Roll No. .....

FIRST SEMESTER

B.Tech.

END SEMESTER EXAMINATION

Nov.-2024

AC101 CHEMISTRY

Time: 3 Hours

Max. Marks: 40

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

1[a] Distinguish between TGA and DTA. Draw a DTA thermogram of a typical polymer material and explain its features. [3 marks] [CO1]

[b] How will you estimate dissolved oxygen in a given water sample. Explain with appropriate chemical equations [3 marks] [CO2]

[c]Molar absorptivity of palladium complex has been reported 2.12×10^5. Assuming that a cell with 10 cm length path is available and minimum measurable absorbance is 0.001 from a spectrophotometer, what is the lowest possible molar concentration of palladium that can be determined by the instrument [2 marks] [CO2]

2[a] Explain any two methods to prevent sludge formation with appropriate chemical equations. [4 marks] [CO1]

[b] What is a meta stable state the phase diagram of a single component system? Explain with a suitable example. [4 marks] [CO5]

3[a] Draw and discuss the phase diagram of Copper and Nickel system in detail. [4 marks] [CO5]

[b] Elucidate the cationic polymerization mechanism of polystyrene. [4 marks] [CO3]

4[a] Write any three important battery characteristics. Explain cathodic and anodic chemical reactions of a Zn-C battery. [4 marks] [CO4]

4 0

[b] Calculate Number average molecular weight, Weight average molecular weight and PDI of a polymer sample solution containing 1 g of 3000 molecular weight (MW); 3g of 2000 MW and 2g of 5,000 MW. Explain the significance of PDI. [4 marks] [CO3]

5[a] 28 g of ethene was polymerized by radical polymerization process and average degree of ploymerisation process of polythene was found to be 1000. Calculate the number of molecules of polythene produced [3 marks] [CO3]

[b] Write the chemical equation for the synthesis of Nylone-6 from cyclohexane. Also mention its two important applications. [3 marks][CO3]

[c] Calculate the atom economy for for converting ethanol to ethene

$CH_3CH_2OH \Longrightarrow CH_2{=}CH_2 + H_2O$ [2 marks] [CO6]

6[a] Illustrate possible modes of vibrations with appropriate sketches in CO_2 [4 marks] [CO2]

[b] Write short note on *any two* of the following: [2+2 marks] [CO4] [CO3] [CO6]

(i) Lithium Battery

(ii) Conducting mechanism of polyaniline

(iii) Green solvents

tal Number of Pages 2
ST SEMESTER
ID-TERM EXAMINATION

Roll. No.....
B.TECH (All Groups)
Nov-Dec 2024

AP 101: Physics

ne: 3:00 Hours

Max. Marks: 40

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

1. Write short notes on the following [2×4=8][CO#3-5]
   [a] Pulse dispersion in optical fibre
   [b] Compton effect
   [c] Intrinsic and extrinsic semiconductors
   [d] Ruby Laser

2. [a] In a single-slit diffraction pattern, the first minimum is observed at an angle of 30° with light of wavelength 600 nm. If the width of the slit is 1.0 mm, calculate the angle for the second minimum. [4][CO#2]
   [b] State and deduce the mathematical expression for the law of addition of relativistic velocities. Show that in no case can the resultant velocity of a material particle be greater than c. [4] [CO#1]

3. [a] Starting with the rate equations for matter-radiation interaction, show that the ratio of the Einstein's A and B coefficients is proportional to the third power of the frequency of radiation. [4][CO#3]
   [b] Describe different types of optical fibre on the basis of refractive index profile. Derive an expression for the numerical aperture for step index fibre in terms of refractive index of the core and cladding. [4][CO#3]

4. [a] Explain the wave-particle duality of matter and light. How was it demonstrated by the Davisson-Germer experiment? [4][CO#4]
   [b] For a 3D potential box where $L_x=L_y=L_z=1$ m, explain why the degeneracy of the ground state is 1, and the degeneracy of the first excited state is 3. Also calculate the difference of energy eigen values of first excited and third excited states for the same. [4][CO#4]

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Q5. [a] Explain the Hall Effect in semiconductors. Derive the expression fo the Hall voltage and Hall coefficient. Also, discuss applications of Hal coefficient. [4][CO#5]

[b] What is Einstein's relation in semiconductor physics? If the electro mobility in a semiconductor is μ=1200 cm^2/V-s at room temperatur (T=300 K), calculate the electron diffusion constant D. [4][CO#5]

Q6. [a] Consider a particle trapped in an infinite potential box of width 'a'

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

Write the Schrodinger equation for this particle and hence get th expression for the energy eigen values and eigen functions for th particle. Draw its first three probability densities and wave functions. [4][CO#4]

[b] At thermal equilibrium, the ratio of the number of spontaneous t stimulated emissions is found to be 10^{10} at a frequency of 5×10^{14} Hz Calculate the ratio of the number of atoms in the higher level to th lower level in a 2-level system at equilibrium. [4][CO#3]

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

THIRD SEMESTER

B.Tech.

END TERM EXAMINATION *Nov/Dec-2024*

BT 201 Introduction to Biotechnology

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

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

Q.1 [A] Attempt any TWO of the following [2½+2½ marks] [CO1]

(i) Give an elaborative account of any three applications of Biotechnology in Agriculture

(ii) How is Biotechnology helpful in Medical / Health sector? Enumerate five applications in the field and discuss any two in detail

(iii) Analyze the role of Biotechnology in the following - Designer milk; DNA fingerprinting; Leavening of bread

[B] Answer the following [2½+2½ marks] [CO1]

(i) Name any five scientists who won Nobel Prize in Physiology & Medicine or Chemistry in the past 15 years. Indicate the contribution of each

(ii) Compare and contrast the following terms, mentioning 2 points for each - Reproductive cloning and Therapeutic cloning; Organogenesis and Somatic embryogenesis

Q.2 [A] Attempt any TWO of the following [2½+2½] [CO4, CO5]

(i) DNA is genetic information carrier. Explain the statement with the help of Hershey and Chase experiment

(ii) Give a descriptive account of the following - 'Prokaryotic standard promoter and its recognition by RNA polymerase' and 'Advantages of supporting medium used in gel electrophoresis'

(iii) Assign roles to the following enzymes / proteins in the process of gene expression and explain the functioning of each in about 50 words - DnaG primase, DNA gyrase, DNA ligase, Sigma subunit of RNA polymerase; Rho protein

P.T.O.

[B] Attempt any TWO of the following [2½+2½] [CO2]

(i) Extrachromosomal nuclear material (Plasmids) confers phenotypic traits on bacteria in which they are present. Explain this statement with examples of various types

(ii) Give reasons for the following - 'Lysosomal enzymes do not hydrolyze cytoplasmic contents' and 'Two eukaryotic cell organelles are semiautonomous'

(iii) Analyze the structures of the following to explain their functions - 'Centriole' and 'Mitochondria'

Q.3 [A] Answer the following [2½+2½] [CO3]

(i) Evaluate the structure and nutrition of fungi and determine the similarities and differences from algae

(ii) Write two points of differences between each of the following - Glycoprotein and Glycolipid; Gram-positive and Gram-negative bacteria; Integral membrane protein and Peripheral membrane protein

[B] Attempt any TWO of the following [2½+2½] [CO3]

(i) Give the salient points of induced fit hypothesis explaining the enzyme active site in enzyme-substrate complex

(ii) Explain the class and functions of oxidoreductase enzymes. What is the basis of their systematic nomenclature and Enzyme Commission numbers?

(iii) Enzymes are very selective for their substrates. What are the various types of specificities of enzymes? Explain with examples

Q.4 [A] Attempt any TWO of the following [2½+2½] [CO4]

(i) What is meant by sticky end restriction enzyme? What are its various types, explain with examples. Explain any one strategy for the selection of recombinants from non-recombinants based on color reaction

(ii) Give two points of differences between any three of the following - Monocistronic and Polycistronic; Introns and Exons; 30S initiation complex and 70S initiation complex; EF-Tu and EF-Ts; Eukaryotic mRNA and Prokaryotic mRNA

P.T.O.

(iii) Give a descriptive account of the structure of secondary and tertiary structures of tRNA. Also clearly explain the positions of anticodon, variable loop, terminal base pair and CCA sequence

[B] Give details of the following steps with respect to Central Dogma of Molecular Biology - 'DNA polymerase III catalyzed DNA chain extension with high processivity' and 'Hairpin termination of prokaryotic transcription' [5] [CO4]

Q.5 [A] Attempt any TWO of the following [2½+2½] [CO5]

(i) Describe the principle and working of agarose gel electrophoresis. Also clearly discuss the roles of following in gel electrophoresis - Ethidium bromide, Bromophenol blue, Glycerol, TAE buffer

(ii) Explain the principle of differential centrifugation and how is it used for the separation of various cell organelles

(iii) Give a flowsheet representation indicating the preparation and working principle of silica-based thin layer chromatography

[B] Give a descriptive account of the principle of ion exchange chromatography. Clearly explain the stationary phase, mobile phase, matrix, washing conditions, and elution conditions. Also compare and contrast anion exchanger and cation exchanger [5] [CO5]

END

Roll no.....

Total no. of Pages: 02

B.Tech.

3rd SEMESTER

END TERM EXAMINATION *Nov-2024*

COURSE CODE: BT-201n

COURSE TITLE: APPLIED MATHEMATICS

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

Note : All questions carry equal marks. Use of calculator is allowed. Assume suitable missing data, if any.

Q.1 (a) In a bolt factory, machines there are four machines A, B, C and D manufacture bolts 20%, 15%, 25% and 40% of the total respectively. Of their outputs 5%, 4%, 3% and 2% are defective bolts. A bolt is drawn at random from the product and is found to be defective. Find the probability that it was manufactured by machine A. [5][CO-1]

(b) From the deck of 52 cards, what is the probability of drawing an ace or a king. [5][CO-1]

Q.2 (a) From a bag containing 4 white balls and 6 red balls, 3 balls are drawn at random. Find the expected number of white balls drawn. [5][CO-2]

(b) A consignment of 10 similar PCs contains 4 defective PCs. If an institution makes a random purchase of 3 PCs from this consignment, find the probability distribution for the number of defective PCs purchased. [5][CO-2]

Q.3 (a) A manufacturer produces 100 fuses that are packed in a box. If 0.5% of the fuses produced are defective. What percent of the boxes will contain 2 or more defective fuses. [5][CO-3]

(b) A telephone switch board receives 20 calls on an average duri an hour. Find the probability for a period of 5 mins such that exact 3 calls are received.

[5][CO-3]

Q.4 (a) Apply method of false position to obtain a root of the equatio $x^2 - x - 2 = 0$ in the interval (1,3) up to 2 iterations. [5][CO-4]

(b) Find using Newton's method, the root of the equation $e^x = 4x$ near to 2, up to 2 iterations. [5][CO-4]

Q.5 (a) Solve the following system of equations using Gauss-Seid iteration method up to 2 iterations.

$10x + y + z = 12,\ 2x + 10y + z = 13,\ 2x + 2y + 10z = 14.$

[5][CO-5]

(b) Solve the following system of equations using Gauss-Jacob iteration method up to 2 iterations.

$10x + y + z = 12,\ x + 10y + z = 12,\ x + y + 10z = 12.$

[5][CO-5]

Total no. of Pages: 1

Roll no..... 47

3rd SEMESTER

B.TECH

END TERM EXAMINATION ***NOVEMBER-2024***

COURSE CODE BT203n

COURSE CELL BIOLOGY

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

Note: Assume suitable missing data, if any.

Section A: Short Answer Questions (5 X 4 = 20)

1. Describe the structure and function of mitochondria, **[4] [CO1]**
2. Explain the events in progression of cancer and the role of oncogenes in its progression. **[4] [CO5]**
3. Outline the stages of mitosis. **[4] [CO2]**
4. Define apoptosis and explain its mechanism. **[4] [CO2]**
5. Explain with examples the role of cell junctions in cell signaling. **[4] [CO3]**

Section B: (8×2 = 16)

1. Why do cells require cytoskeleton? Describe various components of cytoskeleton. **[CO2]**
2. Discuss the different types of signaling pathways and provide examples. **[CO3]**

Section C: Choose one of the following questions (14)

1. Write detailed events in cell cycle, including molecular events. **[CO2]**
2. Describe the transport, working, and role of ion channels in cells, including examples. **[CO4]**

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

ODD SEMESTER

BTech. (BIOTECHNOLOGY)

END TERM EXAMINATION *Nov-2024*

BT205: GENETICS

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

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

1. Answer all of the following questions:

[a] Explain how ABO blood group inheritance represents a case of codominant alleles. [3][CO 1][BTL4]

[b] In the snapdragon plant, a cross between a homozygous parent with white flowers (ww) and a homozygous parent with red flowers (RR) was done. If the red allele shows incomplete dominance, what would be the phenotype of the offspring in the F1 generation? What would be the results of a heterozygote self-cross? Predict both the genotypic ratio and the phenotypic ratio. [3][CO 1][BTL5]

[c] Describe the events that take place in different stages of Meiosis II. [2][CO 2][BTL1]

2. Answer all of the following questions:

[a] Explain in detail the cytoplasmic inheritance of leaf colour in *Mirabilis jalapa* (4 o' clock plant). [4][CO 2][BTL4]

[b] What are multifactorial traits? Give an example. What does covariance tells us while measuring variation in such quantitative traits? [4][CO 3][BTL3]

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3. Attempt any **TWO** questions out of the following:

[a] What do you mean by broad sense and narrow sense heritability? Where can you find applications of heritability estimates?

[4][CO 3][BTL2]

[b] What causes Hemophilia A and B? How is it inherited? If a normal male mates with a carrier female, what are the chances that their sons and daughters have the disease? [4][CO 3][BTL5]

[c] What are mutations? Mention any 2 causes of mutations. What is the difference between a missense and a nonsense mutation?

[4][CO 4][BTL1]

4. Answer all of the following questions:

[a] Explain the conversion of HFr bacterium to F' (F prime) and its subsequent mating with an F^- (F negative) cell.

[4][CO 4][BTL2]

[b] Explain base excision repair mechanism of damaged DNA.

[4][CO 4][BTL2]

5. Attempt any **TWO** of the following questions:

[a] Describe the steps involved in Fluorescence in situ hybridization technique. [4][CO 5][BTL3]

[b] What are molecular markers? How is RFLP used in genetic mapping? [4][CO 5][BTL3]

[c] Explain how Comparative Genomic Hybridization (CGH) technique can be used in molecular cytogenetics.

[4][CO 5][BTL3]

Total No. of Pages 01 *Roll No.* 50

III SEMESTER

B. Tech

END TERM EXAMINATION NOV/DEC 2024

BT207 Fundamentals of Computational Biology

Time : 3:00 Hours Max Marks : 40

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

Q1. a) Discuss biological databases.
b) Mention the differences between SWISS-PROT and TREMBL
[4+4] [CO6]

Q2. a) Align the following sequences using Needleman-Wunsch algorithm
Seq GCATGCT and GATTACA
Using match score of +1, mismatch score of -1 and gap penalty of -1.
b) Write the differences between local and global alignment [4+4] [CO1]

Q3. a) Write short notes on BLAST.
b) Compare PAM and BLOSUM matrices [4+4] [CO3]

OR

Q3. a) What are the different techniques used in pairwise alignment.
b) Write short notes on FASTA [4+4] [CO4]

Q4. a) For the following two sequences, construct a simple dot blot:
GCTAGTCAGATCTGACGC and ATGGTCACATCTGCCGC
Does the plot show any region of similarity and show the alignment sequence
b) Diagrammatically depict how to interpret inverted repeated regions, palindromic regions, direct repeated regions using dot matrix algorithm. (4+4) [CO5]

Q5. a) What are gap penalty (4) [CO4]
b) Write short notes on shot gun sequencing (4) [CO2]

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

3rd SEMESTER
BTech (Biotechnology)

END TERM EXAMINATION November, 2024

BT 209 Bioprocess Technology and downstream processing

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

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

Question 1 Explain the following: [6×2]

i. How Bioprocess differ with chemical process? [CO#1][L_2]
ii. Define Baker's yeast with example. [CO#2][L_1]
iii. Describe the role of saccharification in fermentation. [CO#2][L_4]
iv. What are biofertilizers? [CO#3][L_1]
v. Differentiate flotation and flocculation. [CO#4,5][L_2]
vi. What do you mean by aqueous two phase extraction. [CO#4,5][L_2,L_4]

Que.2. Answer all the following questions
[a] Explain the importance of media design and sterilization in downstream processing. [4][CO#1][L_1,L_2]

[b] Write note on various types of cell culture techniques. [3][CO#1][L_1,L_2]

Que. 3 Explain in detail the process technology for the production of
(a) Ethanol [4][CO#2][L_2,L_3]
(b) Penicillin [3][CO#2][L_3,L_4]

Que. 4 Answer all the following questions:
[a] Explain all the steps of mushroom production from agro-residues. [3][CO#3][L_2,L_5]

[b] Describe in detail microbial production of cellulase. [4][CO#3][L_2,L_5,L_6]

S 2

Que.5 Discuss various stages of downstream processing in detail with examples. [7][CO#4,5][L_2,L_3]

Que. 6 What do you mean by chromatography? Write in detail about the principle and instrumentation of (a) Size exclusion chromatography (b) Ion exchange chromatography [7][CO#4,5][L_2,L_3,L_6]

Que. 7 Write short note on

a. Electrophoresis [2][CO#5][L_1,L_2]
b. Crystallization and drying [1][CO#5] [L_1,L_2]
c. Citric acid production [2] [CO#2][L_2,L_4]
d. Streptomycin [2][CO#2][L_2,L_4]

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5th_ SEMESTER

B.Tech. (Biotechnology]

END SEMESTER EXAMINATION Nov2024

BT 301 : Immunology and Immunotechnology

Time: 3:00 Hours Max. Marks : 40

Note : Answer any 5 questions out of 6 (5x8=40) All parts of a question are compulsory

1. a. Describe how the 12/23 spacer rule is important in VDJ recombination. How is T cell signalling regulated? What are T regulatory cells?

   b. Complement fixation cascade may be initiated without immune complex accumulation, explain in details. Explain 3 ways antibodies may play a crucial role in eliminating pathoges. (CO# 1, 2)

2. a. How is active and passive immunity different? In case a new born baby acquires protection from a bacterial infection due to the antibodies that he acquires through breast milk, will he be protected from the same infection, if challenged again 2 years later? Explain. Which is the class of antibodies most prevalent in breast milk? Which is the class of immunoglobulin most prevalent in mature naïve B cell receptor? Explain the phenomenon of class switching.

   b. Describe how adjuvants enhance the immunogenicity of vaccines. How does central and peripheral tolerance prevent autoimmunity? (CO #1, 3)

3. a. What is graft vs host rejection? How is exogenous antigen presented by MHC II? What is cross presentation of exogenous antigen on MHC class I?

   b. What are the possible reasons for development of autoimmunity? How does Type I hypersensitivity differ from type IV hypersensitivity? (CO# 2, 4)

(CO# 3, 4,

4. Write short notes on the following:
   a. Tumor immunology
   b. Autoimmune anaemia
   c. Hybridoma Technology
   d. Affinity vs avidity

(CO# 2, 4

5. Explain briefly any 2 of the following:
   a. Mechanism of killing tumor target cells by NK cells
   b. Immune response to protozoan antigen
   c. Subunit vaccines vs Live Attenuated polio vaccines
6. Elaborate the principle behind the following immunological techniques and enumerate applications of the same in diagnosis or therapy. (CO#
   a. ELISA
   b. Fluorescence Activated Cell Sorting

SJ

Total No. of Pages. 02 Roll NO. .....

V^th SEMESTER B.Tech. BIOTECHNOLOGY

END TERM EXAMINATION NOV -2024

COURSE CODE- BT303

COURSE TITLE- GENETIC ENGINEERING

Time: 3 Hours *Max.Marks:40*

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

Q.1 a. Discuss the role of restriction enzymes and double digestion in restriction mapping [4][CO 3]][Level 2]

b. Analyze the position of the following in gel- CCC, nicked and open circle plasmid. Explain with example. [4][CO 3] [Level 4]

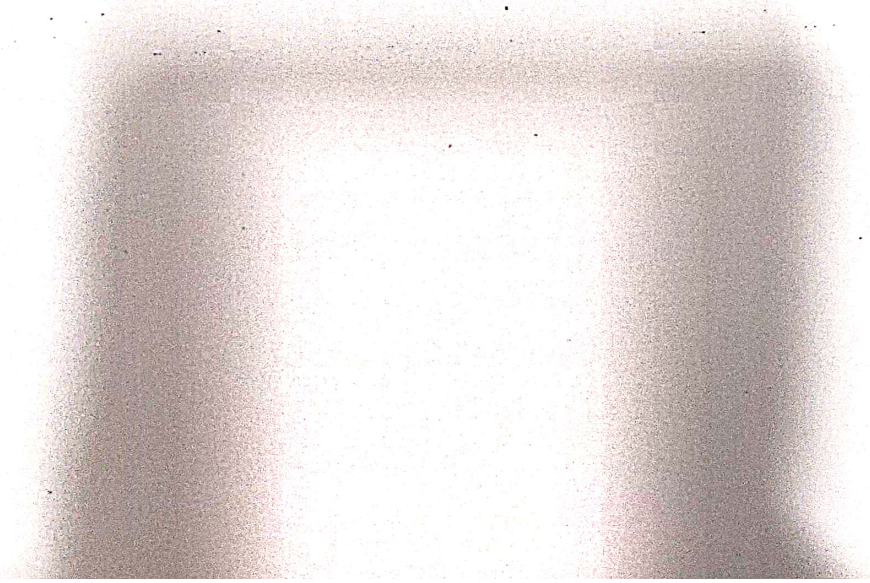
Q.2a. Draw genetic map of lambda bactriophage ? [4][CO2]][Level 3]

b. Explain the construction and uses of cloning in YAC vectors [4][CO4]][Level 6]

Q.3a. Differentiate the structure of pUC8 and pGEM3Z. Explain how can pGEM3Z used for in vitro transcription of cloned genes. [4][CO3]][Level 4]

b. Describe the process of recombinant selection by insertional inactivation of antibiotic antibiotic resistance gene and LacZ gene [4][CO2][Level 3]

Q.4a. How is Footprinting used to identify protein binding sites on DNA molecule? [4][CO5]][Level 2]



b. What are reporter genes? With example discuss the significance of these genes in cloning experiments. [4][CO4]][Level 2]

Q.5 a. What is the process of competent cell preparation? [4][CO2] [Level 1]

b. Explain the role of DNA modifying enzymes in gene cloning. [4][CO2]][Level 2]

Q.6a What are the different expression systems for expressing foreign gene in host? Explain the major problems that could be encountered when foreign genes are expressed in E.coli. [4][CO5]][Level 4]

b. What are genomic and C-DNA libraries? Explain the construction of C-DNA library [4][CO3]][Level 3]

Q.7a Discuss gene transfer methods in plants. What is the role of Agrobacterium in plant transformation? Explain the mechanism of t-DNA transfer to plants. [4][CO4]][Level 3]

b. Write a note on 'Genetic Engineering in Human welfare' [4][CO1] [Level 1]

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B.Tech (5th Semester) End Semester (Nov-2024)

Course Code: BT305 Title: Instrumentation in Biotechnology
Time: 3 Hours Max Marks : 60

Q1. Explain the principle of differential centrifugation. Describe a typical protocol for isolating organelles using this technique. (5)

OR

Describe Capillary Electrophoresis.

Q2. Multiple Choice Questions (2x5)

1. Which of the following is used in electron microscopy?
   a) electron beams b) magnetic fields
   c) light waves d) electron beams and magnetic fields

2. In a spectrophotometric cell of 2.0 cm path length, the solution of a substance shows the absorbance value of 1.0. If the molar absorptivity of the compound is 2×10^{-4} L /mol cm, calculate the concentration of the substance in solution. What is the concentration of the substance in that solution?

   a) 2.5×10^{-5} mol/L b) 4.0×10^{-4} mol/L
   c) 1.0×10^{-4} mol/L d) 5.0×10^{-4} mol/L

3. In Gel Filtration Column,
   a) Smaller analytes will elute first from the column
   b) Large analytes that completely excluded from the pores will pass through interstitial spaces between the particles and will appear first in the eluate
   c) Statement a and b are correct
   d) None of the above

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4. Which type of scattering results in a longer wavelength than the incident light?

a) Rayleigh b) Stokes c) anti stokes d) all of the above

5. The glucose level of the patient has to be checked. Which of the following methods are used to test the glucose level.

a) Sensors b) transducers c) Using spectroscopic method

d) all of the above

Q3. Explain the following with reasoning: (3x5)

1. Why did the pH of the stacking buffer keep almost 2 units lower than the separating buffer?
2. State the method used for visualization of protein localization in the cell and explain the methodology used?
3. Describe the use of nuclear magnetic resonance (NMR) spectroscopy in studying molecular structure. What information can NMR provide that UV-Vis cannot?

Q4. What is the difference between (3x5)

1. Electron microscopy and Optical microscopy
2. SDS-PAGE and agarose gel electrophoresis
3. Preparative and analytical centrifugation

Q5. Explain the working principle of UV spectrophotometer based on BeerLambert law. (5)

Q6. Describe principle of any 5: (2x5)

1. Mass spectroscopy
2. FPLC
3. 2D gel Electrophoresis
4. Transducers
5. Ion exchange chromatography
6. SEM
7. Biosensors

Total no. of pages: 2

Roll No.....59.....

END TERM EXAMINATION

November 2024

B.Tech

BT-323: Population Genetics

Time- 3 hours **Maximum marks- 50**

Note: Answer *SIX* questions. Question No. 1 and 2 are compulsory

1. What are the applications of population genetics in fields such as conservation genetics, human genetics, agriculture, and medical genetics? **[CO1,L2] [4]**

2. The frequency of two alleles in a population is A (p)=0.7, a (q)= 0.3, and the observed heterozygote frequency (H_o)= 0.32. **[CO2, L3] [2x3=6]**
   a) If this population would have been in Hardy-Weinberg (HW) equilibrium what will be the expected heterozygote frequency (H_e)?
   b) Is the observed frequency of heterozygotes (H_o) equal to expected frequency(H_e)? What does this imply about HW equilibrium in this population?
   c) Calculate the Inbreeding coefficient (F) in this population?

3. Explain the "Out of Africa" hypothesis of origin of modern human? Discuss the evidence of human origin in Africa by the concept of: **[CO3, L2][2+4+4=10]**
   a) Mitochondrial Eve
   b) Y-chromosome

4. You are given the following recombination frequencies between four genes, G and H = 20% ; G and I = 5% ; H and I = 15% ; G and J = 28% ; H and J = 8% ; I and J = 23%. Determine the: **[CO4, L3][5+5=10]**
   a) distances between all the gene pairs
   b) relative order of the genes on chromosomes

5. a) How does Sewall Wright's Shifting Balance Theory explain the process of evolution in a species, and what roles do genetic drift, natural selection, and gene flow play in the three phases of this model? **[CO5,L4][6]**
   b)Illustrate your explanation using diagram of adaptive landscape also? **[CO5,L3][4]**

6. a) How does Overdominance and negative frequency dependent selection maintain polymorphism in the population? **[CO6, L5][6]**
   b) How this balanced polymorphism is different from transient polymorphism? **[CO6, L5][4]**

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7. a) What is Polymorphism? Explain how selective sweep and Background selection reduce polymorphism? [CO3,CO1,L2][3]

b) Explain any three processes that could influence genetic differentiation between subpopulations? [CO6,CO2,L5][3]

c) Define sexual selection? [CO5,CO2,L1][1]

d) What does the formula $V_P=V_G+V_E$ represent in quantitative genetics? [CO4,CO1,L3][3]

Total Number of Pages: 2

Roll No. 61

B. Tech Biotechnology

5th & 7th Semester

END-TERM EXAMINATION

NOV-DEC 2024

COURSE CODE: [BT 325]

COURSE TITLE: Cell Biology

Time: 3 Hours

Max. Marks: 50

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

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

i. Define cell organelles and explain any five cell organelles in a eukaryotic cell and their functions.

ii. Explain how the structure of the endoplasmic reticulum (ER) is related to its function.

[b] Demonstrate how the structure of the mitochondrion supports its function as the powerhouse of the cell. [5] [CO1] [BTL 3]

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

i. Explain the differences between the G1, S, and G2 phases of the cell cycle.

ii. Explain how checkpoints during the cell cycle ensure proper division.

[b] Demonstrate your understanding by listing the phases of the cell cycle in the correct sequence. [5] [CO2] [BTL 3]

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

i. Describe the primary types of cell junctions in animal cells.

ii. Predict how a mutation in a receptor protein might affect the signal transduction pathway and the cellular response.

iii. Outline the sequence of molecular events that occur during receptor-mediated endocytosis.

iv. Outline how the cytoskeleton facilitates vesicle movement during endocytosis.

[b] Apply the concept of cell-cell signalling and compare how immune cells communicate during an inflammatory response versus normal homeostasis.

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[5] [CO3] [BTL 3]

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

i. Define cell surface receptors. What is their primary function?
ii. Describe how ligand binding activates a receptor on the cell surface.
iii. Demonstrate how calcium ions function as secondary messengers in muscle contraction by applying your knowledge to explain the signalling pathway.
iv. Outline the differences between extracellular and intracellular signalling pathways in terms of their key components and mechanisms.

[b] Demonstrate how a change in extracellular calcium ion concentration could influence intracellular signalling and apply this to explain muscle contraction. [5] [CO4] [BTL3]

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

i. Define cancer. How does it differ from normal cell growth?
ii. Describe the differences between benign and malignant tumors.

[b] Demonstrate how a mutation in an oncogene might lead to uncontrolled cell division and contribute to developing a specific type of cancer. [5] [CO5] [BTL3]

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Total No. of Pages- 02 Roll No. .....

SEVENTH SEMESTER B.Tech [BT]

END SEMESTER EXAMINATION *NOV-2024*

BT-407: Bioprocess Tech & Downstream Processing

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

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

Q.1 (a) Describe the approaches used for controlling foam formation during fermentation. [3] [CO1]

(b) Calculate the sterilization time period for the bacteria whose specific death rate at 121°C was found to be 1.62 min^{-1}, if del factor for heating, cooling and overall are respectively 10, 9, 29.2? [3] [CO1]

Q.2 (a) Discuss the strategies involved in overproduction of L-Glutamic acid. [3] [CO2]

(b) Elaborate the fermentation processes involved in Citric acid production. [3] [CO2]

Q.3 (b) What is biofertilizer. Illustrate the mechanism of Nitrogen fixation in Leguminous plants. [1+3=4] [CO3]

(b) Write the application of enzymes in detergent and leather Industry. [3] [CO3]

Q.4 (a) Discuss the factors on which the rate of filtration depends. Explain the principle and working of Continuous rotary vacuum filter press [1+3=4] [CO4]

OR

Elaborate the different methods of cell disruption involved in DSP. [4] [CO4]

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(b) In a fermentation process producing baker's yeast, the biomass is separated using a continuous centrifuge, operating at 4000 rpm, with a feed rate of 80 l/min. The solid particles may be assumed to have an average diameter of 0.05 mm. The density of the biomass is 1010 kg/m^3. The fluid may be assumed to have properties of water. Find the sigma factor for the centrifuge. [3] [CO4]

Q.5 (a) Discuss the working of centrifuge used for separation of cream from milk. [3] [CO5]

OR

Describe the different types of membrane used in the separation process. [3]

(b) Discuss the mechanism involved in counter current extraction with diagram. [4] [CO5]

Q.6 (a) Explain the working of spray dryer along with its application. [3] [CO6]

(b) How do you separate particles based on Size and Affinity Chromatography. [4] [CO6]

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Total no of pages 02 Roll No.....

VII – SEMESTER

B.Tech. (BT411:-Industrial Biotechnology)

END SEMESTER EXAMINATION *NOV2024*

Time: 3 Hours *Max. Marks: 50*

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

1 Answers all questions. [3x5] **(CO# 1,2,4)**

a) Why do industries not produce steroids in large quantities.

b) Describe all the kinds of amino acids using suitable examples. also.

c) List all of the biotechnology's branches and provide relevant examples.

d) Write down the applications of Bioremediation and Biopesticides.

e) Explain the processes used to produce Biopesticides.

2 Answers any two. [2x5] **(CO# 2,4)**

a) Explain how Citric acid is produced industrially and describe its uses.

b) Give a brief explanation of how Lactic acid is produced.

OR

a) Make a note of the difference between alcohol and beer production.

b) Distinguish between the methods used to produce organic acid and amino acid.

Q3. Answers any two [2x5] **(CO# 3,4)**

a) What are the differences between antibiotics and vitamins.

b) Explain the process of making Beer and provide examples.

OR

a) Describe the process used to produce Steroids.

b) What are the differences between Cheese and Beer.

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(CO# 1,4)

Q4. Answers any two. [2x5]

a) Describe the bioremediation process, including its challenges and the factors that influence it.

b) Write down the different types of fermentation techniques?

OR

a) How cheese is produced. Note down the fermentation techniques and application of it.

b) How Batch fermentation techniques is different form the continuous fermentation techniques?

[CO# 5]

Q5. Answers any one. [5]

a) Explain the methods used in vaccine production, and outline the different types of vaccines along with their applications.

OR

a) Explain how Recombinant Proteins are produced. Provide examples.

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

SEVENTH SEMESTER B.TECH. (BIOTECHNOLOGY)

END SEMESTER EXAMINATION NOVEMBER 2024

BT413: NANOBIOTECHNOLOGY

Time: 3.00 Hours Max. Marks: 50

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

Q.1 Answer all the following [2 x 6][CO- 1- 5]

a. Write down three anisotropic etchants and mention the reaction mechanism of anyone.
b. Describe the working principle of glucose biosensors.
c. What is Pharmacokinetics and Pharmacodynamics? describe dose response curve.
d. Give two examples of the sacrificial materials to fabricate a device or structure.
e. Name the nanomaterial for (a) Live tracking potential (b) Non-immunogenic (c) Transfection of gene (d) Amphipathic drug delivery.
f. Describe the principles behind the Czochralski method for silicon manufacturing.

Q2. Attempt any TWO questions out of following[4 x 2][CO- 3, 4]

a. Discuss the role of Etching in MEMS technology, and briefly explain different types of dry etching and their applications.
b. Define nanotoxicology. How does nonmaterial affect lungs, briefly explain the toxicological mechanism.
c. Explain the working principle behind the electrochemical etch stop method. Why it is better than "time-dependent and boron doping" etch stop methods.

Q3. Attempt any TWO question out of following [4 x 2][CO- 3, 4]

a. Describe the application of Polymers in MEMS and microsystems.
b. Schematically illustrate the steps involved in fabrication of bulk micromachined pressure sensor, what are its applications.

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c. Describe the two important techniques for nanofabrication, along with suitable figures discuss its applications.

Q 4. Attempt any TWO question out of following [5 x 2][CO- 4]

a. Describe lab-on-a-chip, discuss its fabrication process, and explain its application in medical diagnostics.
b. Fabricate a cantilever using bulk micromachining and surface micromachining techniques, how does cantilever sensing applied in medical and diagnostics?
c. Describe the principle and advantages of optical bioimaging, briefly, explain the working principle and types of fluorescence microscopy.

Q5. Attempt any TWO question out of following [6 x 2][CO- 4, 5]

a. Discuss the application of nanomaterial in targeted drug delivery systems, what are the modification techniques used to enhance the acceptability of nano-drugs. Briefly discuss the role of nanomaterials in clinical diagnostics and disease treatment.
b. What is a biosensor, briefly describe the different components and types of biosensors and explain their applications with suitable examples of target analytes.
c. Briefly describe the crystal structure of silicon and discuss the physical and chemical properties of silicon and its compounds, In comparison with other compounds why Silicon is an ideal candidate material for microfabrication processes in MEMS, explain.

---END---

Total no of pages 02 Roll No.....

VII – SEMESTER

B.Tech. (BT421:-Pharmacogenomics & Personalized Medicine)

END SEMESTER EXAMINATION NOV2024

Time: 3 Hours *Max. Marks: 50*

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

1 Answers all questions. [3x5] **(CO# 1,2,3,4, 5)**

a) How does pharmacogenomic screening for HLA-B1502 and HLA-A-3101 help reduce the risk of severe adverse drug reactions (ADRs) to carbamazepine?.

b) Define alignment and briefly outline the importance/goal of alignment in genome sequencing.

c) What is genotyping, and what are its main purposes? Briefly describe the common methods used for genotyping?

d) What is a peptide bond, and what are its key characteristics?

e) How do the *CYP2C9*1, CYP2C9*2* and *CYP2C9*3* variants affect warfarin metabolism.

Q2. Answers all questions [2x4] **(CO# 2,4)**

a) There are 3 amino acids in the active site of a protein: 2 Arginines (pKa 12.5) and 1 Glutamic Acid (pKa 4.3). Calculate the charge of active site at pH 7.4.

b) Explain how mutations in the ligand binding pocket of a drug target can impact drug binding.

c) Describe the process of variant calling and its importance in genome analysis.

d) What are some common filters used during variant calling to ensure reliability?.

3 Answers any three. [3x3] **(CO# 1,3)**

a) Identify the two primary pathways that influence an individual's response to a drug.

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b) Briefly discuss the types of genetic variations based on their structural and functional classifications.

c) What are the key types of NGS-based sequencing approaches, and how do targeted sequencing and whole-exome sequencing (WES) differ in their application and focus?

d) Provide a detailed explanation of the pharmacokinetics pathway, including its key processes and factors influencing each step. [CO# 5]

Q4. Answers all questions. [2x4]

a) Explain the mechanism of action of Imatinib in treating Chronic Myelogenous Leukemia (CML) and discuss how mutations in the BCR-ABL kinase domain contribute to secondary resistance to Imatinib.

b) Describe the T315I mutation in the BCR-ABL protein and its impact on the treatment of CML. What strategies have been developed to overcome this mutation, and what are the limitations of these approaches? (CO# 2,4)

Q5. Answers any two. [2x5]

a) Explain different levels of protein structure.

b) Discuss the significance of genome annotation and its types. How do structural and functional annotations differ in their approach and objectives? Name any tool that are used for annotation.

OR

a) Explain the drug design process. Also differentiate between structure based and ligand based drug designing.

b) Briefly outline the main steps involved in computational genome analysis, including the role of each step.?

Total no. of Pages: 02 Roll no. 71

3rd SEMESTER B.Tech.[CSE]

END TERM EXAMINATION *Nov-2024*

COURSE CODE- CS201n COURSE TITLE-Digital Logic Design

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

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

Q.1 A) A corporate having 100 shares entitles the owner of each share to cast one vote at the share holder's meeting. Assume that A has 40 shares, B has 30 shares, C has 20 shares and D has 10 shares. A two third majority is required to pass a resolution in a share holder's meeting. Each of these four men has a switch which he closes to vote YES and opens to vote NO for his percentage of shares. When a resolution is passed, the output LED must be ON. Derive a truth table for the output function and give the SOP equation for it. [4][CO1][BTL4]

B) Design a code converter logic circuit which can convert a two digit BCD number to Binary number. [4][CO3][BTL6]

Q.2 A) Draw the logic circuit of a level triggered JK FF. Explain the ways to overcome this limitation. [4][CO4][BTL2]

B) Design a mod 64 up counter by using cascade configuration of three synchronous counters. Draw the complete circuit of the counter and explain its operation. [4][CO4][BTL2]

Q.3 A) What is Logic family? State their types and explain different characteristics of digital ICs. [4][CO2][BTL1]

B) With neat circuit diagram and timing diagram explain the operation of monostable multivibrator. State its use. [4][CO4][BTL2]

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Q.4 A) What is the idea behind a successive approximation type A to D converter? Draw its block diagram circuit and evaluate its performance. [4][[CO3][BTL5]

B) With neat circuit diagram, explain the conversion technique implemented in a weighted resister type D to A converter of 4 bits input. If reference voltage is 20 volts, than calculate the analog voltage output for input binary 1001. [4][[CO3][BTL5]

Q.5 A) What are the characteristics of ROM type memory? How it can be used to design a 3 bit gray to binary code conversion logic. [4][CO4][BTL3]

B) Design a 3 bit synchronous counter using D-FF, which can count up or down depending on a mode control signal M. Explain the operation in up and in down mode. [4][[CO5][BTL6]

Q.6 Write notes on the followings:

(i) Tristate buffer and Tristate invertor.

(ii) Static and Dynamic RAM.

(iii) ASM chart and its use.

(iv) Moore circuit and mealy circuit with example.

[2x4=8][CO2,4,5][BTL5]

Total No. of Page – 2

Roll No. 13

Third Semester

B.Tech.[CSE]

End Term Examination November-2024

CS203n: OBJECT ORIENTED PROGRAMMING CONCEPTS

Time: 3:00 Hours Max. Marks: 40

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

Q. No. 1 [1x8]

(a) Define the term "object" in Object-Oriented Programming. [1][L2][CO1]

(b) What is the purpose of a constructor in C++? [1][L2][CO2]

(c) State one difference between structured programming and object-oriented programming. [1][L2][CO1]

(d) What is the significance of the this pointer in C++? [1][L2][CO2]

(e) What is bytecode in Java? [1][L2][CO5]

(f) Name two access specifiers in Java. [1][L2][CO5]

(g) Mention one benefit of using Java packages. [1][L2][CO5]

(h) What is the difference between checked and unchecked exceptions in Java? [1][L2][CO5]

Q. No. 2 [2x4]

(a) Illustrate the use of static data members in a C++ class with an example. [2][L3][C02]

(b) Write a Java program to demonstrate function overriding. [2][L3][CO5]

(c) Explain how a pure virtual function is used to create an abstract class in C++. [2][L3][CO3]

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(d) Describe the role of throw and throws in Java exception handling with examples. [2][L3][CO203.5]

Q. No. 3 [4x2]

(a) Analyze the use of operator overloading in C++ with an example program. [4][L4][CO3]

(b) Write a Java program that demonstrates multithreading with thread synchronization. [4][L4][CO5]

Q. No. 4 [4x2]

(a) **Evaluate the advantages and disadvantages of templates in** C++ by designing a function template to swap variables. [4][L5][CO4/6]

OR

Write a program in Java that demonstrates **serialization to save and retrieve an object's state.**

(b) Explain with a program how the **client-server model** is implemented in Java using **socket programming.** [4][L5][CO5]

Q. No. 5 [3+5]

(a) **Investigate how abstract classes are implemented in Java** and their role in polymorphism with a program example. [3][L4][CO5]

(b) **Write a Java program** to design a **GUI-based calculator using Swing,** including basic event handling. [5][L5][CO6/3]

OR

Create a program in C++ to demonstrate the use of **friend functions and their applications.**

Total no. of Pages: 4

Roll no.....

3rd SEMESTER

B.Tech. (CSE)

END TERM EXAMINATION

Nov-2024

CS205: Design and Analysis of Algorithms

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) For each of the following recurrence solve them with the help of master theorem?

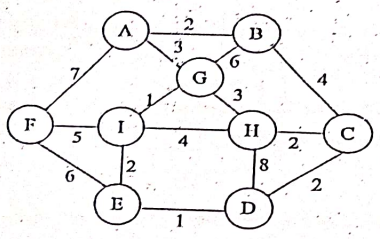
(i) $T(n) = T\left(\frac{3n}{4}\right) + n^2$

(ii) $T(n) = 4T\left(\frac{n}{2}\right) + nlogn$

(b) Solve T (n) $=2T\left(\frac{n}{2}\right) + n^2$ with the help of recursion tree method. Show each and every step involved.

[3+3+4][CO1][L3,L4,L5]

Q.2 Write down Dijkstra algorithm. Show step by step implementation of the same algorithm on the given graph with node A as the source node.



[2+8][CO2][L2,L4]

Q.3 Bob loves foreign languages and wants to plan his course schedule to take the following nine language courses: LA15, LA16, LA22, LA31, LA32, LA126, LA127, LA141 and LA169.

The course prerequisites (course X is prerequisite for course Y if student need to study X before taking the course Y) are as follows:

Course	Prerequisite(s)
LA15	None
LA16	LA15
LA22	None
LA31	LA15
LA32	LA16 & LA31
LA126	LA22 & LA32
LA127	LA16
LA141	LA22 & LA16
LA169	LA32

Using Graphs, suggest a sequence of courses that allows Bob to satisfy all the prerequisites. Use proper algorithm to solve this problem and show all the steps to find the desired sequence. Also write the algorithm used.

[10][CO3][L2, L4, L5, L6]

Q.4 Solve the following 0/1 Knapsack problem using branch and bound algorithm.

Knapsack Capacity W=10

Item	Value	Weight
1	40	4
2	42	7
3	25	5
4	9	3

[10][CO6][L2,L3,L4,L5]

Q.5 (a) Following diagram shows representation of disjoint sets S_1={c, h, e, b} and S_2={f, g, d} using linked lists. Foe every set S, we have head[S], and tail[S].

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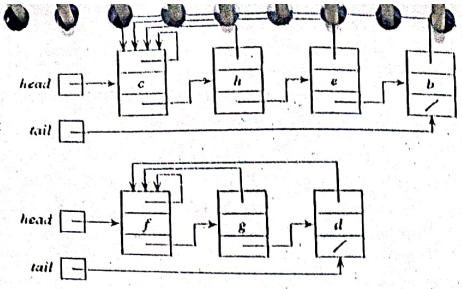

Design best possible algorithms for following operations:
Make-set(), Find-Set(), Union() [6][CO3][L4,L6]

(b) Write algorithm for Huffman coding and apply it on following data:

Char	a	b	c	d	e	f	g	h	i
Frequency	5	1	3	21	5	9	3	6	8

Also compute average code size. [4][CO2][L3,L5]

Q 6. Let $X = x_1x_2 \ldots x_n$ and $Y = y_1y_2 \ldots y_m$ and $Z = z_1z_2 \ldots z_{n+m}$ be three strings of length n, m, and n + m, respectively. We say that Z is a merge of X and Y if x and y can be found as two disjoint subsequences in z. Example: "algodatastrucrituthresms" is a merge of "algorithms" and "datastructures". For $0 \le i \le n$ and $0 \le j \le m$, Merge(i, j) is true if $Z = z_1z_2 \ldots z_{i+j}$ is a merge of $X = x_1x_2 \ldots x_i$ and $Y = y_1y_2 \ldots y_j$. ($X = x_1x_2 \ldots x_i$ is the empty string if i = 0. Similarly for Y and Z.). Define function Merge(i, j) recursively and write code for this.

[10][CO5][L2,L3,L4,L6]

Q.7 (a) Define P, NP, NP-Complete and NP Hard problems and their characteristics. [4][CO7][L1]

(b) Give a divide and conquer pseudocode to find the minimum and maximum element in an array. Also form the recurrence relation and solve the recurrence relation to obtain the complexity of the pseudo code. Also apply the pseudo code to the given below array to find the minimum and maximum of the elements?

28	60	72	56	18	69	21	95	31	17	23	90	70	44	52	24

[6][CO2][L2,L4,L6]

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Total no. of Pages: 3

B.Tech.(CO) Roll no.....

End-Term Examination **Third Semester**

Nov/Dec-2024

CS-207n Operating Systems Design

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

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

Q.1 a) Identify key components of an operating system and their roles in system management. [2] [CO1] [BTL-1]

b) List and describe various inter-process communication methods. [2] [CO2] [BTL-1,2]

c) Evaluate the pros and cons of deadlock detection versus avoidance strategies. [2] [CO3] [BTL-5]

d) Compare paging and segmentation in terms of memory management efficiency. [2] [CO4] [BTL-4]

e) Explain the organization and role of I/O buffering in the operating system. [2] [CO5] [BTL-2]

Q.2 a) Explain why certain system structures, like layered and microkernel architectures, are more suitable for specific applications and environments. [4] [CO1] [BTL-5]

OR

b) Compare the role of an operating system in a distributed system vs. a centralized system by focusing on the unique challenges each scenario presents. [4] [CO1] [BTL-4]

c) Illustrate the Producer-Consumer problem and explain how semaphores solve it. Compare pre-emptive and non-pre-emptive scheduling methods in terms of fairness, responsiveness, and complexity. Which method would you recommend for a high-performance computing environment? [6] [CO2] [BTL-3]

Q.3 a) Explain the trade-offs between deadlock avoidance algorithms, such as Banker's algorithm, and deadlock detection techniques in high-resource systems. [4] [CO3] [BTL-5]

OR

b) Explain the implications of deadlock recovery strategies on system performance and justify the selection of the most efficient strategy for a critical system. [4] [CO3] [BTL-4,5]

c) Evaluate the strengths and weaknesses of different file access methods (sequential, indexed, direct) in cloud storage systems. [4] [CO4] [BTL-5]

Q.4 a) A paging scheme uses a Translation Look-aside Buffer (TLB). A TLB-access takes 10 ns and the main memory access takes 50 ns. What is the effective access time (in ns) if the TLB hit ratio is 90% and there is no page fault? [4] [CO4] [BTL-5]

OR

b) In a virtual memory system, the size of the virtual address is 32-bit, the size of the physical address is 30-bit, the page size is 4 Kbyte and the size of each page table entry is 32-bit. The main memory is byte addressable. Which one of the following is the maximum number of bits that can be used for storing protection and other information in each page table entry? [4] [CO4] [BTL-5]

Q.5 a) Consider a disk with 100 tracks numbered from 0 to 99 rotating at 3000 rpm. The number of sectors per track is 100, and the time to move the head between two successive tracks is 0.2 milliseconds. [4] [CO5] [BTL-5]

A. Consider a set of disk requests to read data from tracks 32, 7, 45, 5 and 10. Assuming that the elevator algorithm is used to schedule disk requests, and the head is initially at track 25 moving up

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(towards larger track numbers), what is the total seek time for servicing the requests?

B. Consider an initial set of 100 arbitrary disk requests and assume that no new disk requests arrive while servicing these requests. If the head is initially at track 0 and the elevator algorithm is used to schedule disk requests, what is the worst-case time to complete all the requests?

b) Consider a disk system with 100 cylinders. The requests to access the cylinders occur in the following sequence:

4, 34, 10, 7, 19, 73, 2, 15, 6, 20

Assuming that the head is currently at cylinder 50, what is the time taken to satisfy all requests if it takes 1 ms to move from one cylinder to the adjacent one and the shortest seek time first policy is used?

[4] [CO5] [BTL-5]

OR

c) Compare process management in Windows, Linux, and Unix. Which operating system would be more efficient for real-time applications? Justify your answer. [4] [CO5] [BTL-5]

Total no. of Pages: 03

Roll no.....

B.Tech. 3rd SEMESTER

END TERM EXAMINATION *Nov/Dec-2024*

CS 209 : SOFTWARE ENGINEERING

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

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

Q.1 (a) Consider the program given below. List out the operators and operands along with their count as per token counting rules. Also, calculate the Halstead software science metrics such as program length, program volume, program level, difficulty, effort, and time. Consider the value of *stroud number* as 18. [5][CO4]

```
int. sort (int x[ ], int n)
{
int i, j, save, im1;
/*This function sorts array
 x in ascending order */
if (n<2) return 1;
for (i=2; i<=n; i++)
{
im1=i-1;
for (j=1; j<=im; j++)
if (x[i] < x[j])
{
Save = x[i];
x[i] = x[j];

x[j] = save;
}
}
return 0;
}
```

(b) You have been assigned as the project manager for a new Customer Relationship Management (CRM) software that a company wants to develop. The software will be used by the sales, marketing, and customer service teams to manage customer interactions, track sales leads, and analyze customer data. Before starting the development process, you need to gather and document the requirements.

On the basis of the above scenario answer the following questions.

i. Which requirement elicitation techniques would you use to gather the requirements for the CRM software from the stakeholders? Discuss it.

ii. What challenges might you face during requirement elicitation, and how can you overcome them? [5][CO4]

Q. 2 Imagine you are developing an Online Food Delivery System (like Zomato or Swiggy) where users can order food from restaurants, pay for their orders, track delivery status, and receive notifications. The system also allows restaurants to manage menus, track orders, and update order status. Below are the main components involved in the system:

Key System Entities are as follows:

i. Customers – Users who browse menus, place orders, and track deliveries.

ii. Restaurants – Businesses that manage their menus, accept orders, and prepare deliveries.

iii. Delivery Drivers – Drivers who pick up and deliver food orders.

iv. Admin – Admin manages restaurants, drivers, and overall system operations.

v. Payment Gateway – Handles payments for customer orders.

vi. Notification Service – Sends updates and notifications to customers, restaurants, and drivers.

Draw the Activity, Sequence, Collaboration, Class, and State Chart Diagrams for the above software system. [10][CO3]

Q.3 Attempt any two:

(a) Explain how the CMM encourages continuous improvement of the software process. [5][CO4]

(b) Construct a table that correlates key process areas (KPAs) in the CMM with ISO-9000. [5][CO4]

(c) Discuss the relationship between quality factors and quality criteria in McCall's software quality model. [5][CO4]

Q.4 Attempt any two:

(a) Admission to a professional course is subject to the following conditions:

Marks in Mathematics	>=	60
Marks in Physics	>=	50
Marks in Chemistry	>=	40
Total in all 3 Subjects	>=	200
or		or
Total in Physics and Mathematics	>=	150

If aggregate marks of an eligible candidate are more than 225, he/she will be eligible for honours course, otherwise he/she will be eligible for pass course. The program reads the marks in the three subjects and generates the following outputs:

- Not Eligible
- Eligible to Pass Course
- Eligible to Honors Course

Design test cases using decision table testing technique. [5][CO5]

(b) Consider a program for the determination of the nature of roots of a quadratic equation. Its input is a triple of positive integers (say a,b,c) and values may be from interval [0,100]. The program output may have one of the following words.

[Not a quadratic equation; Real roots; Imaginary roots; Equal roots]

Design the robustness and worst test cases for this problem. [5][CO5]

(c) Explain Data Flow Testing technique. [5][CO5]

Q.5 Attempt any two:

(a) The development effort for a project is 800 PM. The empirically determined constant (K) of Belady and Lehman model is 0.4. The complexity of code is quite high and is equal to 8. Calculate the total effort expended (M) if maintenance team has reasonable level of understanding of the project (d=0.75). [5][CO6]

(b) What is re-engineering? Differentiate between re-engineering and new development? [5][CO6]

(c) Explain the Boehm's maintenance model with the help of a diagram. [5][CO6]

Total no. of Pages:03 Roll no.....

III SEMESTER

B.Tech. [Chemical Engineering]

END TERM EXAMINATION *Nov/Dec-2024*

CH201n : Engineering Materials & Metallurgy

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

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

Q.1 Find the linear density in the direction [101] of BCC crystal and draw a plane (101). Show that the atomic packing factor of BCC crystal structure is 0.68.

[Marks 4][CO1][BTL3]

Q.2 Define metallic corrosion and classify the different types of metallic corrosion. Describe anodic protection, providing a suitable example to illustrate its application.

[Marks 4][CO2][BTL2]

Q.3 Define ferrite, cementite, and pearlite, and determine the relative amounts of ferrite, cementite, and pearlite microconstituents for a 99.45 wt% Fe–0.55 wt% C alloy at a temperature just below the eutectoid. Determine the following:

(a) The fractions of total ferrite and cementite phases
(b) The fractions of the proeutectoid ferrite and pearlite
(c) The fraction of eutectoid ferrite

[Marks 4][CO3] [BTL5]

Q.4 Describe the construction and interpretation of TTT diagram for Eutectoid carbon steel. Explain microstructures from the austenite to martensite and bainite transformation on the curve, and its practical implications. 08

[Marks 4][CO3][BTL3]

Q.5 How does an increase in carbon content impact the required annealing temperature, time, and resulting microstructure? Differentiate between spheroidizing and stress relief annealing of carbon steel? How does surface thermochemical hardening done and explain with an example?

[Marks 4][CO4][BTL2]

Q.6 Define brittle fracture in metals and alloys, and explain the mechanisms of brittle fracture, including factors that increase a metal's susceptibility to brittle failure. A large glass plate is subjected to a tensile stress of 50 MPa. Given the specific surface energy of the glass as 0.3 J/m² and its modulus of elasticity as 70 GPa, calculate the maximum allowable length of a surface flaw that will not lead to fracture.

[Marks 4][CO4][BTL5]

Q.7 Describe the steps of fatigue failure when the applied stress is below the yield stress. Differentiate between fatigue limit and fatigue strength, providing material examples for each. Discuss the factors that influence the fatigue life of carbon steels, and provide a practical example of how fatigue resistance can be improved in a real-world application.

[Marks 4][CO5][BTL6]

Q.8 Describe the mechanisms of creep failure and identify common features observed in materials that lead to fail due to creep, such as intergranular cracking and void formation. What are some strategies used in material design and processing to improve creep resistance, especially in components used in turbine engines or nuclear reactors?

[Marks 4][CO5] [BTL6]

OR

Q.8 Compare the properties of polymer, metal, and ceramic matrix composites, specifically regarding stress and strain, and temperature resistance. Explain why carbon–carbon composites are ideal for high-temperature applications, such as in aerospace engineering.

[Marks 4][CO5]][BTL4]

Q.9 Differentiate between particle-reinforced and fiber-reinforced composites and providing examples for each. Explain the main differences between large-particle composites and dispersion-strengthened composites in terms of structure and strength mechanisms. Identify and analyze two specific applications for large-particle and dispersion-strengthened composites, focusing on their use in modern industries.

[Marks 4][CO6][BTL3]

Q.10 Explain the process of powder metallurgy in the manufacture of self-lubricating bearings. Discuss the key steps involved, including powder selection, compaction, and sintering, and explain how these steps contribute to the formation of porosity necessary for lubrication retention.

[Marks 4][CO6][BTL2]

OR

Q.10 Define the atomization methods used to produce powders for powder metallurgy. What are the important characteristics of metal powders? Explain how the compressibility of powder is calculated.

[Marks 4][CO6][BTL1]

Total no. of Pages: 02 Roll no..... 87

3rd/5th/7th SEMESTER **B.Tech. Chemical Engineering**

END TERM EXAMINATION *Nov-2024*

CH203n : Transport Phenomena

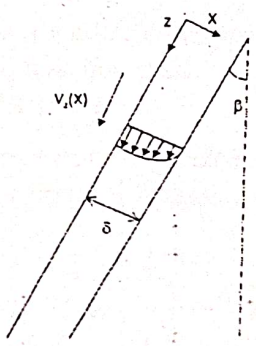
Time: 03:00 Hours *Max. Marks: 50*

Note : Assume suitable missing data, if any.

Q.1 (a) Classify the following physical properties into zero-order, first-order order and second-order tensor quantities
(i) Temperature; (ii) Velocity; (iii) Heat Flux; (iv) Shear Stress; (v) Diffusivity [5][CO1][BTL4]

(b) Select the appropriate coordinate system (Cartesian, Cylindrical, or Spherical) for the following problems
(i) Fluid flowing between two parallel plates
(ii) Shear stress in the lubricant wax surrounded by a bearing ball.
(iii) Oxygen diffusion through the river surface.
(iv) Heat dispersion from a metal rod due to electricity.
(v) Coating of a wire [5][CO1][BTL5]

Q.2 An inclined surface of length L and width W is situated at an angle B to the vertical direction, as shown below. A Newtonian fluid is freely falling on the surface as a film of thickness δ. Assuming the flow is laminar, determine the velocity profile, flow rate, and shear force on the surface by the fluid.



[10][CO2, CO3][BTL3]

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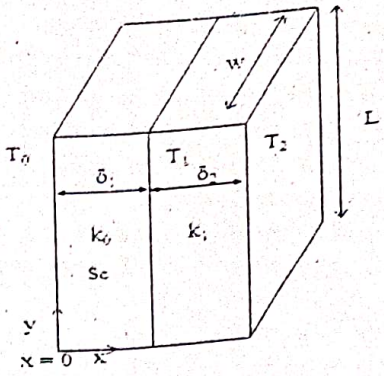
Q.3 Consider a composite wall of height L, width W and thickness δ δ_2. The wall contains two layers of different materials with therm conductivity K_0 and K_1, and different thickness δ_1 δ_2 respectively. At $x=0$, the composite wall is maintained a constant temperature T_0. At the same time, at $= \delta_1 + \delta_2$, it ha constant temperature of T_2, as shown below. The first layer ($x=0$ $\delta 1$) is also producing heat, which is equal to Sc per unit time per volume. Determine the heat flux across the composite wall i steady state condition.



[15][CO4][BT

Q.4 (a) Write down the limitations of Fick's Law. [5][CO5][BT

(b) In a ternary mixture of water, ethanol and NaCl are prese mass concentrations of 0.7, 0.25, and 0.05, respectively. Molec of these compounds move with a velocity of 0.1 m/s, 0.2 m/s, 0.05 m/s, respectively. Values of absolute fluxes of these compo are 0.1 kg/m^{2}s, 0.3 kg/m^{2}s, and 0.2 kg/m^{2}s, respectively. Calc the values of diffusive fluxes for all compounds. [10][CO5][BT

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

3rd Semester **B. Tech**

End Semester Examination **Nov-Dec 2024**

CH205n: Chemical Eng. Thermodynamics

Time: 3 hrs **Max Marks: 40**

Note: **Attempt any four questions**
All questions carry equal marks
Assume suitable data if any

Q1. a) Establish the cyclic relation. (5) [CO3]

b) Show that for 1 g mole of an ideal gas, the equation of state PV=RT is well supported by cyclic relation $(\partial P/\partial V)_T(\partial V/\partial T)_P(\partial T/\partial P)_V = -1$, assuming that one variable is dependent on other two. (5) [CO3]

Q2. a) What is the standard Gibbs free energy change and how it is related to equilibrium constant. Discuss the condition of feasibility of a chemical relation in terms of standard Gibbs free energy change. (6) [CO5]

b) At 1 atm and 27^0C will the vaporization of liquid water be spontaneous? Given that ΔH=971 Cal and ΔS=26 e.u. (4) [CO5]

Q3. a) What do you mean by criteria for phase equilibrium. Explain the phase rule for non-reacting system. State Duhem's theorem in sustaintiating the phase rule. (5) [CO4]

b) What is an Azeotrope and categorize it. Discuss minimum boiling Azeotrope with the help of a phase diagram for a particular system. (5) [CO4]

Q4. a) State the principal of working of a thermocouple for the measurement of temperature. A platinum resistant thermometer has a resistance of 150 Ω at 100 °C. The resistance changes to 300 Ω when it is exposed to hot gas. Find the temperature of the hot gas assuming ά=0.0039 at O°C. (4) [CO1]

b) Differentiate between heat pump and heat refrigerator. Show that COP of the heat pump is greater than that COP of refrigerator by unity. (6) [CO2]

5. a) Derive the following relation:

$$\ln P_2/P_1 = \Delta H/R\,[1/T_1 - 1/T_2]$$

What assumptions are involved in Clausius – Clapeyron equation? (6) [CO3]

b) With the help of neat schematic representation explain the importance of vapour- liquid equilibrium of a binary system. (4) [CO4]

6. Write short notes on any three:

a) Joule – Thomson effect and Joule – Thomson coefficient

b) Fugacity and Fugacity coefficient

c) Reaction coordinate

d) Pressure composition (P-x-y) diagram

e) Carnot cycle and Carnot engine

(10) [CO3, CO4, CO5, CO2]

Total no. of Pages:03 *Roll no.....*

THIRD SEMESTER

B.Tech.

END TERM EXAMINATION **NOV/DEC-2024**

CH207 **ENGINEERING ANALYSIS AND DESIGN**

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

Note: IS 2825-1969 Indian Standard code for Unfired Pressure vessel of 14 pages from page no. 43-56 are allowed in the examination hall.
Assume suitable missing data, if any.

Q.1 (a) A vessel is to be designed to withstand an internal pressure of 240 MN/m^2. An internal diameter of 18 cm is specified, and steel (μ=0.3) has a yield point of 450 MN/m^2 has been selected. The factor of safety is 1.5. Calculate the wall thickness (in mm) required by the [6+4][CO2]

(i) Maximum principal stress theory
(ii) Maximum strain theory
(iii) Maximum strain energy theory

(b) What do you mean by the term Standards? Write down any two standard numbers along with their title.

Q.2 (a) A process vessel is to be designed for the maximum operating pressure of 600 kN/m^2. The vessel has a nominal diameter of 180 cm and tangent to tangent length of 2.4 m. The vessel is made of IS: 2002-1962 Grade 2B quality steel having an allowable design stress value of 118 MN/m^2 at working temperature. The corrosion allowance is suggested to be 2 mm for the life span expected for the vessel. The vessel is to be fabricated according to class 2 of Indian standards specifications, which stipulate the weld joint efficiency factor of 0.85. The vessel is to be provided [3+2+5][CO4, CO1]

with a conical head having the half-apex angle 30°. Calculate the thickness of the head at the junction of the head and shell. Take Z = 1.35

(b) Explain the Flued-in and Flared-out type compensation with a neat diagram.

(c) Write down the expression used to determine axial stress (tensile and compressive) due to pressure and dead loads in tall vessels.

Q.3 (a) Write down the final expression used to calculate thickness and pressure for the cylindrical pressure vessels. [2+4+4][CO4]

(b) What do you mean by the term support for process vessels? Write down the various types of supports. List the parameters that need to be followed while selecting support.

(c) Differentiate between Open and Closed Vessel.

Q.4 A ring-type flange with a plain face for a heat exchanger shell is required to be designed to the following specifications: [10] [CO2, CO3]

Design pressure = 10 bars
Design temperature = 423.15 K
Flange material = IS: 2004-1962 Class 2
Bolting steel = 5% Cr Mo steel
Gasket material = asbestos composition
Shell outside diameter = 100 cm
Shell thickness = 1 cm
Shell inside diameter = 98 cm
Ratio of outer diameter to inner diameter = 102.1 cm
Gasket thickness = 0.16 cm
Outer diameter = 103.2 cm
Diameter at location of gasket load reaction = 102.2 cm
Allowable stress of flange material = 100 MN/m^2
Allowable stress of bolting material = 138 MN/m^2
Minimum design seating stress = 25.5 MN/m^2
Gasket factor = 2.75

Flange type = optional
a_1 or h_D = 3.5 cm;
a_2 or h_T = 3.0 cm;
a_3 or h_G = 2.4 cm
(i) Check the gasket width condition and
(ii) Calculate the flange moment computations and comment on the controlling moment.

Bolt size	Root area (m^2)	Actual no. of bolts (n)	R (m)	B_S (m)	C = nBs/π (m)	C = ID+2*(1.415 g_o+R) (m)
M 16*1.5	1.33*10^{-4}	52	0.025	0.075	1.24	1.0583
M 18*2	1.54*10^{-4}	44	0.027	0.075	1.05	1.0623
M 20*2	2.00*10^{-4}	36	0.030	0.075	0.86	1.0683

Total no. of Pages: 03 *Roll no.....*

THIRD SEMESTER

B.Tech.

END TERM EXAMINATION NOV/DEC-2024

CH209/CH209n CHEMICAL ENGINEERING PROCESS CALCULATIONS

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

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

Q.1 Combustion of solid wastes produces a flue gas of the following analysis: $CO_2 = 9.00\%$, $CO = 2.00\%$, $O_2 = 7.00\%$ and $N_2 = 82.0\%$. Find the difference in enthalpies for this gas between the bottom and top of the stack if the temperature of the gas at the bottom is 600 K and that at the top is 375 K. The heat capacities of the gas are: [10][CO4]

CO = a; CO_2 = b; O_2 = c; N_2=d;

$Cp_a = 26.586 + 7.582 \times 10^{-3}\, T - 1.12 \times 10^{-6}\, T^2$
$C_{pb} = 26.540 + 42.454 \times 10^{-3}\, T - 14.298 \times 10^{-6}\, T^2$
$C_{pc} = 25.74 + 12.987 \times 10^{-3}\, T - 3.864 \times 10^{-6}\, T^2$
$C_{pd} = 27.03 + 5.815 \times 10^{-3}\, T - 0.289 \times 10^{-6}\, T^2$

C, is in kJ/kmol K and T is in K.

Q.2 Check the dimensional consistency of the following empirical equation for a heat-transfer coefficient [10][CO1]

$$h_t = 0.023\, G^{0.8} k^{0.67} Cp^{0.33} D^{-0.2} \mu^{-0.47}$$

where, h_t = Heat transfer coefficient
G = Mass velocity
k = Thermal conductivity
Cp = Specific heat
D = Diameter
μ = Absolute viscosity

Q.3 Carbon monoxide and hydrogen react to give methanol [10][CO2]

$$CO + 2H_2 \rightarrow CH_3OH$$

The conversion of CO entering the reactor is only 20%. A feed stream consisting of 33% CO, 66.5% H_2, and 0.5% CH_4, is mixed with a recycling stream and fed to a reactor. Methanol leaving the reactor is separated and the unconverted gases are recycled. To prevent the accumulation of CH_4 and keep its concentration in the recycle stream at 3%, a portion of the recycled stream is blown off. For 100 moles of fresh feed, determine:

a) The moles of recycle stream
b) The moles of purge stream
c) The composition of the purge stream
d) The moles of methanol produced.

OR

An air (B) and water (A) sample has a dry bulb temperature 55°C and an absolute humidity 0.0030 kg water /kg dry air at 1 std. atm pressure.

Calculate:

a) The percentage humidity
b) The molal absolute humidity
c) The partial pressure of water vapour in the sample
d) The relative humidity

Given: Saturated humidity = 0.115; Partial pressure of water at saturation (P_s) = 15730 N/m²

Q.4 Nitrogen and hydrogen react under certain conditions to form ammonia, according to the following equation: [10][CO3]

$$N_2 + 3H_2 \Leftrightarrow 2NH_3$$

If 280 kg of nitrogen and 64.5 kg of hydrogen are brought together and allowed to react at 515°C and 300 atm. pressure and it is found that there are 38 kg mole of gases present at equilibrium.:

a) How many kgmoles of nitrogen, hydrogen and ammonia are present at equilibrium?
b) Which is the limiting reactant and which is the excess reactant?
c) What is the amount of theoretically required hydrogen and what is the percent excess hydrogen?
d) What is the degree of the completion of the reaction?
e) What is the percentage conversion of hydrogen to ammonia.

Q.5 a) One half of the high-pressure steam after being utilized for power generation is sent to the plant as process steam. The other half is returned to the boiler as condensate carrying 50 ppm solids. [5+5][CO5]

To keep the solid level in the boiler below 1600 ppm solids, a part of the boiler water is blown down continuously. The fresh boiler feed water is found to contain 500 ppm solids. If steam produced is free of solids, calculate the weight ratio of feed water to the blowdown water.

or

a) An evaporator is fed continuously with 50000 kg/hr of a solution containing 10% NaOH, 10% NaCl and 80% water by weight. During the evaporation, water is boiled off and NaCl precipitates as catalysts and removed from the remaining liquor. The concentrated liquor leaving the evaporator contains 50% NaOH, 2%NaCl and 48% water. Calculate: (a) kg of water evaporated per hour,
(b) kg of salt precipitated per hour,
(c) kg of concentrated liquor produced per hour.

b) Methyl alcohol and Ethyl alcohol at 100°C have vapour pressure 2710 mm Hg and 1635 mm Hg respectively. Calculate the total pressure and composition of the vapour in contact with a liquid containing 30% by weight methyl alcohol and 70% by weight ethyl alcohol at 100°C.

8. [a] What are the factors which affect the mechanical properties of the Polymer? 3 CO-4

[b] Define the terms Stiffness and Toughness. How do these calculate from stress and strain diagram? 2 CO-5

Total no. of pages -04

Roll no.....

V SEMESTER - B.Tech

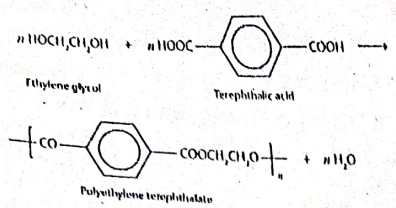
END TERM EXAMINATION *November-2024*

CH301: POLYMERIC MATERIALS

Time 3:00 Hours Max. Marks: 40

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

Q.No.		Marks	CO
1 [a]	The burger model completely defines both creep and stress relaxation properties of polymer. Is the statement true or false. Justify your answer.	3	CO-4
[b]	There is no sharp melting point in amorphous polymer. Is the statement true or false. Justify your answer	2	CO-4
2 [a]	Consider the expression for reciprocal of average degree of polymerization, when styrene is polymerized with t-butyl hydroperoxide at 60°C $1/D_p = 0.6 \times 10^{-4} + 10.0R_p + 1.73 \times 10^4 R_p^2$ Calculate the value of (i) monomer transfer constant (ii) initiator transfer constant (iii) rate constant for initiator decomposition, if the monomer concentration is 8.35 mol/l , the value of the term $k_p^2 f k_d/k_t = 3.29 \times 10^{-9}$ and initiator efficiency is 0.5. Where, D_p =average degree of polymerization, Rp = Rate of Polymerization, k_p = rate constant for propagation reaction, f= efficiency of initiator, k_d= rate constant for decomposition of initiator, k_t= rate constant for termination.	3	CO-1
[b]	Calculate the feed ratio of ethylene glycol and terephthalic acid that should be employed to obtain a polyester of approximately 96,000 gm/mol molecular weight at 99.5% conversion. What is the identity of the end group.	2	CO-1

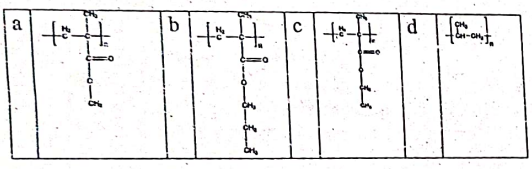


3 [a] What is threshold molecular weight? Why is it varying from one polymer to another polymer? 3 CO-1, CO-3

[b] Define the terms (i) backbiting (ii) telomerization 2 CO-1

4 [a] A manufacturing plant situated in Indore has designed latex-based paint having glass transition temperatures between 5-7°C. The quality control department checked the film forming ability of paint and found that it has superior film forming ability, good adhesion and doesn't show any surface defect. The paint was supplied to different region of India. The customer from Siachen has complained that paint did not form continuous films and shows cracks. The customer from Chennai complained that paint has a lack of adhesion. Why does the paint behave differently in different cities? Suggest a suitable solution for the above problem. 3 CO-4

[b] Arrange the following polymers in increasing order of their glass transition temperature. State the reason. 2 CO-4



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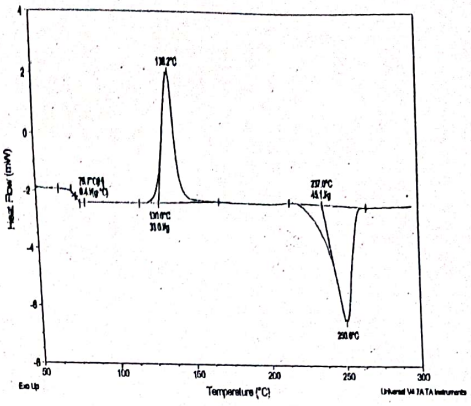
5 [a] The following thermogram is obtained for a sample of polyethylene terephthalate on DSC instrument. Analyze the thermogram. 3 CO-5

The theoretical heat of fusion for 100% crystalline PET is 140J/g.



[b] Why do we cannot produce 100% crystalline polymer from polymer melt? 2 CO-4

6 [a] Discuss the working principle of Gel Permeation Chromatography for measuring the molecular weight and molecular weight distribution. 3 CO-3

[b] 4.4 gm of a polyester that is known to be linear and to contain acid groups at both ends requires titration with 11 ml 0.02 M NaOH to reach a phenolphthalein end point. Calculate the Number average molecular weight of polymer. 2 CO-3

7 [a] What are the Barus and Weissenberg effects? Why do polymer fluids show these effects? 3 CO-4

[b] Define the term storage modulus and loss modulus. 2 CO-5

Total no. of Pages: 02

Roll no. 93

5th SEMESTER B.Tech

END TERM EXAMINATION *Nov-2024*

CH303: Mass Transfer-I

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

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

Q.1(a) "Separation of component (s) can be achieved via using a mass-transfer operation or using a purely mechanical operation". Give an example of such separation operation, where both mass-transfer operation as well as mechanical operation can be employed. As per your opinion, which one is the better choice and why? [2][CO1][L2, L4]

(b). Oxygen (A) is diffusing under steady-state through a non-diffusing gas mixture of methane (B) and hydrogen (C) in the volume ratio 2:1. The total pressureis 1 X 10^5 N/m^2, and the temperature is 0°C. the partial pressure of the oxygen at two planes 5.0 mm apart is respectively 12000 and 6000 N/m^2. The diffusivities are estimated to be $D_{O2\text{-}H2}$ =6.99 X 10^{-5} and $D_{O2\text{-}CH4}$ =1.86 X 10^{-5} m^2/s. Calculate the rate of diffusion of oxygen in kmol/s through each square meter of the two planes. [4][CO2][L5]

Q.2 (a) Derive the relationship between the Local and Overall mass transfer co-efficients. Prove that, for a highly soluble gas, K_G=k_G. [6][CO2] [L3, L4]

Q.3 (a) What is Whitman's two-film theory. What are its salient features of this theory? What are its applications? [6][CO3][L1, L2, L3]

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Q.4 (a) Derive the equation for the operating line for the absorption (of single component) in terms of mole ratio units for a counter-current system. [5][CO4][L6]

(b) Explain with diagram, how the driving force for the gas absorption decreases at minimum Liquid Gas Ratio. [3][CO4][L4]

Q.5 (a) For air-water mixture of dry bulb temperature 65C, a wet bulb temperature of 35 C was determined. The total pressure is 1 std atm. Compute humidity of the air.

Given, Latent heat of water , λ_w = 2419300 J/kg and Saturation humidity, Y'_w = 0.0365 kg water / kg of air. [3][CO4][L4

(b) What are the advantages of continuous drying over the batch process? [2][CO4][L2]

Q 6 (a) Draw a neat diagram of 'Packed Column" and label all its parts [4][CO5][L2]

(b) Why Natural Draft Towers are hyperbolic in shape? Draw a neat and Clean diagram of Mechanical draft tower with counter-current flow. [5][CO4][L2, L6]

--END--

Total no. of pages 3 *Roll No.....*

FIFTH & SEVENTH SEMESTER **B.TECH**
END SEMESTER EXAMINATION **Nov-2024**

CH305 CHARACTERIZATION OF MATERIALS

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

Instructions to the candidates: *Attempt all questions*

Q.1 Write answers in one word. (10×1)

i. The _____ is the national standard body of India responsible for setting quality and safety standards for various products and services. [CO1]

ii. The _____ standards are internationally recognized and emphasize global harmonization of quality management systems. [CO1]

iii. In Transmission Electron Microscopy (TEM), the _____ technique is crucial for determining the crystallographic orientation of materials. [CO2]

iv. Raman spectroscopy detects molecular vibrations by measuring the shift in _____ after the scattering of light from a sample. [CO3]

v. Liquid Chromatography-Mass Spectrometry (LC-MS) is widely used for analysis of _____ in pharmaceutical and biological research. [CO4]

vi. In IR spectroscopy, the presence of a broad absorption band around 3200-3600 cm^{-1} indicates the formation of a _____ hydrogen bond, commonly found in alcohols and carboxylic acids. [CO3]

vii. Proton Nuclear Magnetic Resonance (^{1}HNMR) spectroscopy can identify the number of chemically distinct _____ in a molecule based on their chemical shifts. [CO3]

viii. Atomic Force Microscopy (AFM) is primarily used to study the _____ and surface roughness of materials at the nanoscale. [CO4]

ix. The ^{13}C NMR spectrum is used to determine the structure of organic molecules by analysing the environment of _____ atoms.

[CO3]

x. The Raman shift is a result of an _____ collision between incident photons and the vibrational modes of a molecule, leading to a change in the energy of the scattered light.

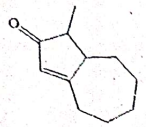
[CO3]

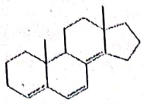
Q.2 Write a short answer (5×2)

i What are mandatory standards?

[CO1]

ii. Calculate λ_{max} for the following molecules using Woodward–Fieser rules:

a 

b 

[CO2]

iii. Arrange the following compounds in the increasing order of shielding effect. Support your answer with a suitable explanation. CH_3I, CH_3Cl, CH_3F, CH_3Br

[CO2]

iv. Mention two common applications of Gas Chromatography-Mass Spectrometry (GC-MS).

[CO3]

v. What structural information can be obtained from the XRD spectrum of a sample?

[CO4]

Q.3 (i) Describe the organizational structure and governance framework of the International Organization for Standardization (ISO).

(3) [CO1]

(ii) What is fermi resonance? A compound with the molecular formula $C_2H_4O_2$ was analyzed using IR spectroscopy, resulted in the following characteristic peaks in its spectrum: 2900-2950 cm^{-1}, 1710 cm^{-1} and 3500-3650 cm^{-1}. The compound also gave effervescence with sodium carbonate. Suggest its structure.

(4) [CO3]

(iii) The excitation wavelength of laser in a Raman effect experiment is 586nm. If the stokes line is observed at 592nm, then what will be the wavenumber of the anti-stokes line in cm^{-1}?

(3) [CO2]

Q. 4 (i) How do secondary electrons and backscattered electrons contribute to image contrast and detail in Scanning Electron Microscopy (SEM)?

(3)[CO3]

(ii) With the help of a well-labelled diagram, describe the working of mass detector in a mass spectrometer. How can the mass spectrum of CH_3Br be analyzed to accurately characterise its molecular structure and detect the presence of isotopes?

(4)[CO4]

(iii) A research team utilized non-contact Atomic Force Microscopy (AFM) to study the surface of a new polymer-clay nanocomposite developed for environmental applications. The AFM images revealed that clay nanoparticles were well-dispersed, which improved the properties of the material for water filtration applications. Additionally, surface roughness measurements provided insights into the structural impact of the nanoparticles within the polymer.

i. What is the main advantage of using non-contact AFM mode for studying polymer- clay nanocomposites?

ii. How did non-contact AFM contribute to understanding the dispersion of clay nanoparticles within the polymer matrix?

(3)[CO4]

END

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Total no. of Pages: 01

Roll no.....

5th/7th SEMESTER

B.Tech. Chemical Engineering

END TERM EXAMINATION *Nov-2024*

COURSE CODE: CH307

COURSE TITLE: Petroleum Refining Engg.

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

Note :
Assume suitable missing data, if any.

Q.1 (a) Name the products for which the following tests are performed. (i) Octane Number, (ii) Aniline Point, (iii) Smoke Point, (iv) Penetration Test, (V) Silver Strip Corrosion Test. [5][CO1][BTL5]

(b) Classify the crude oil based on 'base'. Which type of crude oil is more suitable for high-quality gasoline production in this classification? [5][CO1][BTL5]

Q.2 (a) Name the five different petroleum products. Arrange them in the increasing order of boiling points and write down their two critical characteristics/properties. [5][CO2][BTL4]

(b) Write down the main additives of Gasoline and their purpose. [5][CO2][BTL2]

Q.3 Draw a neat flow chart of the Visbreaking process. What is the purpose of the Visbreaking process? How the decoking of furnace tubes is performed. [10][CO3][BTL3]

Q.4 Draw a neat flow chart of the reforming process. Write down the reactions involved and catalysts used in the reforming process. [10][CO4][BTL3]

Q.5 Draw a neat flow chart of the Merox process. Write down the reactions involved in the Merox process. Which type of products are treated by the Merox process in the refinery? [10][CO5][BTL2]

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

V/VII SEMESTER

B.Tech. Chemical Engineering

END TERM EXAMINATION *DEC-2024*

CH 315 PLASTIC TECHNOLOGY

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] Write the chemical formula representing the monomer and polymer of: Polyvinyl chloride and Polystyrene. [2][CO1]

[B] Write the correlation between structure and properties of Polypropylene. [4][CO2]

[C] Explain the manufacturing of Nylon 6,6 and Nylon 6. [4][CO1]

Q.2[A] Compare the properties of Poly(butylene terephthalate) and Poly(ethylene terephthalate) based on their chemical structures. [4][CO2]

[B] Identify the applications of Polystyrene in modern society. [3][CO3]

C] What are the different types of polymers based on their response to heat? Explain the thermal properties of different polymer classes and how these properties relate to their chemical structures. [3][CO2]

Q.3[A] Write any six additives used during Masterbatch formation. [3][CO1]

[B] Identify the applications of Polypropylene in the following areas:
(1) Packaging (2) Automobiles (3) Textiles (4) Medical devices

99

[4][CO3]

[C] Name the Advanced Controlled Polymerization Techniques. [3][CO

Q.4[A] Explain the stages of the formation of urea-formaldehyde resi
Write the steps involved in the formation of urea-formaldehy
resin moulding powder. [5][CO
[B] Explain the steps involved in the Preparation and Curing of epo
resin. [5][CO

Q.5[A] How amorphous and crystalline forms of Poly(ethyle
terephthalate) moulding compounds are developed? Write t
applications of the amorphous and crystalline Poly(ethyle
terephthalate). [5][CO1CO
[B] Compare the properties of Melamine-Formaldehyde and Ure
Formaldehyde moulding materials. Based on its properties, identi
the applications of Melamine-Formaldehyde resin. [5][CO2CO

Q.6[A] Identify the Polymers used in: [5][CO
(a) Chewing gum
(b) Foodstuffs packaging with the ability to boil-in-bag
(c) Carbonated beverages packaging
(d) Adhesive for Plywood
(e) Rocket Nozzles
[B] Write a note on recent advances in polymeric materials. [5][CO

100

[Total No. of Printed Pages: 2] [Roll No.....]

END SEMESTER EXAMINATION B.Tech

FIFTH SEMESTER November 2024

CH319: Rubber Technology

[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) Explain in detail the concept of sol, gel, macro and micro gel in NR

b) Name the methods used for concentration of latex. Explain any two in detail.

L2, L1
CO1 (5 +5 = 10 marks)

Q2 a) Discuss the factors on which T_g of a polymer depends? T_g of Polyethylene is well below room temperature like rubber but still it is plastics. Why?

b) Discuss the effect of frequency of tapping and age of tree on MW and MWD of natural rubber. **L3, L4 CO1, CO3 (5 +5 = 10 marks)**

Q3 (a) With the aid of principle of thermodynamics as applicable to deformation of ideal elastomer show that tensile stress 'f' is dependent on entropy change.

(b) Among the polyamide and polyacrylate which one is prone to hydrolysis. Justify your answer.

(c) Why NR and BR have poor heat and ozone resistance. How it can be improved. **L1, L3, L4 CO1, CO4 (5 +2.5+2.5 = 10 marks)**

Ques 4 (a) Discuss the process of manufacture of SBR and its physical & mechanical properties along with its applications.

(b) Explain the need of addition of the following in a rubber compound and there effect on the properties of rubber compound giving suitable example

(i) accelerator
(iii) Antioxidant **L3, L5, L6 CO1, CO2,CO5 (5 +5 = 10 marks)**

Ques 5 (a) Discuss the manufacture of footwear with the help of a flow diagram. State the materials used for making footwear and list the various types of reinforcement used.

(b) Write the steps involved in the manufacture of latex products by latex spreading. **L5, L6 CO2, CO4 (5 +5 = 10 marks)**

END

Total no. of pages -02 Roll no.....

V/VII SEMESTER B.Tech

END TERM EXAMINATION *December-2024*

CH 405 : FIBER TECHNOLOGY

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

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

Q.No.			Marks	CO
1	[a]	Wliat are the properties of fiber forming polymer?	3	CO-1
	[b]	What are the polymer and fiber properties corelated with the comfort property of the garment.	2	CO-1
2	[a]	Arrange the following cellulosic fiber in terms of tensile strength. Cotton, Flax, Viscose. Corelate the structure of the fiber with their strength properties.	3	CO-1
	[c]	Define the term mercerization. Why do cotton fabrics show lusture after mercerization?	2	CO-1
3.	[a]	Discuss the melt spinning process with help of neat diagram?	3	CO-2
	[b]	How the process parameters affect the crystalline structure and orientation of polymer chains in melt spinning process.	2	CO-2
4	[a]	How do the different cross-sectional structures develop in melt, wet and dry spinning processes ?.	3	CO-2
	[b]	What are the functions of spin finish? Why does the spin finish need to have good scourability?	2	CO-3
5	[a]	What is the residual draw ratio? How is it corelated with drawing process?	2	CO-3
	[b]	Why is the actual draw ratio lower than machine draw ratio?	2	CO-3
	[c]	Why are the filaments like nylon and polypropylene cold drawn while the Polyethylene terephthalate hot drawn?	1	CO-3

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6	[a]	How does the false twist texturing process produce the stretched textured yarns.	3	CO-3
	[b]	Why is the heat setting process essential? What are the structural changes that happened after heat setting of filaments?	2	CO-3
7	[a]	Discuss the manufacturing process of viscose rayon.	3	CO-4
	[b]	Write the chemical reaction involved during the development of Viscose rayon.	2	CO-4
8	[a]	Discuss the industrial process of manufacturing Nylon 66 yarn.	3	CO-4
	[b]	Differentiate the properties of Nylon 6 and Nylon 66.	2	CO-4

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

SEVENTH SEMESTER B.TECH. [Chemical Engineering]

END SEMESTER EXAMINATION DEC.-2024

CH409 PLANT ENGINEERING and PROCESS ECONOMICS

Time: 3 Hours *Max. Marks: 50*

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

1. (i) Describe the boundary layer theory and derive the continuity and momentum equations for flow over flat plate. 7

OR

(ii) Solve the momentum equation for the velocity distributions within the hydrodynamic boundary layer and boundary layer thickness with respect to the distance from leading edge.

(iii) Illustrate the hydrodynamic boundary layer (HBL) and thermal boundary layer (TBL) for different Prandtl (Pr) numbers. 3

2. (i) Illustrate the various types of control valves with suitable diagrams. 7

OR

(ii) Derive the valve characteristics of linear, equal-percentage and quick opening valves.

(iii) Determine the optimal pipe diameter for a water flow rate of 20 kg/s. The pipe is of carbon steel. The density of water is 1000 kg/m^3. 3

3. (i) Describe the relative merits of various materials of construction. 4

(ii) Describe the brackish water treatment and desalination process. 3

(iii) Describe the processes involved in fuel cells and applications. 3

4. (i) Describe the various objectives for instrumentation and control. 3

(ii) Describe the distillation column control for temperature and composition using process flow diagrams. 7

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OR

(iii) Describe the heat exchanger control using process flow diagrams.

5. (i) Explain the significance and importance of hazard and operability (HAZOP) study.

(ii) The sales of an equipment result in the net cash flow of ₹ 10 lakhs pe at the end of each year for 3 years. The discount rate is 4%. Estimate the present worth of the total cash flows.

(iii) A manufacturing plant has a total capital investment of ₹ 2 crores. T average profit per year is ₹ 20 lakhs. The average depreciation cost per y ₹ 10 lakhs. Determine the payout period if there are no interest charges.

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

B.Tech (VII Sem)

END TERM EXAMINATION *Nov-2024*

CH417: Polymer Waste Management

Time: 3 hrs *Max. Marks: 50*

Note : Question no. 1 and 7 are compulsory.
Attempt any **FOUR** questions from question no 2 to 6.

Q.1 Attempt **any SIX.** (3x6=18)

(a) Are paper bags more environmentally friendly than plastic ones? Justify your answer?

(b) Out of reduce, reuse and recycle, which is the most favoured option for waste management? Justify.

(c) Differentiate between thermoplastic and thermosetting materials? Give two examples of each.

(d) What is plastic waste? What are the different sources of plastic waste? Why do Plastics fall under a difficult material to recycle?

(e) What is plastic recycling? Define its goals and use. {**No need to classify**}.

(f) Discuss the major environmental concern related to landfills.

(g) What are the advantages of waste to energy?

Q.2 What are different types of recycling? Explain in detail. [5][CO2]

Q.3 Long-term impacts and overall problem of the plastic waste issue can be addressed only by establishing better waste management systems. Justify. [5][CO1]

Q.4 Define and classify Landfills. Discuss different methods of landfilling? [5][CO3]

Q.5 Discuss environmental legislations associated with Forest and Wild life in India and salient features of Environmental Protection Act 1986. [5][CO4]

Q.6. What is composting? Discuss different methods of composting and explain its advantages. [5][CO4]

Q.7. Write short notes on any **THREE** of the following: [3x4=12]

(a) Upcycling and downcycling (of plastics or metals)
(b) Types of polymer degradation.
(c) Measures to promote environmental awareness.
(d) Incineration (including objective, process and advantages)

--------End-------

Total no. of pages:1 Roll no.....

5/7th SEMESTER 108

B.Tech. Chemical Engineering

END TERM EXAMINATION *Nov-2024*

COURSE CODE CH-429 COURSE TITLE: Energy Resources

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

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

1. What measures can India adopt to ensure a smoother transition to renewable energy? [5] [CO1]
2. Define the term conventional and non-conventional energy with examples? [5] [CO1]
3. Define calorific value and calculate the calorific value for glucose ($C_6H_{12}O_6$) when 10 moles of it produces 30,240 KJ heat on burning completely? [5] [CO2]
4. a) What is the octane number? Comment on the efficiency of a fuel in relation to the octane number? [3] [CO2]
   b) Comment on aniline point and acid value of the fuel? [2] [CO2]
5. a) Write the principle of fuel cells. [2] [CO4]
   b) Define altitude, zenith, and azimuth angle? [3] [CO3]
6. Write note on the wind power generation potential of India, and how much it exploited so far? [5] [CO5]
7. Write short note on [5] [CO3]
   a) PM-KUSUM scheme b) UDAY scheme
8. a) What is a coal gas? Give its two uses. [2] [CO3]
   b) Define the process carbonization? [3] [CO3]
9. Describe the process of refining crude oil and the different products that can be extracted from it? [5] [CO2]
10. Compare and contrast the biomass and biogas? [5] [CO5]
11. What are solar collectors? Give their classification and compare them based on construction and area of application. [5] [CO5]

Total no. of Pages: 2

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Roll no.....

I SEMESTER

B.Tech.

END TERM EXAMINATION *Nov-2024*

CE 101 : Basics of Civil Engineering

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

Note : All questions carry equal marks.
Attempt all parts of a question in continuation only.
Assume suitable missing data, if any.

Q.1 a) What are the main components of a building?

b) What is the principle of surveying? Classify various surveying techniques.

c) How do modern technologies namely drones and satellite-based GPS systems are compared in terms of accuracy and efficiency to traditional surveying methods such as total station and theodolite?

d) Calculate the floor space index of a residential building having plot size of 100 sq. m and total built up area of 160 sq. m.

[8][CO1][BTL2-3]

Q.2 a) What is velocity ratio? Describe its application based on machine foundations. Draw a flow chart.

b) Evaluate the influence of the center of gravity and moment of inertia on the stability of high-rise buildings during earthquakes.

[8][CO2][BTL5]

Q.3 a) What factors affect the loading capacity of soil, and why is it important for foundations? Mention the assumptions required in bearing capacity evaluation. Use tabular representation.

b) Explain the design considerations for retaining walls to resist both sliding and overturning.

[8][CO3][BTL6]

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Q.4 a) How the raw water from the source is processed for the residential supply and the waste water is recycled back to the source? Draw a flow chart.

b) What are the chemical and microbiological parameters used to assess water quality? Use tabular representation.

[8][CO4][BTL3-4]

Q.5 a) Classify soil according to Indian standard (IS) classification systems. Write steps for construction of expressway from Delhi to Allahabad and how the highway planners consider various parametrs during planning? Draw a flow chart.

b) What is intelligent transportation system (ITS)? How ITS is evolving the highway and transportation system?

[8][CO5][BTL3-5]

Total no.of Page-01 Roll No.....

III SEMESTER B. Tech. Civil Engineering

END TERM EXAMINATION *November-2024*

CE 201n : Introduction to Earth, Atmosphere and Environmental Science

Time: 03 Hours *Max. Marks: 50*

Note: Attempt all questions. All questions carry equal marks. Support your answers by giving neat and detailed sketches.

Q.1 **(a)** Describe the composition and characteristics of the following atmospheric zones:

(i) The Troposphere

(ii) The Stratosphere

(iii) The Thermosphere **[5][CO1]**

(b) Describe the composition and characteristics of the following components of the internal structure of the Earth:

(i) The Crust

(ii) The Mantle

(iii) The Core **[5][CO1]**

Q.2 What do you mean by "climate"? How climates are classified on the basis of latitudes? Give principal characteristics of various climate classes. **[10][CO2]**

Q.3 What is "weathering of rocks"? Describe in detail various methods or processes by which rocks undergo weathering. What is "soil profile"? **[10][CO3]**

Q.4 How rocks are classified? Explain the mechanism of formation of each class of rock, also write important rocks in each classification. **[10][CO5]**

Q.5 **(a)** Explain various methods of "wind erosion". What are different types of aeolian deposits? **[5][CO4]**

(b) Explain various methods of "river erosion". What are the products of prolonged river erosion? **[5][CO4]**

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

III SEMESTER

B.TECH 112

CE 201 CIVIL ENGINEERING BASICS AND APPLICATIONS

TIME: 3.00 HOURS MAX. MARKS: 40

NOTE: ALL QUESTIONS ARE COMPULSORY

ALL QUESTIONS CARRY EQUAL MARKS

ASSUME SUITABLE MISSING DATA, IF ANY

1. Attempt any two parts.

a. Discuss the significance of following properties of lime-

- Slaking of lime
- Hardening of lime (4) CO-1

b. With a neat sketch explain types of defects found in timber. Describe the classification and uses of plywood. (4) CO-1

c. What are the factors controlling composition and quality of steel. Differentiate between mild steel and HYSD bars. (4) CO-1

2. Attempt any two parts.

a. What are the essential requirements of a good foundation? With a neat sketch explain types of foundations. (4) CO-2

b. Explain the following terms used for masonry-

King closer, Queen closer, Beveled bat, Corbel, Cornice, Coping, Gable and Parapet (4) CO-2

c. Differentiate English bond with Flemish bond with their essential features. (4) CO-2

Total No. of pages 1 Roll No._____

III SEMESTER B.Tech. [Civil Engg.]

END SEM EXAMINATION (NOV. 2024)

CE 203 ENGINEERING MECHANICS

Time: 3 Hours Max. Marks: 40

Answer any five questions. All questions hold equal marks. Assume missing data if needed.

Q.1 Four forces, 10 N, 20 N, 30 N, and 40 N, act at different points on a rigid body. The distances from the reference point are 1 m, 2 m, 3 m, and 4 m, respectively. Find the total moment of this system about the reference point (origin) using Varignon's theorem. [CO1,CO2][BTL: L3]

Q.2 In a pulley system, the load to be lifted is 500 N, and the effort required is 125 N. If the velocity ratio of the system is 6, calculate the mechanical advantage and the efficiency of the system. [CO3][BTL: L4]

Q.3 A body of weight 400 N is placed on an inclined plane, and the coefficient of friction between the body and the plane is 0.3. Calculate the force required to move the body up the plane if the angle of inclination is 20°. [CO3][BTL: L3]

Q.4 State Pappus and Guldinus Theorem I and II. [CO4][BTL: L2]

Q.5 Find the moment of inertia of a rectangular section (width = 5 cm, height = 12 cm) about an axis 2 cm above its centre of gravity. Use the Parallel Axis Theorem. [CO4][BTL: L3]

Q.6 A ball is thrown at an angle of 30° with an initial speed of 20 m/s. Find:

a. The time of flight.
b. The maximum height attained by the ball.
c. The horizontal range of the projectile. [CO5][BTL: L3]

Q.7 A 0.5 kg ball is dropped from a height of 2 m and strikes a hard floor. The coefficient of restitution between the ball and the floor is 0.8.

a. Calculate the velocity of the ball just before impact.
b. Find the velocity of the ball after the bounce. [CO5][BTL: L3]

Q.8 Analyze the truss shown in figure Q.8 and find forces in all the members of the truss. [CO2,CO3][BTL: L4]

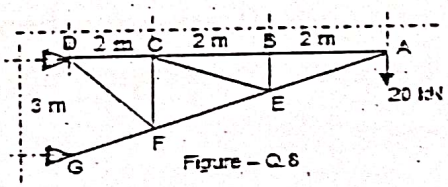

Figure – Q.8

III-SEMESTER 114

B. Tech [Civil Engineering]

END TERM EXAMINATION **Nov-2024**

Course Code: CE-203 **Course Title: Design of Structures-I**

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

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

Q.1:- A beam section, 300 mm wide and 560 mm deep is reinforced with 4 bars of 25 mm diameter in the tensile zone and 4 bars of 12 mm diameter in the compression zone. The cover to the center of both the reinforcement is 40 mm. Determine the moment of resistance of the section, if M-20 concrete and HYSD bar are used. **[5]L(3) CO(3)**

Q.2:- Figure 01 shows reinforcement specification in RCC slab. Draw the cross section in both (X and Y direction) of the figure, indicating the main steel bar, distribution steel bar and cover. Draw the shape of chair shown in figure. What is the purpose of MS pipe being laid in between the reinforcement? **[5] L(2) CO(3)**

Q.3:- Pair the Following **[2] L(1) CO(4)**

a	Target strength of Concrete	i	$\frac{280}{3\sigma_{cbc}}$
b	Modulus of elasticity of concrete	ii	$0.7\sqrt{f_{ck}}$
c	Tensile strength of concrete	iii	$5000\sqrt{f_{ck}}$
d	Modular Ratio of Concrete	iv	$f_{ck} + 1.65\,s$

Q.4:- Signify the importance of hanger bar in a singly reinforced beam and degree of bend in stirrups with suitable sketches. **[2] L(6) CO(3)**

Q.5:- Design a reinforced concrete footing for a rectangular column of section 300 mm x 500 mm supporting an axial factored load of 1500 kN. The

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safe bearing capacity of the soil at site is 185 kN/m^2. Adopt M20 grade of concrete and Fe 415 HYSD bars. **[6] L(3) CO(3)**

Q.6:- A rectangular reinforced concrete column of cross-sectional dimensions 300 mm x 600 mm is to be designed to support an ultimate axial load of 2000 kN. Design suitable reinforcements in the column using M20 grade concrete and Fe415 HYSD bars. **[6] L(3) CO(3)**

Q.7:- Draw the cross section for the following columns **[2] L(4) CO(5)**

a) Biaxial eccentric loading b) Composite column

Q.8:- What are the ways to provide anchorage? And which factors enhancing the bond strength? **[4] L(5) CO(3)**

Q.9:- Match (capital letters with small letters. No need to draw diagram) the following with fig.02. **[3]L(2) CO(5)**

a) Fender pile b) Friction pile c) Batter pile d) Sheet pile e) End bearing pile f) Well foundation

Q.10:- Bring out the difference between **[3]L(4) CO(5)**

a. Limit state method and working stress method

b. Under reinforced section and over reinforced section

c. Architectural and structural Drawing

Q.10:- Pair the Following **[2]L(1) CO(3)**

a	Design aids for reinforced concrete	i SP:16-1980
b	Handbook of concrete reinforcement and detailing	ii SP:34-1987
c	Recommended guidelines for concrete mix design	iii SP:10262-1982
d	Plain and reinforced concrete - code of practice	iv IS:456-2000

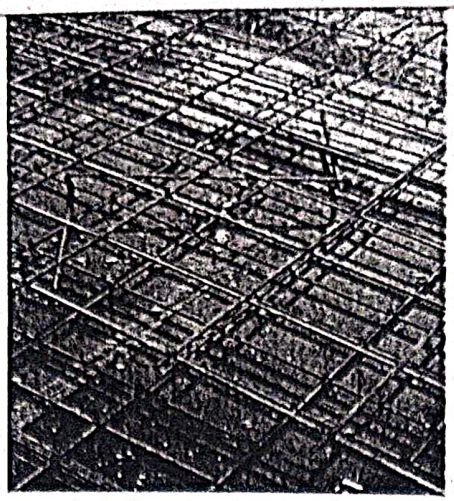
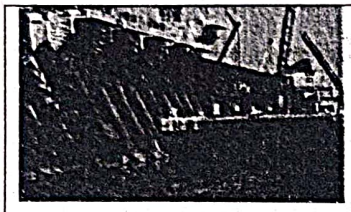


Fig.01



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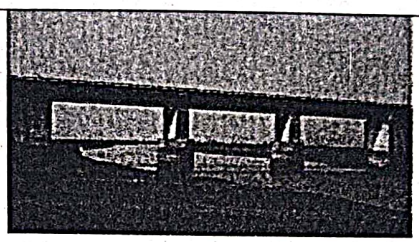

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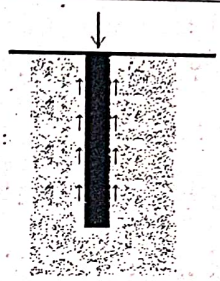

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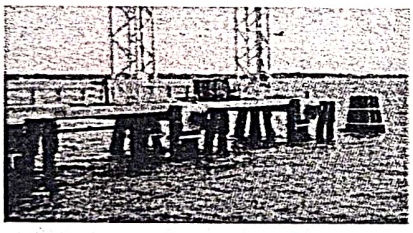

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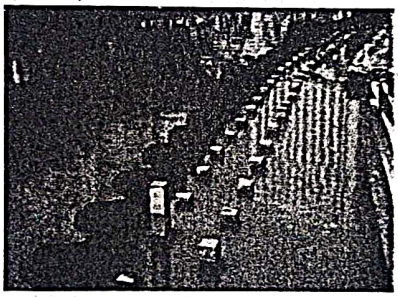

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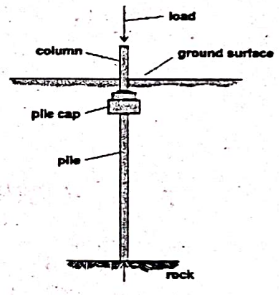

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Fig.02

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Total No. of Pages 02 Roll No. .....

THIRD SEMESTER B.Tech. [Civil]

END SEMESTER EXAMINATION November-2024

CE205 Fluid Mechanics

Time:3 hours Max. Marks: 40

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

1. (a) A horizontal pipe of 100 mm diameter is joined by sudden enlargement to a 150 mm diameter pipe. Water is flowing though it at the rate of 2 m^3/min. Find :
   (i) Loss of head due to abrupt expansion,
   (ii) Pressure difference in two pipes, and
   (iii) Change in pressure if the change of section is gradual, without any loss. 6 Marks (CO 5) (BTL 4)

   (b) State and explain Newton's law of viscosity. 2 Marks (CO 1) (BTL 2)

2. (a) A compound pipeline 1650 m long made up of pipes 450 mm diameter for 900 m, 375 mm for 450 m and 300 mm for 300 m, is required to be replaced by a pipe of uniform diameter. Find the diameter of the new pipe, assuming the length to remain the same. 6 Marks (CO 5) (BTL 4)

   (b) Define the following (i) Absolute Pressure (b) Gauge Pressure 2 Marks (CO 2) (BTL 2)

3. (a) A pipeline of 0-6 diameter is 1.5 km long. To augment the discharge, another pipeline of the same diameter is introduced parallel to the first in the second half of its length. Find the increase in discharge if the friction factor is 0-04 and head at the inlet is 30 m. 6 Marks (CO 4) (BTL 3)

   (b) Define Metacentre and Metacentric height. 2 Marks (CO 2) (BTL 2)

4. (a) Derive an expression for the loss of head due to friction in pipes. 6 Marks (CO 6) (BTL 2)

(b) Define and explain briefly the following (i) Velocity Potential
Stream function. 2 Marks (CO 3) (BTL 2

5. (a)An oil of viscosity 0.02 poise and sp. gr. 0.8 is flowing through 50 m
diameter pipe of length 500 m at the rate of 0.19 lit./sec. Determine:
(i) Reynolds number of flow,
(ii) Centre-line velocity,
(iii) Pressure gradient,
(iv) Wall shear stress, and
(v) Power required to maintain the flow. 6 Marks (CO 6) (BTL

(b) What are repeating variables? How are these selected by dimensio
analysis? 2 Marks (CO 3) (BTL

6. (a)A triangular plate of 1 m base and 1.5 m altitude is immersed in wat
The plane of the plate is inclined at 30° with water surface while the base
parallel to and at a depth of 2 m from the water surface. Calculate:
(i) The total pressure on the plate, and
(ii) The position of the centre of pressure 6 Marks (CO 2) (BTL

(b) Name and explain briefly the hydraulic coefficients.
2 Marks (CO 3) (BTL

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

CE-207- Engineering Survey and Geo informatics

END SEMESTER EXAM **NOVEMBER, 2024**

Time: 3 Hours **MAX Mark -40**

All Question are compulsory. Assume Suitable Missing Data if any

Q.1: What is DPS (Digital Position Systems? Advantages and Disadvantages CO5-08 Marks

Q.2: Write Short notes on CO4- 08 Marks

1. ROS (Robotics Operating Systems)
2. Contouring

Q. 3: What is function of total station? Merits and Demerits CO3-08 Marks

Q.4: Differentiate between dummpy level and EDM ? Advantages and Disadvantages CO2-08 Marks

Q.5 : Explain the followings any two CO1-08 Marks

a) Robotic technique in Engineering surveying

b) Artificial intelligence technique in engineering surveying

c) Field astronomy in engineering Surveying

d) Types of maps and field and office work

-----End-----

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Total no. of Pages: 2

Roll no.....

3rd SEMESTER

B.Tech. (Civil Engg.)

END TERM EXAMINATION

Nov-2024

CE 209n: Analysis of Structures-1

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 Find the forces in the members of the frame shown in Fig. 1. All members have the same cross-sectional area and are of the same material. [8] [CO3] [BTL: L_1-L_5]

Q.2 The load system shown in Fig. 2 moves from left to right on a girder of span 10 metres. Find the load position and absolute maximum bending moment for the girder. [8] [CO2] [BTL: L_1-L_5]

Q.3 A loaded chord ACDEFB of span 55m, having five equal segments. The dip of the cable at D is 7.5m below the left support. The right support B is 6m higher than the support A. Concentrated loads of 30 kN, 40 kN, 24 kN and 18 kN are acting at C, D, E and F respectively. Find the reactions at the supports, tension in various parts of the cable, inclination of various parts of the cable and length of the cable. [8] [CO5] [BTL: L_1-L_5]

Q.4 A beam ABCD is simply supported at its ends A and D over the span of 30 metres. It is made up of three portions AB, BC and CD each 10 metres in length. The moments of inertia of AB, BC and CD are I, 3I and 2I respectively, where $I = 2 \times 10^{10}$ mm^4. The beam carries a point load of 150 kN at B and another point load of 300 kN at C. Neglect self-weight of the beam, calculate slopes and deflections at B and C using Conjugate beam method. [8] [CO4] [BTL: L_1-L_5]

Q.5 A three hinged parabolic arch has a span of 22 metres and a rise of 5 metres. It carries a uniformly distributed load of 20 kN/m over the left half of the span and a point load of 120 kN at 5 metres from the right end. Find the bending moment, normal thrust and radial shear at a section 4 metres from the left end. [8] [CO5] [BTL: L_1-L_5]

Q.6 The quadrantal ring AB shown in Fig. 3 is of radius r. It supports a concentrated load P at the free end A. Find the vertical and horizontal deflections of A. Assume uniform flexural rigidity. [8] [CO3] [BTL: L_1-L_5]

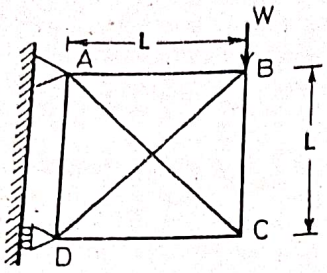

Fig. 1

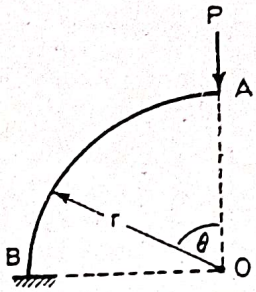

Fig. 3

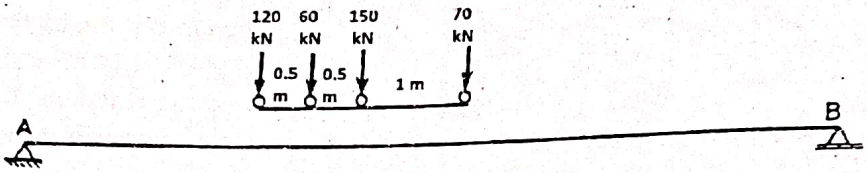

Fig. 2

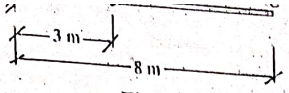

Fig 7

OR

A simply supported beam of 6 m is subjected to 1 kN moving from left to right support. Draw the variation of support reaction at the left support and right support. Draw ILD of SF and BM at ¼ span from left support. If the beam carries a **moving** u.d.l of 5 kN (of length greater than span) from left to the right support determine maximum SF and BM at ¼ span point from left support using ILD.

A hollow alloy tube 4 m long with external and internal diameters of 40 mm and 25 mm respectively was found to extend 4.8 mm under a tensile load of 60 kN. Find the buckling load for the tube with both ends fixed. Also find the safe load on the tube, taking a factor of safety as 5. [5] [CO4] [BTL3]

OR

For a pin-jointed column of length L determine the critical load.

9 Determine the horizontal displacement of the roller end at point D given in Fig 8 by **Unit Load Method**. Take cross-section of bottom members as 3000mm² and for all other members as 6000mm², E = 2000 kN/mm². [5] [CO2] [BTL5]

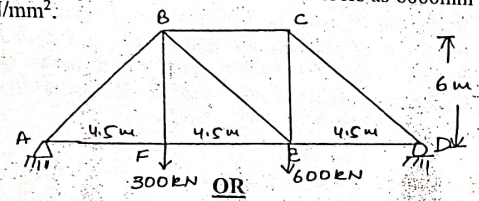

Fig 8

OR

Solve the truss for the forces in the members of the truss shown in Fig 9 by **Substitution Method**. Replace member BE by AC. [5] [CO2] [BTL6]

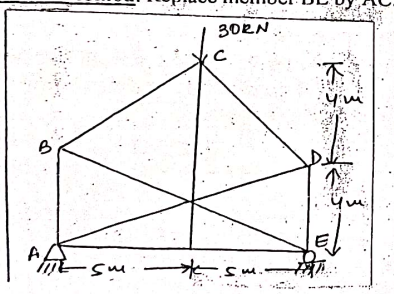

Fig 9

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

V^th SEMESTER **B.Tech.**

END TERM EXAMINATION ***Nov-2024***

COURSE CODE: CE 301

COURSE TITLE: ANALYSIS OF DETERMINATE STRUCTURES

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

Note : All questions carry equal marks. Attempt any 8 questions. Assume suitable missing data, if any.

Q1 (a) Differentiate between a compound and complex space truss. [2] [CO6][BTL2]

(b) Determine the static indeterminacy of the beam and frames given in Fig 1. [3] [CO1][BTL3]

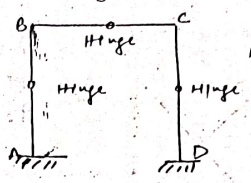

Fig 1(a)

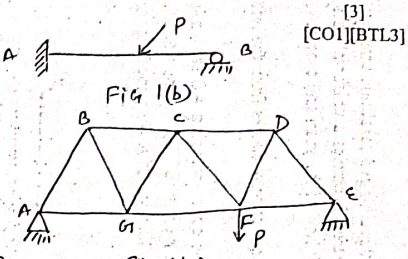

Fig 1(c)

OR

(a) What is the Moment curvature relationship and what are its uses? [2] [CO1][BTL2]

(b) Difference between short and long column [1]

(c) What is a linear arch? [1]

(d) How does pure shear affect a brittle material? [1]

Q2 Evaluate the slope at C and Deflection at E by **Conjugate Beam Method** for the beam given in Fig 2 [5] [CO3] [BTL5]

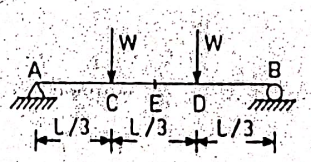

Fig 2

OR

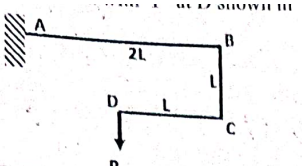

Fig 2

Q3 Use the **Moment-Area Method** to determine the slope at end A and the deflection at points B of the beam shown in Fig 3. [5] [CO3] [BTL5]

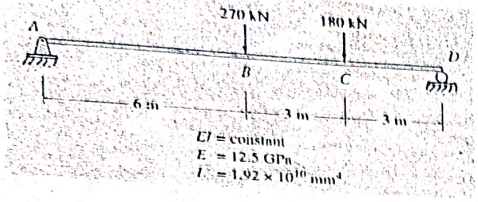

Fig 3

OR

Using the moment-area method determine deflection at the free end of a non-prismatic cantilever beam of 4 m length subjected to a concentrated load at the free end. The beam has **2I** up to 2 m from fixed support and **I** from the middle to the end of the cantilever where **I** = MOI of the beam.

Q4 Determine the deflection at point E of the portal frame subjected to a udl of 15kN/m given in Fig 4by **Castigliano's Method**. [5] [CO2] [BTL4]

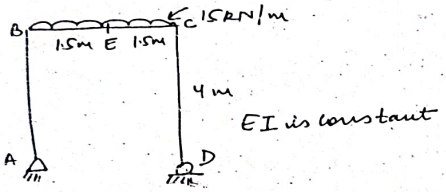

Fig 4

OR

member is 2 m and θ is 45°. Determine vertical and horizontal deflection of the loaded joint subjected to a load P. Use unit load method. E & A are constant.

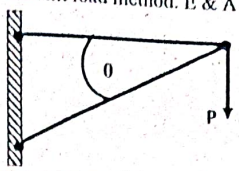

Fig 5

Q5 Using **Macaulay's** method determine the slope at C for the beam given in Fig 6 taking EI = 40 x 10^3 kN-m^2. [5] [CO3] [BTL4]

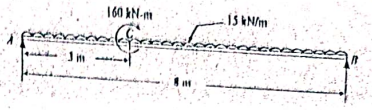

Fig 6

OR

Using **Macaulay's** method determine vertical deflection and slope at support of a simply supported beam subjected to a point load at the middle of the beam. Take EI is a constant

Q6 A symmetrical 3-hinged parabolic arch has a span = 16 m and a rise = 4 m and is hinged at supports and the crown. It carries a concentrated vertical 16 kN load at a distance of 4 m from the left end support. Determine magnitude and direction of reactions and maximum positive and negative bending moment. [5] [CO4] [BTL5]

OR

A symmetrical 3-hinged parabolic arch has a span = 15 m and a rise = 3 m and is hinged at supports and the crown. It carries a concentrated vertical 2 kN load at a distance of 2 m to the right of the support and another vertical load of 2 kN at the crown. Determine horizontal thrust and draw B.M.D.

Q 7 Draw the influence lines for the vertical reaction and the reaction moment at support A and the shear and bending moment at point B of the cantilever beam shown in Fig. 7. [5] [CO5] [BTL4]

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

5TH SEMESTER **B.Tech. CIVIL ENGINEERING**

END TERM EXAMINATION *Nov-2024*

COURSE CODE: CE303 **DESIGN OF RCC STRUCTURES**

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

Note : Attempt any FIVE questions. IS code is not permitted. Assume suitable missing data, if any.

Q.1(a) Describe stress strain relationship of Mild steel with the help of a labelled sketch. M4/CO1/BTL1

(b) A singly reinforced RC beam is subjected to a working moment of 80 KNm. Design the beam by determining the effective depth of it and the area of reinforcement for a balanced design. The width of the beam may be taken as 200 mm. Use M20 concrete and Fe415 steel. M4/CO1/BTL1

Q.2(a) Describe various exposure conditions defined in IS456-2000. Discuss precautions taken for RC work near a coastal area. M4/CO2/BTL2

(b) What do you understand by workability of concrete? Describe a method to measure it with a sketch of the equipment. M4/CO2/BTL2

Q.3(a) An RC beam of width 230 mm and effective depth 500 mm is subjected to a factored moment of 200 KNm. Determine the beam reinforcement. Use M20 concrete and Fe415 steel. If desired, take the stress in compression steel as 353 N/mm^2. M4/CO2/BTL2

(b) Discuss why 'Over-reinforced beams' are not desired. Describe a case when such sections may be used. M4/CO2/BTL2

Q.4(a) An RC beam of width 250 mm and effective depth 310 mm is reinforced with 339 mm^2 of steel in the tension zone. Find the moment of resistance of the beam. Use M20 concrete and Fe415 steel. M4/CO2/BTL2

(b) Discuss why a minimum value of strain in tensile reinforcement is specified for the design of RC beams. M4/CO2/BTL2

Q.5(a) An RC T beam, of M20 grade concrete, has a web width of 240 mm, effective depth of 400 mm, flange width 740 mm and flange thickness of 100 mm. The beam is reinforced with 1005 mm^2 Fe415 reinforcement. Determine the moment of resistance of the beam. M4/CO3/BTL3

(b) Write assumptions for limit state of collapse in flexure. M4/CO4/BTL3

Q.6 Write detailed notes on any two of the following topics.

a. Design for shear in beams
b. Compaction of concrete
c. Use of admixtures in concrete

M4/CO5/BTL4

ANNEX G
(*Clause* 38.1)

MOMENTS OF RESISTANCE FOR RECTANGULAR AND T-SECTIONS

G-0 The moments of resistance of rectangular and T-sections based on the assumptions of 38.1 are given in this annex.

G-1 RECTANGULAR SECTIONS

G-1.1 Sections Without Compression Reinforcement

The moment of resistance of rectangular sections without compression reinforcement should be obtained as follows :

a) Determine the depth of netutral axis from the following equation :

$$\frac{x_u}{d} = \frac{0.87 f_y A_{st}}{0.36 f_{ck} b.d}$$

b) If the value of x_u/d is less than the limiting value (*see* Note below 38.1), calculate the moment of resistance by the following expression :

$$M_u = 0.87 f_y A_{st} d\left(1 - \frac{A_{st} f_y}{bd f_{ck}}\right)$$

c) If the value of x_u/d is equal to the limiting value, the moment of resistance of the section is given by the following expression :

$$M_{u\,lim} = 0.36 \frac{x_{u,\,max}}{d}\left(1 - 0.42 \frac{x_{u,\,max}}{d}\right) bd^2 f_{ck}$$

d) If x_u / d is greater than the limiting value, the section should be redesigned.

In the above equations,

x_u = depth of neutral axis,
d = effective depth,
f_y = characteristic strength of reinforcement,
A_{st} = area of tension reinforcement,
f_{ck} = characteristic compressive strength of concrete,
b = width of the compression face,
$M_{u,\,lim}$ = limiting moment of resistance of a section without compression reinforcement, and
$x_{u,\,max}$ = limiting value of x_u from 39.1.

G-1.2 Section with Compression Reinforcement

Where the ultimate moment of resistance of section exceeds the limiting value, $M_{u,\,lim}$ compression reinforcement may be obtained from the following equation :

$$M_u - M_{u,\,lim} = f_{sc} A_{sc} (d - d')$$

where

M_u, $M_{u,\,lim}$, d are same as in G-1.1,
f_{sc} = design stress in compression reinforcement corresponding to a strain of

$$0.003\,5 \frac{(x_{u,\,max} - d')}{x_{u,\,max}}$$

where

$x_{u,\,max}$ = the limiting value of x_u from 38.1,
A_{sc} = area of compression reinforcement, and
d' = depth of compression reinforcement from compression face.

The total area of tension reinforcement shall be obtained from the following equation :

$$A_{st} = A_{st1} + A_{st2}$$

where

A_{st} = area of the total tensile reinforcement,
A_{st1} = area of the tensile reinforcement for a singly reinforced section for $M_{u,\,lim}$, and
$A_{st2} = A_{sc} f_{sc} / 0.87 f_y$.

G-2 FLANGED SECTION

G-2.1 For $x_u < D_f$, the moment of resistance may be calculated from the equation given in G-1.1.

G-2.2 The limiting value of the moment of resistance of the section may be obtained by the following equation when the ratio D_f / d does not exceed 0.2 :

$$M_u = 0.36 \frac{x_{u,\,max}}{d}\left(1 - 0.42 \frac{x_{u,\,max}}{d}\right) f_{ck} b_w d^2 + 0.45 f_{ck} (b_f - b_w) D_f \left(d - \frac{D_f}{2}\right)$$

where

M_u, $x_{u,\,max}$, d and f_{ck} are same as in G-1.1,
b_f = breadth of the compression face/flange,
b_w = breadth of the web, and
D_f = thickness of the flange.

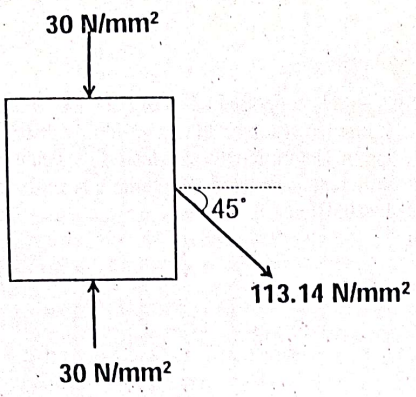

Fig.3

Q.6 (a) A beam 3m long, simply supported at its ends, is carrying a point load W at its mid span. If the slope at the ends of the beam is not to exceed 1^0, find the deflection at the mid span. [CO4] [3] [BTL4]

(b) A steel specimen of 12mm diameter extends by 6.31×10^{-2} mm over a gauge length of 150mm when subjected to an axial load of 10kN. The same specimen undergoes a twist of 0.5° (degree) a length of 150mm over a twisting moment of 10 N-m. Using the above data, determine the elastic constants E, μ, G and K. [CO3][5] [BTL5]

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

VSEMESTER ***Nov./Dec.-2024***

B.Tech. END SEMESTER EXAMINATION

CE-305 Mechanics of Materials

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) What is stress? In what way does the shear stress differ from direct stress? Explain. [CO1][BTL2]

(b) Indicate the shapes of shear force diagram and bending moment diagram for point load and uniformly distributed loads. [CO2] [BTL1]

(c) The length, Young's modulus and coefficient of thermal expansion of bar P are twice that of bar Q. what will be the ration of stress developed in bar P to that in bar Q if the temperature of both bars is increased by the same amount? [CO1][BTL3]

(d) What is simple bending? Explain [CO4][BTL1]

(e) Define the term Flexural rigidity, torsional rigidity, polar moment of inertia. [CO1][BTL2]

Q.2 (a) A steel rod of diameter 25 mm is placed inside a copper tube of internal diameter 30 mm and external diameter 40 mm, the ends being firmly fastened together. Determine the stresses induced in the steel rod and copper tube when the composite bar is subjected to a compressive load of 500 kN. Take $E_s = 2 \times 105$ N/mm^2 and $E_c = 1.1 \times 105$ N/mm^2. [CO1] [3] [BTL3]

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(b)Draw the loading and bending moment diagram of a beam from the shear force diagram of the beam as shown in Fig.1.

[CO2][5] [BTL6]

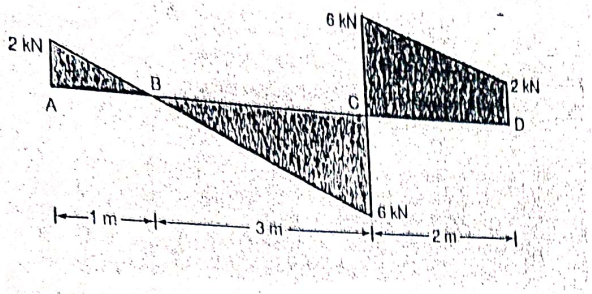

Figure. 1

Q.3(a) A beam section is of T-shape, formed by 2 planks of 120 mm and 20 mm. The beam is simply supported over a span of 3m and subjected to a u.d.l of 0.4kN/m. Draw the bending stress distribution diagram across the section at centre.[CO2][5] [BTL4]

(b) A wooden beam 100 mm wide x 250 mm deep and 3 m long is simply supported at its ends. It carries a u.d.l of 40 kN/m over the entire length. Determine the maximum shear stress and sketch the variation of shear stress along the depth of the beam.

[CO2][3][BTL3]

Q. 4 (a) What are the key differences between Euler's theory and Rankine's theory of columns? [C04][2][BTL2]

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(b) A simply supported beam of I-section as shown in Figure2 deflects 12mm when subjected to a uniformly distributed load of 50kN/m length. Determine the safe load if the beam is used as a column with both ends fixed. Use Euler's formula with a factor of safety 5. E=205GPa. [CO4][6][BTL6]

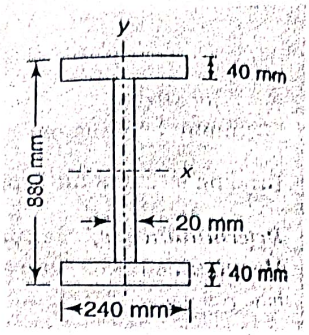


Fig. 2

Q.5. (a) Find the torque which a shaft of 200mm diameter can safely transmit, if the shear stress is not to exceed 50N/mm^2.

[CO3][2][BTL2]

(b) At a point in a strained material the resultant intensity of stress across a plane is 113.14 N/mm^2 tensile inclined at 45° to its normal as shown in Fig. 3. The normal component of intensity across the plane at right angles is 30 N/mm^2 compressive. Find the position of principal planes and stresses across them. Find also the value of maximum shear at that point.[CO5][6] [BTL6]

Total no of Pages: 03- *Roll No-* .....

End Term Examination NOV- 2024

V SEMESTER B Tech (CIVIL ENGG)

CE-307 ADVANCED GEOTECHNICAL ENGINEERING

Time: 3hr **Max Marks: 40**

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

1. Attempt all of the following questions:

(a) A beam of X rays of wavelength 0.073 nm is diffracted by (110) plane of rock salt with lattice constant 0.27nm. Determine the glancing angle for second order diffraction. (2)

(b)What is degree of consolidation? (2)

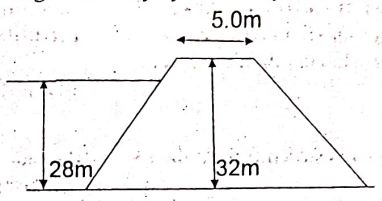
(c) How the degree of consolidation is determined when the variation of pore pressure is linear. (2)

(d) What is effect of fineness of soil on the undrained shear strength of clayey soil. (2)

2. Attempt any Two questions out of the following:

(a) Describe pump in tests for finding permeability of the aquifer. (4)

(b) The cross section of an earth dam is shown below. Find the seepage through dam body by Pavlovsky's method.



The upstream & downstream slopes are 1v:2h. The hydraulic conductivity is 8×10^{-4} m/min. (4)

(c) Derive the relation for Skempton's pore pressure parameters. (4)

3. Attempt any Two questions out of the following:

(a) On the basis of one dimensional consolidation test results on a clay, the coefficient of consolidation for a given pressure range was obtained as 8×10^{-3} mm²/sec. In the field there is a 2 m thick layer of the same clay with two way drainage. Based on the assumption that a uniform surcharge of 70 kN/mm² was to be applied instantaneously, the total consolidation settlement was estimated to be 175 mm. However, during the construction, the loading was gradual; the resulting surcharge can be approximated as

q (kN/m²) $= 70t/60$ days for $t \leq 60$ days and $q = 70$ kN/m² for $t \geq 60$days.

Estimate the settlement at t = 30 and 120 days. (4)

(b) Discuss numerical solution for radial drainage. (sand drain) (4)

(c) What is coefficient of consolidation. How it is determined by computational method. (4)

4. Attempt any Two questions out of the following:

(a) Explain three- dimensional consolidation. (4)

(b) A compacted soil was tested in unconsolidated undrained condition in triaxial apparatus with a cell pressure of 450kN/m². Before the application of cell pressure, the pore pressure in the sample was zero. The results obtained are as follows-

Strain (%)	Deviator stress(kPa)	Pore pressure(kPa)
0	0	240
3.0	560	280
5.5	1030	160
7.0	1170	110
9.0	1240	95
13.5	1220	75
15.0	1190	55

(i)Draw deviator stress vs strain curve.
(ii)Plot the variation Pore pressure coefficient A_f with strain
(iii) Determine the value of pore pressure coefficient B and comment upon its degree of saturation. (4)

(c) Discuss stress path and its applications. (4)

5. Attempt any Two questions out of the following:

(a) In a triaxial test explain following-

- Axial compression test
- Axial extension test (4)

(b) Discuss the results of direct shear test on sand. What are the demerits of this test? (4)

(c) In sand drain what do you mean by free strain consolidation and equal strain consolidation. Discuss the effect of smear zone on radial consolidation. (4)

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

_____SEMESTER

B. Tech

END TERM EXAMINATION *Nov-2024*

COURSE CODE: CE309

COURSE TITLE: ENVIRONMENTAL ENGINEERING DESIGN

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

Note:1) Attempt all questions; the internal choice is indicated wherever applicable.
2) Marks are indicative of time distribution. The use of a calculator is allowed.
3) Mobile/tablets/programming calculators are not permitted.
4) Assume suitable missing data, if any.

Q1. Describe any four of the following

i) Surface loading and weir loading [CO2] [L2]
ii) JAR Test [CO1] [L1]
iii) Sludge digestion [CO1] [L1]
iv) Factors considered in the optimization of Rising Mains [CO5][L4]
v) UASB Process based treatment [CO5] [L1]

[2*4=8]

Q2. Write the typical value of key engineering parameters of operation of the following and draw the schematic diagram (attempt any two of the following)

i) Oxidation ditch
ii) Clariflocculator
iii) Rotating biological contactor

[2*3=6][CO4] [L1,L2]

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Q3. A) Calculate the diameter and discharge of a circular sewer laid at a slope of 1in 500 when running half full and with a velocity of 2 m/sec.
[5][CO 3][L5]

B) What are the important considerations while preparing a Layout of a wastewater treatment train? Further, what is the purpose of a hydraulic flow diagram?
[4][CO1][L2]

Q4. An activated sludge system is to be used for the secondary treatment of 20 MLD of municipal wastewater. After primary clarification, the BOD is 150 mg/ L, and it is desired to have not more than 10 mg/L of soluble BOD in the effluent. A completely mixed reactor is to be used, and pilot plant analysis has established the following kinetic values: $Y = 0.4$ kg/kg, $k_d = 0.06$ d^{-1}. Assuming an MLSS concentration of 3200 mg/L and an underflow concentration of 11,000 mg/L from the secondary clarifier, determine (1) the volume of the reactor, (2) the mass and volume of solids that must be wasted each day, and (3) the recycle ratio.
[3*3=9] [CO4] [L6]

Q5. A town with a population of 5 lakhs is to be supplied with water daily at 180 litres per head. The periodic demand of water is as follows:

6 AM to 9 AM	30% of total
9 AM to 12 Noon	20% of total
12 Noon to 3 PM	10% of total
3 pm to 6 pm	15% of total
6 pm to 9 pm	20% of total
9 pm to 6AM	5% of total

Determine the capacity of the reservoir assuming pumping to be at a uniform rate and the period of pumping to be from 6 AM to 9 PM
[8] [CO3] [L3,L5]

Q4(c): A saturated sandy soil layer is subjected to an earthquake of Mw 7.5 at a site in zone IV. The ground water table depth is located at 4 m from the ground surface. $\gamma_{sat} = 20\frac{kN}{m^3}$ and $\gamma_w = 9.8\frac{kN}{m^3}$. The Cyclic resistance ratio (CRR) is given as 0.15. Test the liquefaction susceptibility of the soil at a depth of 10 m below ground surface following IS 1893 Part 1: 2016.

[2 x 04 = 08][CO3,CO4] [BTL :L3,L4,L5]

Q5(a): How does IS 1893 Part 1: 2016 guide the design of buildings with soft stories? Provide an example of failure modes associated with such structures.

Q5(b): What are the seismic design considerations for masonry buildings specified in IS 4326: 2013?

Q5(c): What are the differences in stirrup detailing for ordinary moment-resisting frames (OMRF) and special moment-resisting frames (SMRF) under IS 13920: 2016?

[2 x 04 = 08][CO5] [BTL :L2,L3,L4].

Total No. of pages 04 Roll No._____

V SEMESTER B.Tech. [Civil Engg.]

END SEM EXAMINATION (NOVEMBER 2024)

CE313 EARTHQUAKE TECHNOLOGY

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

Note: Students' references IS 1893-Part 1: 2016, IS 13920: 2016, and IS 4326: 1993 are permitted during the exam. Answer four options for Q1 and two out of three for other questions. All questions hold equal marks. Assume missing data if needed.

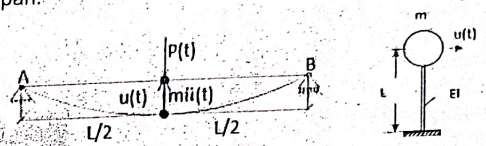
Q1: Attempt any four of the following:

[4 x 02 = 08][CO 1] [BTL 1 to 5 : Focused on L3,L4]

I. Give an example and briefly describe the characteristics of dynamic loading when:
   a. The load magnitude varies with time, but the direction remains constant.
   b. The load direction varies with time, but the magnitude remains constant.

II. Explain D'Alembert's principle.

III. Write the equation of motion for the simply supported beam shown in the figure below. Take $k = \frac{48\,EI}{L^3}$. Express BM(t) at the centre of the span.

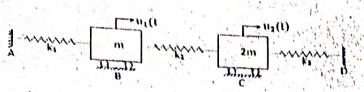


IV. Determine the natural frequency of the water tank shown in figure above. Assume that the water and tank act as a rigid body supported by a massless uniform cantilever column.

V. Compare the lumped mass procedure of system modeling in discrete and distributed coordinates.

VI. State the Hamilton principle and explain the terms involved.

Q2(a): Use Lagrangian equation to derive the equation of motion governing the system shown in figure below. Consider $u_1(t) and\ u_2(t)$ as the absolute displacements. Take $k_1 = k_2 = k_3 = k$.



Q2(b): A single degree of freedom SDOF system consists of a mass of 10 kg and a stiffness of 5000 N/m. The system is subjected to a harmonic excitation force $F(t) = 100\sin(5t)$ N, where t is in seconds. Determine:

a. The natural frequency of the system.
b. The damping ratio, assuming the system has a damping coefficient of 50 N Sec / m.
c. The steady-state amplitude of the displacement of the system.
d. The phase angle of the steady-state displacement with respect to the excitation force.

Q2(c): The mass and stiffness matrix of a 3 degree of freedom system are given below. Determine the eigen value and eigen vectors of the first mode for the system using Stodola method of iterative procedures. Take m = 45.4 kN sec^2/m and k = 29421 kN/m.

$$[k] = \{\frac{k}{9}\}\begin{bmatrix}16 & -7 & 0\\ -7 & 10 & -3\\ 0 & -3 & 3\end{bmatrix};[m] = m\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 0.5\end{bmatrix}$$

[2 x 04 = 08][CO2] [BTL :L4,L5]

Q3(a): A 4-story building with a total weight of 5250 kN is in a seismic zone IV. Take I = 1.2 , R = 5. Top floor weight is 750 kN and each lower floor weighs 1500 kN. the heights of the stories are uniform at 4 m each. Consider RC MRF without infills building frame. Building foundation is rock site. Using equivalent static method determine:

a. The time-period of the building and design horizontal acceleration coefficient as per IS 1893 Part I 2016.
b. The total base shear (V_{base}) acting on the building.
c. The lateral force acting at each floor level.
d. Draw loading diagram and Shear force diagram for the frame.

Q3(b): Mass matrix and modal matrix for a two-storey building frame are as follows. The initial displacements are known in terms of the constrained coordinates. Determine the initial conditions in modal coordinates.

$$\begin{bmatrix}2m & 0\\ 0 & m\end{bmatrix}\phi = \begin{bmatrix}\frac{1}{2} & -1\\ 1 & 1\end{bmatrix}[u(0)] = \begin{bmatrix}u_1(0)\\ u_2(0)\end{bmatrix} = \begin{bmatrix}\frac{1}{2}\\ 1\end{bmatrix}[\dot{u}(0)] = \begin{bmatrix}\dot{u}_1(0)\\ \dot{u}_2(0)\end{bmatrix} = \begin{bmatrix}0\\ 0\end{bmatrix}$$

Q3(c) The response spectrum method based lateral force data for a two-storey building and modal natural frequencies are given in the table below. Draw the storey shear diagram and apply the CQC modal combination rule to obtain the SFD for the frame. Consider the damping ratio of 5% for each floor.

Lateral Force	Mode 1	Mode 2
1st Floor (kN)	24.77	12.54
2nd Floor (kN)	24.77	-6.27
Natural Frequency	3.72 Hz	7.44 Hz

[2 x 04 = 08][CO3] [BTL :L3,L4,L5]

Q4(a) The equation of motion for a damped spring-mass SDOF system under harmonic excitation is

$$m\ddot{u}(t) + c\dot{u}(t) + ku(t) = F_0\sin(\omega t)$$

Show that the peak displacement amplitude occurs at a frequency ratio of $r = \frac{\omega}{\omega_n} = \sqrt{1-2\xi^2}$.

Q4(b): If the PGA at bedrock is 0.2g and the amplification factor for undamped soil is given by $AF = \left|\frac{1}{\cos(\frac{\omega H}{v_s})}\right|$ where H=10 m, v_s = 200 m/s, and the predominant frequency is f = 2 Hz, calculate the amplified PGA at the surface.

Total no. of Pages: 04

Roll no. 133

Vth SEMESTER

B.Tech.

END TERM EXAMINATION *Nov-2024*

COURSE CODE CE315 COURSE TITLE ROCK ENGINEERING

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

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

Q.1 A mudstone rock mass at a depth of 200 m contains three fracture sets. One set comprises bedding planes; these are highly weathered, slightly rough surfaces, and are continuous with an orientation of 180/10. Another set is jointing; these joints are slightly weathered, slightly rough, and have an orientation of 185/75. The third set is also jointing; again, the joints are slightly weathered and slightly rough, and have an orientation of 90/80. The strength of the intact rock has been assessed as 55 MPa, and values for the RQD and mean fracture spacing are reported as 60% and 0.4 m, respectively. Use the Q system to assess the stability of the rock mass. For the tunnel of 10m span calculate maximum unsupported span and permanent support pressure.

Also find the in situ modulus of deformation if a foundation of size 2m X 2m is placed on the above rock mass for a four storey building.

[10][CO1,3][BTL3, 4]

OR

(a) Explain with suitable sketch the use of plate load test and their results for finding out the bearing capacity of rock on sound and poor rocks?

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

(b) With the help of suitable sketches justify, how you will decide the positioning/ placing of the foundation at site, for the following conditions encountered at site: [5] [CO4] [BTL 3, 4]

(i) General concreting for foundation

(ii) Foundation on rock mass of two different compressiblities

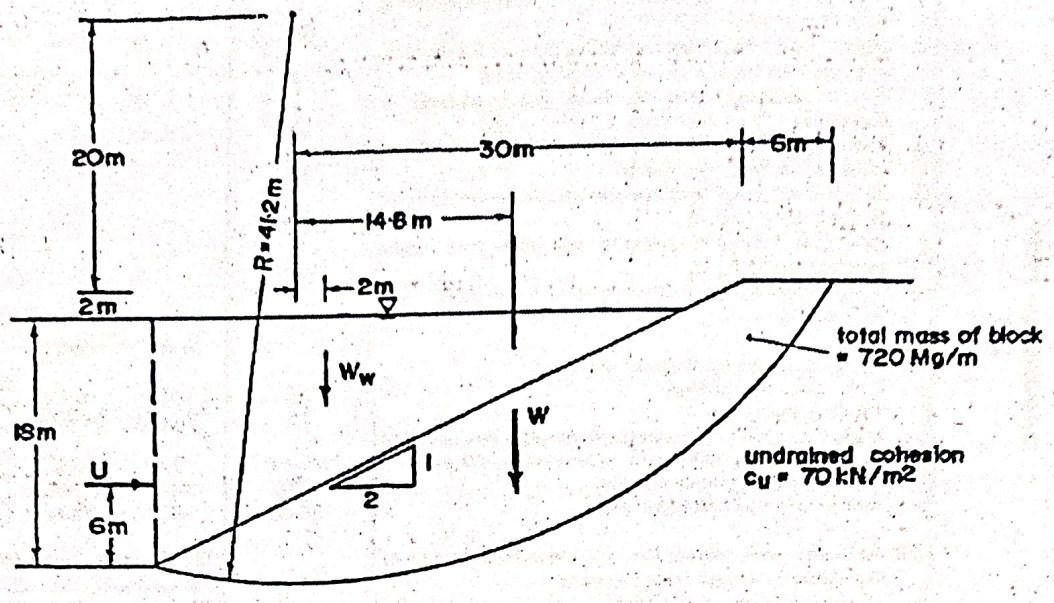
(iii) Foundation adjacent to sloping grounds

(iv) Foundation at different levels

(v) Foundation for multistoried building in rock slope

Rock Quality Designation, RQD	a: Very poor b: Poor c: Fair d: Good e: Excellent	RQD 0-25 25-50 50-75 75-90 90-100	*Where RQD is reported or measured as 10 (including 0), a nominal value of 10 is used to evaluate Q* *RQD intervals of 5, i.e., 100, 95, 90, etc., are sufficiently accurate*
Joint Set Number, J_n	a: Massive, none or few joints b: One joint set c: One joint set plus random d: Two joint sets e: Two joint sets plus random f: Three joint sets g: Three joint sets plus random h: Four or more joint sets, random, heavily jointed 'sugar cube', etc. j: Crushed rock, earthlike	J_n 0.5-1.0 2 3 4 6 9 12 15 20	*For intersections, use (3.0 × J_n). For portals, use (2.0 × J_n)*
Joint Roughness Number, J_r	*(i) Rock wall contact and* *(ii) Rock wall contact before 10cm shear* a: Discontinuous joint b: Rough or irregular, undulating c: Smooth, undulating d: Slickensided, undulating e: Rough or irregular, planar f: Smooth, planar g: Slickensided, planar *(iii) No rock wall contact when sheared* h: Zone containing clay minerals thick enough to prevent rock wall contact j: Sandy, gravelly, or crushed zone thick enough to prevent rock wall contact	J_r 4 3 2.0 1.5 1.5 1.0 0.5 1.0 1.0	*Add 1.0 if the mean spacing of the relevant joint set is greater than 3m.* *J_r = 0.5 can be used for planar slickensided joints having lineation, provided the lineations are favourably orientated.* *Descriptions b to g refer to small-scale features and intermediate-scale features, in that order.*
Joint Alteration Number, J_a	*(i) Rock wall contact* a: Tightly healed, hard, nonsoftening, impermeable filling, i.e., quartz or epidote b: Unaltered joint walls, surface staining only c: Slightly altered joint walls. Nonsoftening mineral coatings, sandy particles, clay-free disintegrated rock, etc. d: Silty or sandy clay coatings, small clay fraction (nonsoftening) e: Softening or low-friction clay mineral coatings, i.e., kaolinite, mica. Also chlorite, talc, gypsum, and graphite, etc., and small quantities of swelling clays (discontinuous coatings, 1-2mm or less in thickness) *(ii) Rock wall contact before 10cm shear* f: Sandy particles, clay-free disintegrated rock, etc. g: Strongly over-consolidated, nonsoftening clay mineral fillings (continuous, <5mm in thickness) h: Medium or low over-consolidation, softening, clay mineral fillings (continuous, <5mm in thickness) j: Swelling clay fillings, i.e., montmorillonite (continuous, <5mm in thickness). Value of J_a depends on percentage of swelling clay-sized particles, and access to water, etc.	J_a 0.75 1.0 2.0 3.0 4.0 4.0 6.0 8.0 8.0-12.0	ϕ_r (approx.) 25°-35° 25°-30° 20°-25° 8°-16° 25°-30° 16°-24° 12°-16° 6°-12°	*Values of ϕ_r are intended as an approximate guide to the mineralogical properties of the alteration products, if present*

Q.3 (a) Evaluate the short term stability for the dam shown in Fig. The embankment consists of a saturated soil for which the angle of shearing resistance $\phi u = 0^0$ and the undrained cohesion cu = 70kN/m2. The calculation is to be carried out for the reservoir depth of 18m and for the case where the reservoir has been completely emptied. [5][CO5][BTL4]



(b) Explain basic requirements for design of a structure in Rock. How repeated feedback of field data into the input data of the design helps in the development of the reliable design techniques ? [5][CO4][BTL4, 6]

Q.4 Write short notes on [10][CO 1,2,3,4,5][BTL1,3]

(a) CNL and CNS boundary condition
(b) RQD
(c) Landslides controlling measures
(d) Early Warning System
(e) Observatory method in Tunnelling

Joint Alteration Number, J_a	*(iii) No rock wall contact when sheared* k: Zones or bands of disintegrated or rock and clay (see g:, h:, j: for description of clay condition) l: Zones or bands of silty clay, small clay fraction (non-softening) m: Thick, continuous zones or bands of clay (see g:, h:, j: for description of clay condition)	6.0, 8.0 or 8.0-12.0 5.0 10.0, 13.0 or 13.0-20.0	6°-24°
Stress Reduction Factor, SRF	*(i) Weakness zones intersecting excavation, which may cause loosening of rock mass when tunnel is excavated*	SRF	*Reduce these SRF values by 25-50% if the relevant shear zones only influence but do not intersect the excavation*
	a: Multiple occurrences of weakness zones containing clay or chemically disintegrated rock, very loose surrounding rock (any depth)	10.0	
	b: Single weakness zones containing clay or chemically disintegrated rock (excavation depth <50 m)	5.0	
	c: Single weakness zones containing clay or chemically disintegrated rock (excavation depth >50 m)	2.5	
	d: Multiple shear zones in competent rock (clay-free), loose surrounding rock (any depth)	7.5	
	e: Single shear zones in competent rock (clay-free) (depth of excavation <50 m)	5.0	
	f: Single shear zones in competent rock (clay-free) (depth of excavation >50 m)	2.5	
	g: Loose open joints, heavily jointed or 'sugar cube', etc. (any depth)	5.0	
	(ii) Competent rock, rock stress problems	σ_c/σ_1 σ/σ_1	*Few case records available where depth of crown below surface is less than span width. Suggest SRF increase from 2.5 to 5 for such cases*
	h: Low stress, near surface	2.5 >200 >13	
	j: Medium stress	1.0 200-10 13-0.66	
	k: High-stress, very tight structure (usually favourable to stability, may be unfavourable for wall stability)	0.5-2.0 10-5 0.66-0.33	
	l: Mild rock burst (massive rock)	5-10 5-2.5 0.33-0.16	
	m: Heavy rock burst (massive rock)	10-20 <2.5 <0.16	
	(iii) Squeezing rock; plastic flow of incompetent rock under the influence of high rock pressures		*For strongly anisotropic stress field (if measured): when $5 \le \sigma/\sigma_3 \le 10$, reduce σ_c and σ_t to $0.8\sigma_c$ and 0.8σ; when $\sigma/\sigma_3 > 10$, reduce σ_c and σ_t to $0.6\sigma_c$ and $0.6\sigma_t$ (where σ_c = unconfined compressive strength, σ_t = tensile strength (point load), σ_1 and σ_3 = major and minor principal stresses)*
	n: Mild squeezing rock pressure	5-10	
	p: Heavy squeezing rock pressure	10-20	
	(iv) Swelling rock; chemical swelling activity depending on presence of water		
	q: Mild swelling rock pressure	5-10	
	r: Heavy swelling rock pressure	10-15	

Joint Water Reduction Factor, J_w		J_w	Approx. water pressure (kg/cm²)
	a: Dry excavations or minor inflow, e.g. 5 l/min locally	1.0	<1
	b: Medium inflow or pressure, occasional outwash of joint fillings	0.66	1.0-2.5
	c: Large inflow or high pressure in competent rock with unfilled joints	0.5	2.5-10.0 *Factors c to f are crude estimates. Increase J_w if drainage measures are installed*
	d: Large inflow or high pressure, considerable outwash of joint fillings	0.33	2.5-10.0
	e: Exceptionally high inflow or water pressure at blasting, decaying with time	0.2-0.1	>10.0 *Special problems caused by ice formation are not considered*
	f: Exceptionally high inflow or water pressure continuing without noticeable decay	0.1-0.05	>10.0

Q.2 (a) Explain role of Instrumentation in Tunnelling. With the help of suitable sketches explain the role of 3 D- Bi-reflex optical target to find tunnel convergence. [5] [CO 4][BTL 1 , 2]

(b) What are the methods of tunnelling in different types of rock ranging from soft to hard rock and explain drill and blast method of tunnelling. [5] [CO 5][BTL 1 , 2]

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Total no. of Pages: 02

Roll no.:.....

5th Semester

B.Tech Civil Engineering

End-Term Examination

Nov/Dec-2024

CE317: Solid Waste Management and Air Pollution Control

Time: 03:00 Hours

Max. Marks: 40

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

1. (a) What are the purpose of processing techniques and equipment. [5][CO1]

(b) Define composting and explain the different steps involved in the composting process. [5][CO2]

2. (a) Explain the various factors considered in the design of sanitary landfills. [5][CO3]

(b) Describe the classification of air pollutants along with their source of generation. [5][CO3]

3. Estimate the energy content of solid waste (on dry basis and ash free dry basis) with the following composition as given below: [10][CO4]

Components	% mass	Energy (KJ/Kg)	% moisture content
Food waste	35	4650	70
Paper	20	16750	06
Cardboard	15	16300	05
Plastic	10	32600	02
Garden Trimming	05	6500	60
Wood	12	18600	20
Tin cans	3	700	03

Assume mass of MSW sample as 100kg and fly ash content as 5%.

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4. (a) A landfill area of (150 m x 100 m) is available for handling 25 years municipal solid waste (MSW) for a town of 500000 people. Out of the total landfill area only 80% is actually available for landfill and other is used for auxiliary services. Assuming that average per capita MSW discard per year in town is 0.05 tons, landfill density is 500 kg/m^3, and that the 15% of the actual landfill cell volume is used for soil cover, estimate [5][CO4]

(i) the landfill lift in one year

(ii) number of years for which the landfill can be used if the landfill can't be increased beyond 25 m.

(b) Calculate the area requirement for a sanitary landfill for a city with population of 1,000,000 having a solid waste generation rate of 0.5 kg/cap./day. Assume density in landfill to be 1.2 ton/m^3. [5][CO4]

Or

Examine the environmental and health impacts of improper solid waste management. What measures can be taken to minimize these impacts. [10][CO4]

Total No. of Pages 01 Roll No. 139

End Semester Exam B.Tech Civil Engineering

5th Semester Nov 2024

CE 319: Application of Geo-informatics Remote Sensing and GIS in Engineering

Time: 03:00 Hours Max. Marks: 40

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

1. (a) What are the different types of satellites. Explain the various characteristics of satellite orbits with diagrams [5][CO1]
   (b) Differentiate spectral, spatial, radiometric and temporal resolutions with examples. [5][CO2]
2. (a) Define systematic and non-systematic errors. Describe the sources of systematic and non-systematic errors. [5][CO3]
   (b) Define digital elevation model, what are the different types of digital elevation models? [5][CO3]
3. (a) Write a short note on density slicing, thresholding, time composting images & synergic images with examples. [5][CO4]
   (b) Briefly explain the critical role of remote sensing in modern civil engineering emphasizing its benefits in improving efficiency, accuracy, sustainability in infrastructure development and maintenance [5][CO5]
4. (a) Explain the features of any one remote sensing satellite. [5][CO5]
   (b) Explain the calculation of slope from digital elevation model. [5][CO5]
5. (a) Write five applications each of Remote Sensing and GIS [5][CO5]
   (b) Tabulate EM spectrum and indicate specific applications of different bands [5][CO5]

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VII SEMESTER

B.Tech

END TERM EXAMINATION *Nov-2024*

CE-413 WATER RESOURCES MANAGEMENT

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) Explain the key factors influencing the planning of water resources projects.

(b) Discuss how factors like hydrology, environmental impacts, social needs, and economic constraints interact during the planning phase. [CO3]

Q.2 (a) Explain the concept of a Unit Hydrograph and its role in flood prediction? Differentiate between an Instantaneous Unit Hydrograph and a traditional Unit Hydrograph.

(b) A catchment has an area of 250 km² and a rainfall intensity of 2 cm/h. If the duration of rainfall is 3 hours, calculate the total volume of runoff using the Synthetic Unit Hydrograph method. Assume a runoff coefficient of 0.4. [CO2]

Q.3 (a) Discuss the key methodologies and challenges associated with flood forecasting and flood management within the realm of water resource engineering.

(b) The return period for the annual maximum flood of a given magnitude is 8 years. What is the probability that this flood magnitude will be exceeded once during the next 5 Years? [CO2]

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Q.4 (a) Discuss how multi-objective optimization can help balance conflicting objectives (e.g., irrigation needs vs. environmental conservation) in water resources engineering projects.

(b) Illustrate the importance of optimal sequencing and scheduling of resources in large-scale water infrastructure projects. [CO3]

Q.5 (a) How do engineers incorporate sustainable development principles in the planning of water resource projects?

(b) Discuss the importance of stakeholder involvement in the planning and developing water resources projects. [CO4]

Q.6 (a) Critically assess the limitations of traditional economic evaluation methods (e.g., net present value, internal rate of return) in the context of water resource projects with uncertain future benefits.

(b) How do these limitations affect decision-makers' ability to accurately capture the full range of potential benefits and costs? [CO3]

Q.7 (a) Explain water recharging methods including artificial recharge techniques such as recharge pits and trenches. Discuss the importance of groundwater recharge in maintaining aquifer levels.

(b) An aquifer of a 20 m average thickness is overlain by an impermeable layer of 30 m thickness. A test well of 0.5m diameter and two observation wells at a distance of 10 m and 60 m from the test well are drilled through the aquifer. After pumping at a rate of 0.1 m3/s for a long time , the following drawdowns are stabilized in these wells : first observation well , 4m; second observation well , 3m. Show the arrangement in a diagram . Determine the coefficient of permeability and the drawdown in the test well, State the validity of Darcy' law. [CO1]

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B.TECH. (CIVIL) VII SEMESTER

END TERM EXAMINATION **Nov/Dec-2024**

CE415: TRANSPORTATION SAFETY AND ENVIRONMENT

Duration: 3:00 Hr *Max. Marks: 40*

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

Q.1(a) Distinguish between condition diagram and collision diagram. [CO2][4]

(b) Write key steps of road safety audit. [CO3][4]

Q.2 Noise level data collected by noise level meter for a duration of half an hour recorded every 15 sec interval on the side of the highway are summarised in the following table. Determine Traffic Noise Index and Equivalent Noise Level. [CO4][8]

Noise level	No of observations
61-65	3
66-70	12
71-75	25
76-80	28
81-85	10
86-90	8
91-95	3
96-100	1

Q.3(a) Describe the positive and negative impacts of highway projects. [CO2][4]

(b) Describe the major elements of EMP. [CO3][4]

P.T.O.

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Q.4 Explain Gaussian dispersion model. Determine the ground level concentration of pollution from highway traffic at a distance of 2 km downwind along its centre line. Wind is blowing normal to highway at an average speed of 20 km/h. As per stability condition, constants are given as c = 33.2, d = 0.725 and f = -1.7. The traffic flow is measured as 3600 vehicles per hour. The average pollution emission rate of vehicles is given as 0.30 g/km. [CO4][8]

Q.5 Explain **ANY TWO** of the following: [CO1][4+4]

(a) EIS

(b) Black spot

(c) Noise dose

Total no of Page : 01 Roll No----------

SEVENTH SEMESTER B.Tech

END TERM EXAMINATION Nov/Dec-2024

CE 423: ADVANCED TRANSPORTATION ENGINEERING

Time: 3Hours Max. Marks: 40

Answer any five questions All questions carry equal marks Assume suitable data if any

1.(a) State importance of trip distribution in transportation planning. The distribution of present trips among zones 1,2 and 3 are given in O.D matrix shown in below table. The future trips generated in zone 1, 2 and 3 are expected to be 360, 1260 and 3120 respectively. Calculate future trip distribution matrix using Uniform Growth factor method.

D / O	1	2	3
1	60	100	200
2	100	20	300
3	200	300	20

(b) State importance of O-D survey in traffic management. Enlist various methods to conduct O-D survey. Explain execution of O – D survey using tag on car method with advantages and disadvantages.

[4+4] [CO1]

2. (a) What is modal split? Discuss importance of model split analysis.

(b) Define Trip. Explain the various factors governing the rate of trip generation and trip attraction. [4+4] [CO2]

3. The average normal flow of traffic on cross roads A and B during design period are 500 and 300 PCU per hour; the saturation flow values on these roads are estimated as 1350 ans 1100 PCU per hour respectively. The all-red time required for pedestrian crossing in 13sec. Design two phase traffic signal with pedestrian crossing by Webster's method. [8] [CO2]

4.A plate load test was conducted on a soaked subgrade during monsoon season using a plate diameter of 30 cm. The load values corresponding to the mean settlement dial readings are given below. Determine the modulus of subgrade reaction for the standard plate.

Mean settlement values,mm	0.0	0.24	0.52	0.76	1.02	1.23	1.53	1.76
Load values, kg	0.0	460	900	1180	1360	1480	1590	1640

[8] [CO3]

5. The traffic studies and axel load distribution studies carried out during project preparation indicated that there are(i)6000 commercial vehicles per day with rear axle loads in the range of 2700 to 3800 kg and growth rate of 7% p.a and (ii)2000 heavy commercial vehicles with their real axel loads in range 11,000 to 1400 kg and growth rate of 4.5%.The road pavement is expected to be constructed in a period of 3.0 years after this study and flexible pavement structure is to be designed.

[8] [CO4]

6. (a) What are the factors to be considered for the design of flexible pavements. Discuss significance of each

(b) Explain ESWL. Briefly explain the graphical method determination of ESWL. [4+4] [CO3]

7. (a) Discuss the importance of repeated application of very heavy loads on rigid pavements.

(b) Compute the radius of relative stiffness of 25 cm thick cement concrete slab using the following data;

Modulus of elasticity of concrete = 3×10^5 kg/cm^2

Poisson's ratio for concrete = 0.15

Modulus of subgrade reaction, K ==20 kg /cm^3

[4+4] [CO4]

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VII SEMESTER

B.Tech.

END TERM EXAMINATION *Nov-2024*

CE –431 Cyclonic Hazard Assessment and Mitigation

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

Note : All Questions are Compulsory.
Assume suitable missing data, if any.

Q1.

a. What are cyclones? Explain with help of diagram and labels. 4 marks

b. Briefly describe pressure zones, temperate zones, frigid zones and polar zones. 4 marks

Q2.

a. What is Coriolis force? 4 marks

b. Explain the formation of cyclones in the temperate zones with the help of a diagram-label it carefully. 4 marks

Q3.

a. How clouds are formed? 4 marks

b. How are cyclones nominated by the committee of different organizations? Name them and briefly describe them. 4 marks

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

VII SEMESTER

B.Tech.

END TERM EXAMINATION ***Nov-2024***

CE –431 Cyclonic Hazard Assessment and Mitigation

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

Note : All Questions are Compulsory.
Assume suitable missing data, if any.

Q1.

a. What are cyclones? Explain with help of diagram and labels. 4 marks

b. Briefly describe pressure zones, temperate zones, frigid zones and polar zones. 4 marks

Q2.

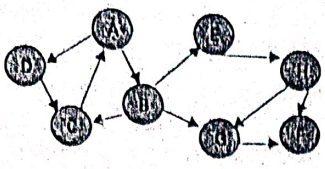
a. What is Coriolis force? 4 marks

b. Explain the formation of cyclones in the temperate zones with the help of a diagram-label it carefully. 4 marks

Q3.

a. How clouds are formed? 4 marks

b. How are cyclones nominated by the committee of different organizations? Name them and briefly describe them. 4 marks



In what order will the nodes be visited using a Breadth First Search? In what order will the nodes be visited using a Depth First Search?

[CO5][2 X2=4M]

Q.3 a) Binary search is better than linear search; how can we differentiate between them? Give a suitable example, highlight the limitations, and calculate the time complexity.

[CO4][4M]

b) Sort the following elements using the Algorithms mentioned below:

39, 9, 81, 45, 90, 27, 72, 18

i) Insertion sort
ii) Merge sort

Give the time complexity of each case and provide the best solution..

[CO4][2x2=4M]

Q.4 a) Let S be a stack of size $n \geq 1$. Starting with the empty stack, suppose we Push the first n natural numbers in sequence, and then perform n Pop operations. Assume that PUSH and POP operations take X seconds each, and Y seconds elapse between the end of one such stack operation and the start of the next operation.

(i) For $m \geq 1$, define the stack-life of m as the time elapsed from the end of PUSH(m) to the start of the Pop operation that removes m from S.

P.T.O

(ii) Find out the average stack-life of an element of this stack. Write all your steps/ calculations.

[CO1] [2X3=6 M]

b) The following C function takes a singly linked list of integers as a parameter and rearranges the elements of the list. The list is represented as pointer to structure. The function is called with the list containing integers 1, 2, 3, 4, 5, 6, 7 in the given order. What will be the contents of the list after the function completes?

[CO2] [2M]

```
struct node
{
int value;
      struct node *next;
};
void rearrange(struct node *list)
{
struct node *p, *q;
 int temp;
if (list==NULL || list → next==NULL)
return;
p = list; q = list → next;
while(q!=NULL)
{
temp = p → value;
p → value = q → value;
q → value = temp;
p = q → next;
if (p!=NULL) q=p → next;
else q= NULL;
}
}
```

Q.5 Define these terms:

i) Difference between Graph and Tree data structure
ii) Graph, Sub-Graph and Multigraph
iii) In-degree, Out-degree and Total No. of degree for any Graph
iv) Adjacency Matrix, give suitable example including loop for any vertex

[CO6] [2 X 4=8 M]

Total No. of Page -- 2 Roll No. 153

Fifth Semester B.Tech.ICSE/

End Term Examination November-2024

CO203: OBJECT ORIENTED PROGRAMMING

Time: 3:00 Hours Max. Marks: 40

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

. No. 1 [1x8]

) What is a class in Object-Oriented Programming? Provide an example. [1][L2][CO1]

) What are constant objects in C++? [1][L2][CO2]

) List two advantages of object-oriented programming over structured programming. [1][L2][CO1]

) What is the difference between static and non-static member functions in C++? [1][L2][CO2]

) What is type promotion in Java? [1][L2][CO5]

) Define the role of interfaces in Java. [1][L2][CO5]

) Mention one use of the finally block in Java. [1][L2][CO5]

) What is multithreading, and why is it useful in Java? [1][L2][CO5]

. No. 2 [2x4]

) Demonstrate how objects can be passed as arguments in a C++ program. [2][L3][CO2]

) Write a Java program to demonstrate the concept of inheritance using extends. [2][L3][CO5]

) Explain the concept of this pointer in C++ with an example. [2][L3][CO3]

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(d) Describe with examples the difference between method overloading and method overriding in Java. [2][L3][.5

Q. No. 3 [4x2]

(a) Analyze how abstract classes in C++ are implemented with the help of pure virtual functions. Provide an example. [4][L4]

(b) Write a Java program to create multiple threads and demonstrate thread priorities. [4][L4]

Q. No. 4 [4x2]

(a) Design a program in C++ that demonstrates the concept of objects as return values in member functions. [4][L5]

OR

Write a Java program that uses the Serializable interface to store and retrieve an array of employee objects.

(b) Explain with a program how the **client-server model** is implemented in Java using **socket programming**. [4][L5]

Q. No. 5 [3+5]

(a) Write a Java program to demonstrate polymorphism using an abstract class and overridden methods. [3][L4]

(b) **Write a Java program** to design a **GUI-based calculator using Swing**, including basic event handling. [5][L5]

OR

Explain with an example the advantages and limitations of virtual destructors in C++.

Total No. of Page – 3 Roll No. .....

Elective 2 **B.Tech.**

End Term Examination ***Dec–2024***

CO205: DISCRETE STRUCTURES

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

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

Q. No. 1

A Test the validity of the following argument relating to the students of Delhi Technological University (DTU) using Rules of Inference: - (5) [CO1] {L5}

(i) A student of the DTU is eligible to apply for placement only if the student has CGPA more than 6.0.

(ii) If a student has not obtained passing grade in a subject that a student registered for, then the student cannot appear for the internship test.

(iii) If a student is eligible to apply for placement, then the student can appear for the internship test.

(iv) There are some students who have CGPA less than 6.0

Therefore, it can be concluded that at least one student did not obtain passing grade in a subject that the student registered.

B Convert the statement $(x \rightarrow (y \wedge w)) \wedge (z \rightarrow (y \wedge w))$ into PDNF forms (5) [CO1] {L2}

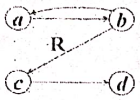
Q. No. 2

A Prove or disprove that for any integer $n \geq 1$, $n^3 - n$ is divisible by 3. (5) [CO2] {L5}

B Solve the recurrence relation represented by $a_n = 5a_{n-1} - 6a_n - 2$ for $n \geq 2, a_0 = 1, a_1 = 2.5$ and determine the value of a_{25} (5) [CO2] {L3}

Q. No. 3

A Let $A = \{a, b, c, d\}$ and R a relation on A defined by the digraph shown in the figure. (5) [CO3] {L3}



Is R a transitive relation? If not, identify the transitive closure of R.

B If $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$, $p_1 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 3 & 4 & 1 & 2 & 6 & 5 & 7 & 8 \end{pmatrix}$; (5) [CO3] {L2}

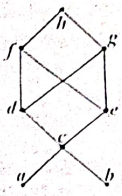
$p_2 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 2 & 3 & 1 & 5 & 4 & 6 & 7 & 8 \end{pmatrix}$; $p_3 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 6 & 3 & 2 & 5 & 4 & 1 & 7 & 8 \end{pmatrix}$.

Outline the expression for $(p_2 \circ p_1) \circ p_3$. Is the resulting permutation odd or even?

Q. No. 4

A If $A = \{1, 2, 3, 5, 6, 10, 15, 30\}$ with the partial order $\leq$ of divisibility on A, *i.e* $a \leq b$ if and only if a *divides* b ; and $B = P(S)$, the power set of S, where $S = \{e, f, g\}$; and $(B, \subseteq)$ be a poset, where $\subseteq$ is the with partial order of containment. Analyse if $(A, \leq)$ and $(B, \subseteq)$ are isomorphic posets. Justify your answer. (5) [CO3] {L4}

B Consider the poset $(A, \leq)$. If $A = \{a, b, c, d, e, f, g, h\}$ and $\leq$ is the partial order on A with Hasse diagram as shown in Figure. $B = \{a, b\}$ and $C = \{c, d, e\}$ are subsets of A. Interpret what are the following: - (5) [CO3] {L2}



(i) Lower Bounds of B and C.

(ii) Upper Bounds of B and C

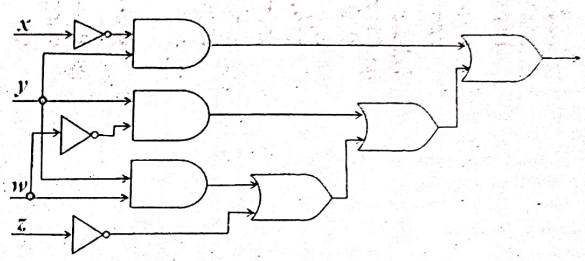
(iii) Greatest Lower Bound of B and C

(iv) Least Upper Bound of B and C

Q. No. 5

A Given D_n is the set of positive integers that divides any integer $n \geq 1$ and p is a prime number, prove or disprove that if p^2 divides n, then D_n is not a Boolean Algebra. (5) [CO3] {L5}

B Develop the Boolean polynomial for the function, $f: B_4 \rightarrow B$ given by logic diagram show in the figure given below. (5) [CO3] {L3}



Use the properties of Boolean algebra (or any graphical method) to refine the polynomial to use minimal number of variables and operators.

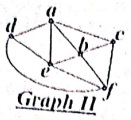
Draw logic diagram for the new Boolean polynomial.

A Draw the digraphs of the possible spanning trees for the symmetric relation whose graph is given alongside. How many spanning trees are there? (5) [CO4] (L2)



B For the graph H shown in figure, construct the chromatic polynomial, $P_H(x)$.

Use $P_H(x)$ to find the chromatic number, $\chi(H)$, of graph H. (5) [CO4] (L6)



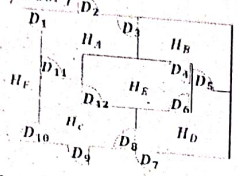
Graph H

Q. No. 7

A An exhibition route map is required to be made for a newly renovated museum with five indoor Exhibit Halls and one outdoor Exhibit Stand. The floor plan of the museum is given in Figure.

Plan a route to visit every exhibit hall / stand in the museum by passing through each door exactly once? Justify your answer. (5) [CO4] (L3)

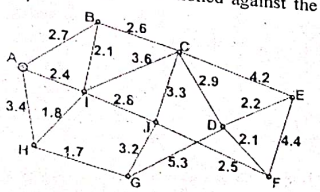
Legend
H_i: Exhibit Hall/Stand i
D_j: Door j



B The representative weighted-graph of the cost of establishing data connectivity between new branch offices of a multi-national company (MNC) is shown in figure below. The weights mentioned against the edges represent the cost in multiples of ₹100,000/-. The Chief Operations Officer of the MNC intends to find the most economical solution to the problem. (5) [CO5] (L3)

Assuming that the Head-office is located at city A, build a minimal spanning tree (root as city A) with vertices representing various branch offices of the company.

What will be the minimum cost for establishing this data network?



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

V Semester
B.Tech.

END SEMESTER EXAMINATION *(November-2024)*

CO301 SOFTWARE ENGINEERING

Time: 3 Hours *Max. Marks: 40*

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

Q1. Answer the following questions briefly:

a) Differentiate between Black Box Testing and White Box Testing with suitable examples. **[CO3]**

b) What are the advantages of using DFDs for requirement analysis? Mention at least three benefits and provide a brief explanation for each **[CO2]**

c) Your team is developing a mobile application for online food delivery. Which software process model would you recommend for this project? Justify your choice. **[CO5, 6]**

[4+4+2=10] [BTL 4,2,5]

Q2. a) A software team is working on a project with the following metrics:

- Total lines of code (LOC): 10,000
- Effort per KLOC: 25 person-months
- Average productivity: 200 LOC/person-month

Calculate the total effort required and the estimated number of people required to complete the project in 6 months. **[4][CO4][BTL 3]**

b) A client is unhappy with the prototype of their software application. As a project manager, how would you handle this situation? Suggest three steps you would take to resolve their concerns. **[2][CO1,6][BTL 6]**

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c) What is regression testing? Why is it important in the software lifecycle? [4][CO5][BTL 2]

Q3. a) Define coupling and cohesion in software design. How do they impact software quality? [5] [CO2,3] [BTL 2]

b) Explain and analyze the distinctions and similarities between incremental development and iterative development, focusing on their methodologies, practical applications, and impact on software project outcomes. [5] [CO1] [BTL 4]

Q4. a) A university wants to automate its admission process. As a software engineer, draw a context-level-0 and context-level-1 DFD for this system. Include:

- External entities: Applicant, Admin Office
- Processes: Submit Application, Verify Documents, Process Fee
- Data stores: Application Records, Payment Records

[6] [CO3] [BTL 6]

b) You are managing a software development team for an e-commerce website. How would you ensure the quality of the software during its development? Mention any three strategies you would follow. [4][CO5] [BTL 3]

Q5. a) Define software prototyping and explain its benefits and drawbacks. [5] [CO4] [BTL 2]

b) List the importance of requirement engineering in the software development process? Explain its main steps. [5] [CO4] [BTL 1]

END

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Total No. of Pages 2 *Roll No.....*
V-SEMESTER *B.Tech.(CO+EL*
END TERM EXAMINATION Nov/Dec- 202

CO-303 THEORY OF COMPUTATION

Time: 3:00 Hours **Max. Marks: 5**

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

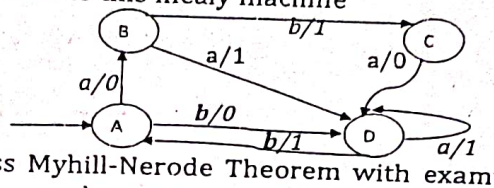
Q.No. 1

A. Design a Finite automata (FA) which can check that th decimal of given binary string is divisible by 5 and also write regular expression for the language $L=\{0^n 1^m \mid (n+m \text{ is even})\}$. *[5] CO1 BTL-3*

B. Prove that if L is a context free language (CFL) and F is regula language then L-F is a context free language. *[5] CO4 BTL-6*

Q.No. 2

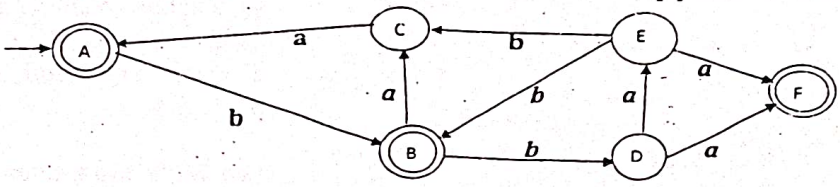
A. Consider following mealy machine, construct a Moore machine equivalent to this mealy machine *[5] CO3* BTL-3



B. Discuss Myhill-Nerode Theorem with example and construct DFA for regular expression$(0 + 1)^*(110 + 01)$. *[5] CO1* BTL-2,3

Q.No. 3

A. Explain Arden's theorem and find a regular expression (RE) corresponding to the following FA using Arden's theorem. *[5] CO2* BTL-4



b). Devise an efficient algorithm that takes advantage of symmetry properties to display a sine function over one cycle. [3][CO#2]

c). Consider a line L with equation $y = \frac{1}{2}(x+4)$ and triangle XYZ with X(2,4), Y(4,6) and Z(2,6). Reflect the triangle about line L. [3][CO#3]

Q.4

a). Derive the normalization transformation matrix for window to viewport transformation. [2][CO#4]

b). Modify the boundary-fill algorithm for a 4-connected region to avoid excessive stacking by incorporating scan-line methods. [3][CO#2]

c). Derive the three-dimensional transformation matrix for scaling an object by a scaling factor s in a direction defined by the direction cosines α, β, and γ. [3][CO#3]

Q.5

a). A cube of length 10 units has one of its corner at origin (0,0,0) and three edges along three principle axis. Hence, the coordinates of the cube are A(0,0,0), B(10,0,0), C(10,10,0), D(0,10,0), E(0,0,10), F(10,0,10), G(10,10,10), H(0,10,10). If the cube is to be rotated about z-axis by an angle of 45 degree in counterclockwise direction, then calculate the new position of all 8 vertices of the cube. [2][CO#3]

b). A cubic Bezier curve is defined by control points (20,20), (60,80), (120,100) and (150,30). Find equation of the curve and its mid point coordinates. [3][CO#5]

c). Explain Weiler-Atherton polygon clipping algorithm with the help of an example. What are the advantages of Weiler-Atherton polygon clipping algorithm over Sutherland-Hodgeman polygon clipping algorithm. [3][CO#4]

Q.6 Write short notes on following: [8][CO#6]

a). Specular reflection model
b). Guard shading
c). Depth buffer (Z-Buffer and A-Buffer) method
d). Scan line method

Total No. of Pages 03 *Roll No. .....*

FIFTH SEMESTER **B. Tech.[CSE]**

END SEMESTER EXAMINATION ***Nov-Dec 2024***

CO325 PROBABILITY & STATISTICS

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

Note: Answer *ALL* questions.
Assume suitable missing data, if any.
CO# is course outcome(s) related to the question.

1[a] Answer the followings: **[5] [CO1]**

(i) An insurance company believes that people can be divided into two statistics show that an accident-prone person will have an accident at sometime within a fixed 1-year period with probability 0.4, whereas this probability decreases to 0.2 for a non-accident-prone person. If we assume that 30 percent of the population is accident-prone. What is the probability that a new policyholder will have an accident within a year of purchasing a policy?

(ii) Reconsider part (i) and suppose that a new policyholder has an accident within a year of purchasing his policy. What is the probability that he is accident-prone?

[b] Suppose that X is a continuous random variable whose probability density function is given by **[5] [CO1]**

$$f(x) = \begin{cases} C(4x - 2x^2), & 0 < x < 2, \\ 0, & otherwise. \end{cases}$$

(i) What is the value of C?

(ii) Find $P(X > 1)$.

2. Answer *any TWO* of the followings

[a] A pointer is spun on a fair wheel of chance numbered from 0 to 100 around its circumference and it follows uniform distribution. **[5] [CO2]**

(i) What is the average value of all possible pointer positions?

(ii) What deviation from its average value will the pointer position take on the average; that is, what is the pointer's standard deviation?

[b] There are 500 boxes each containing 1000 ballot papers for election. The chance that a ballot be defective is 0.002. Assuming Poisson distribution, find the number of boxes containing at most two defective ballot papers. [5] [CO2]

[c] A missile can be accidentally launched if two relays A and B both have failed. The probabilities of A and B failing are known to be 0.01 and 0.03, respectively. It is also known that B is more likely to fail (probability 0.06) if A has failed. [5] [CO2]

(i) What is the probability of an accidental missile launch?
(ii) What is the probability that A will fail if B has failed?
(iii) Are the events "A fails" and "B fails" statically independent?

3. Answer *any TWO* of the followings

[a] Suppose that two-dimensional continuous random variable (X, Y) has joint probability density function given by: [5] [CO4]

$$f(x,y) = \begin{cases} 1 - e^{-x} - e^{-y} + e^{-(x+y)}, & x > 0, y > 0 \\ 0, & otherwise. \end{cases}$$

(i) Are X and Y independent?
(ii) $P(X + Y \leq 1)$
(iii) $P(X \leq 1 \cap Y \leq 1)$.

[b] A joint sample space for two random variables X and Y has four elements (1, 1), (2, 2), (3, 3), and (4, 4). Probabilities of these elements are 0.1, 0.35, 0.05, and 0.5 respectively.

(i) Determine through logic and sketch the distribution function $F_{X,Y}(x, y)$.
(ii) Find the probability of the event $\{X \leq 2.5, Y \leq 6\}$.
(iii) Find the probability of the event $\{X \leq 3\}$. [5] [CO3]

[c] Three coins are tossed. Let X denote the number of heads on the first two and Y denote the number of heads on the last two. Find: [5] [CO4]

(i) The joint distribution of X and Y.
(ii) Marginal distribution of X and Y.
(iii) E(X) and E(Y).

4.[a] A researcher wants to determine if the average weight of a particular breed of dogs differs from 30 kg. She randomly samples 50 dogs of this breed and finds an average weight of 32 kg with a standard deviation of 5 kg. Use a 0.05 significance level to test the claim that the average weight of this breed of dogs is different from 30 kg. [5] [CO4]

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[b] A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. Test whether the sample has come from a population with a mean of 38. Also calculate 95% confidence limits for the population. [5] [CO5]

5. [a] A sample of 26 bulbs gives a mean life of 990 hours with a S.D. of 20 hours. The manufacturer claims that the mean life of bulbs is 1000 hours. Is the sample not up to the standard? [5] [CO5]

[b] A study is conducted to test whether gender is associated with a preference for a particular drink. The data is summarized below:

Gender	Coffee	Tea	Total
Male	40	30	70
Female	20	60	80
Total	60	90	150

At a 5% level of significance, test whether drink preference is independent of gender. [5] [CO6]

----Best of Luck----

Given the input $\mathbf{X} = [120, 3]$, compute the hidden layer and output layer values using ReLU and sigmoid activations, respectively. Classify the customer as "Churn" or "No Churn" using a threshold of 0.5.

[b] For the MLP described in the above question, let the true label for the customer $\mathbf{X} = [120, 3]$ be Y = 1. Compute the error using binary cross-entropy loss. Then, derive the gradient of the loss with respect to the activation from the output layer. [2+2] [CO3]

[c] For the MLP described in the above question, Construct the computational graph showing the flow of calculations. Then, derive the gradient of the loss with respect to $W^{(2)}$. [2+2] [CO3]

5[a] A two-player zero-sum game tree (Fig. 1) has a root node as the current state and leaf nodes with scores (some as unknown "?"). Player Max aims to maximize, and Player Min aims to minimize the score. Apply the minimax algorithm with alpha-beta pruning to determine the root node's optimal value. Identify pruned branches and justify the pruning decisions. [4] [CO6]

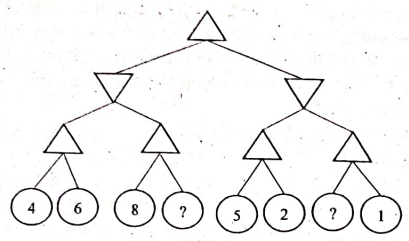

Fig. 1

[b] In a 4x4 grid world, a robot starts at S (1, 1) and aims to reach the charging station C (4, 4). Each step incurs a reward of −2, and reaching C provides a reward of +20. The discount factor is $\gamma = 0.8$. Using the value estimates for neighboring states given in the table below, compute the expected returns for each action (up, down, left, right) from (1, 1) using the Bellman update equation. Determine the optimal action at (1, 1) and explain the impact of γ on the decision. [4] [CO6]

Table IV

State	(1,1)	(1,2)	(2,1)	(2,2)	(3,3)	(4,4)
Value	4.0	4.8	5.2	5.6	8.0	20.0

----Best of Luck----

Total No. of Pages 04 *Roll No. .....*

FIFTH SEMESTER **B. Tech.[CSE]**

END SEMESTER EXAMINATION ***Nov-Dec 2024***

CO327 MACHINE LEARNING

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

Note: Answer *ALL* questions.
Assume suitable missing data, if any.
CO# is course outcome(s) related to the question.

1[a] Classify the following tasks as supervised, unsupervised, or reinforcement learning. For each, explain the type of data used (labeled, unlabeled, or interactive feedback), the task's goal (e.g., prediction, grouping, or decision-making), and the key challenge in achieving the goal, considering factors like data quality, model generalization, or exploration-exploitation trade-offs. [Keep your answer pointwise (each one sentence only)]. [1x4=4] [CO1]

(i) Develop a model to predict the likelihood of a customer purchasing a product based on their demographic and browsing data. Is this prediction model likely to generalize well to unseen customers?

(ii) Analyze a dataset of unlabeled social media posts to uncover key topics or themes and group them into related clusters. What metrics could be used to evaluate the quality of these clusters?

(iii) Train an autonomous vehicle to navigate through an unfamiliar environment and reach a target destination while avoiding obstacles. How can the vehicle balance exploration of the environment and exploitation of learned strategies?

(iv) Use historical real estate data, including features like location, size, and age of houses, to predict the sale price of new properties. How can the model account for differences in market conditions over time?

[b] A hospital is using a decision tree model to classify patients into "high-risk" and "low-risk" categories for a specific medical condition based on their health metrics. To evaluate the model, the effects of pruning are analyzed for certain nodes in the decision tree, focusing on changes in both training and validation accuracies. The table below provides the relevant data for analysis. Identify which nodes should be pruned to

improve the decision tree's generalization and justify your answer mathematically. **[4] [CO3, CO4]**

Table I

Metric	Node A	Node B	Node C	Node D	Node E
Training Accuracy (%) Before Pruning	97	96	98	95	94
Training Accuracy (%) After Pruning	95	94	96	93	91
Validation Accuracy (%) Before Pruning	84	83	82	81	80
Validation Accuracy (%) After Pruning	86	85	84	83	82

2. Answer *any TWO* of the followings

[a] A space research organization is using a Naive Bayes classifier to classify a newly observed celestial object as either a Comet or an Asteroid. The classification is based on three binary features: "Highly Reflective", "Irregular Orbit", and "Ice Presence" (1 for true, 0 for false). The following table summarizes the relevant counts from the training dataset: **[4] [CO3]**

Table II

Class	No. of Objects with Highly Reflective = 1	No. of Objects with Irregular Orbit = 1	No. of Objects with Ice Presence = 1	Total Objects in Class
Comet	30	50	40	60
Asteroid	20	10	5	40

A newly detected object has the following features: Highly Reflective = 1, Irregular Orbit = 1, and Ice Presence = 1. Using the Naive Bayes classifier, classify the object as a Comet or an Asteroid.

[b] A medical research team is using a Support Vector Machine (SVM) to classify patients as "High Risk" or "Low Risk" for a condition based on two health indicators: X_1 (blood pressure) and X_2 (cholesterol level). The decision boundary identified by the SVM is $0.4\times X_1 + 0.6\times X_2 - 120 = 0$, with two support vectors: one at ($X_1 = 140$, $X_2 = 200$) for "High Risk" and another at ($X_1 = 130$, $X_2 = 220$) for "Low Risk." Classify a new patient with $X_1 = 145$ and $X_2 = 210$. Explain the role of support vectors in the SVM. **[2+2] [CO3]**

[c] A logistic regression (LR) model is used to predict whether a student will pass an exam (Pass = 1) or fail (Pass = 0) based on two features: Hours Studied (X_1) and Number of Practice Tests Taken (X_2). The coefficients of trained LR model are: $w_0 = -4$, $w_1 = 0.6$, $w_3 = 0.8$. For a student who studied for 10 hours and took 5 practice tests, determine whether the student will pass or fail based on the probability $P(Pass = 1)$ and a decision threshold of 0.5. What would the classification be if the decision threshold is increased to 0.7? **[4] [CO3, CO4]**

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3. Answer *any TWO* of the followings

[a] A telecom company is using K-means clustering to segment customers based on monthly usage patterns. The company tested different values for the number of clusters, K, and recorded the **inertia** for each. In K-means, inertia measures the sum of squared distances between each data point x_i and the centroid c_k of its assigned cluster C_k: **[4] [CO1, CO6]**

$$Inertia = \sum_{k=1}^{K} \sum_{i \in C_k} \|x_i - C_k\|^2$$

The inertia values recorded for different cluster counts K are shown below:

Table III

K	2	3	4	5	6
Inertia	3500	2500	1800	1200	1000

Explain inertia in K-means clustering and why it decreases as K increases. Determine the optimal K based on the inertia values, describing how the "elbow method" can help.

[b] A PCA was performed on a dataset with four features: Temperature, Humidity, Wind Speed, and Precipitation. The first principal component (PC1) captures 65% of the total variation in the dataset, and the second principal component (PC2) captures 25%. What does it mean that PC1 captures 65% of the variation in the dataset? Should the dataset be reduced to two principal components based on the variation captured? Justify your answer. **[2+2] [CO6]**

[c] A classification model predicts whether a basketball player will score more than 20 points in a game (High Scorer = 1) or not (High Scorer = 0). In a test dataset of 500 games, 100 were actual high-scoring games. The model predicted 120 games as high-scoring, correctly identifying 80, while 20 high-scoring games were misclassified as low-scoring. Construct the confusion matrix and calculate Precision, Recall, Specificity, and F1-Score. Discuss how increasing the threshold affects Recall. **[1+2+1] [CO4]**

4. Answer *any TWO* of the followings

[a] An MLP predicts customer churn (Churn = 1, No Churn = 0) based on Monthly Spend (x_1) and Customer Support Tickets (x_2). The MLP has 2 input neurons (layer 0), 2 hidden neurons with ReLU activation (layer 1), and 1 output neuron with sigmoid activation (layer 2), The weights and biases are: **[4] [CO3]**

$$W^{(1)} = \begin{bmatrix} 0.5 & -0.2 \\ 0.7 & 0.1 \end{bmatrix}, W^{(2)} = \begin{bmatrix} 0.8 \\ -0.3 \end{bmatrix}, b^{(1)} = \begin{bmatrix} 0.1 \\ -0.3 \end{bmatrix}, b^{(2)} = -0.2$$

Total no. of Pages: 03

7th SEMESTER
B.Tech.

END TERM EXAMINATION NOV-2024

COURSE CODE CO411 COURSE TITLE COMPUTER VISION

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

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

Q.1 Attempt all parts:

(a). Illustrate with a real-world example for pinhole perspective and explain its behaviour under various effects. [4][CO1][BTL2]

(b). A point light source illuminates a surface located 2 m away. The radiant intensity of the light source is 50 W/sr. Assuming the surface is perfectly Lambertian with a reflectance ρ=0.6\rho = 0.6ρ=0.6, calculate:

1. The irradiance on the surface.
2. The radiance observed from the surface at an angle of 30 degree from the surface normal.

[6][CO1][BTL5]

Q.2. Attempt any two parts:

(a). Suppose two cameras placed at 50 cm apart are viewing a scene point placed. front of them. The focal length of in the cameras is 20 cm. The scene point is imaged at 19 cm (from the left edge of the first cameras image plane) and 9 cm (from the left edge of the second cameras image plane). Find the depth of the scene point.

[5][CO1][BTL3]

(b). Explain the notion of the derivative of an image. Suggest a definition of first-order derivative and second-order derivative. Justify the definitions by using basic properties of the derivatives.

[5][CO2][BTL1,3]

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(c). What is image enhancement? Differentiate spatial domain and frequency domain methods. If I is the input intensity and O is the output intensity then write the equation for image negation and log transformation. Let the intensity range for the image is [0, L-1].

[5][CO2][BTL1,2]

Q.3 Attempt any two parts:

(a). In an optical flow problem, the intensity of a pixel at (x,y) in frame t is I(x,y,t). Assume the following intensities:

I(x,y,t)=50, I(x+1,y,t)=55, I(x,y+1,t)=52, I(x,y,t+1)=53.

1. Compute the gradients ∂I/∂x, ∂I/∂y, and ∂I/∂t.
2. Solve for the flow components v_x and v_y using the **optical flow constraint equation**

$$\frac{\partial I}{\partial x}v_x + \frac{\partial I}{\partial y}v_y = -\frac{\partial I}{\partial t}$$

[5][CO4][BTL#]

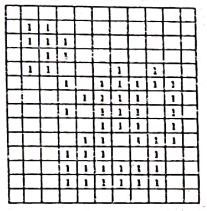
(b). If an edge detection task has a very low signal-to-noise ratio, which parameter(s) of the Canny detector would you adjust? Justify your answer with numerical examples. [5][CO3][BTL6]

(c). Explain the concept of optical flow. How is it used to estimate motion in a sequence of images? Discuss the differences between dense and sparse optical flow. [5][CO4][BTL4]

Q.4 Attempt any two parts:

(a). Given the image and the structure element in, compute the output images for the following operations: (i) Dilation (ii) Erosion

[5][CO4][BTL4]



image



structuring element

(b). A PCA-based feature extraction reduces the dimensionality of a dataset from 100 dimensions to 20 dimensions. If the explained variance ratio of the first 5 components is [0.4, 0.3, 0.15, 0.1, 0.05], what percentage of the total variance is captured by these 5 components? [5][CO5][BTL2]

(c). Differentiate between semantic segmentation, instance segmentation, and panoptic segmentation. [5][CO5][BTL5]

Q.5 Attempt any two parts:

(a). How does illumination variation in a scene affect the accuracy of optical flow estimation? also, discuss the computational challenges of real-time optical flow estimation. [5][CO5][BTL4]

(b). In an object detection algorithm, bounding boxes (BB) are denoted as (x,y,h,w) where x is the x-axis coordinate, y is the y-axis coordinate, h is the height of BB, and w is the width of BB. Now, calculate the Intersection over union for the following pair <Ground truth, Predicted> of bounding boxes: [5][CO6][BTL3]

i. <(10, 15, 100, 150), (20, 20, 90, 130)>
ii. <(40, 35, 120, 100), (30, 25, 100, 100)>

(c). Explain the importance of feature extraction in object detection models. Compare handcrafted features (e.g., HOG, SIFT) with deep features extracted from convolutional neural networks (CNNs).

[5][CO6][BTL2]

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

VII -SEMESTER B.Tech.(CO)

END SEMESTER EXAMINATION Nov – 2024

CO-415 WIRELESS AND MOBILE COMPUTING

Time: 3:00 Hours Max. Marks: 40

Note: Answer all questions by selecting any Two parts from each question.
Assume suitable missing data, if any.

Q.No. 1 4 X2 =08

A) Analyze the differences between various IEEE 802.11 standards and explain the purpose of each field in the MAC frame of IEEE 802.11, including how it relates to wireless communication. CO#1 BTL-4

B) Apply the principles of CSMA/CA to analyze how devices manage access to a shared medium and explain working of Authentication & access in GSM. CO#4 BTL -3

C) Describe how the subsystems of cellular architecture interact with one another to provide mobile services and explain Mobile call origination and termination in a cellular system. CO#2 BTL-4

Q.No. 2 4 X2 =08

A) A city has an area of 1800 square miles and is covered by a cellular system using a 19- cell reuse pattern. Each cell has a radius of 8 miles and the city has 70 MHz spectrum with a full duplex channel bandwidth of 90KHz. Find: CO#2 BTL-5

(i) The number of cells in the service area.

(ii) The number of channels per cell.

(iii) Total number of subscribers that can be served.

B) Evaluate the effectiveness of Mobile IP in real-world applications and explain how Mobile IP maintains a mobile device's connectivity while roaming between different networks? CO#3 BTL-5

C) Compare and contrast RSA with other key exchange algorithms and find cipher text corresponding to plain text M=439, also generate Public key and Secret key using RSA algorithm by taking two prime numbers p=31 and q=23. CO#3 BTL-5

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[c]. In a Genetic Algorithm, given the following fitness scores for a population of 5 chromosomes: {3,7,2,8,5}, calculate the selection probability for each chromosome using the roulette wheel selection method. [4||CO3||BTL3]

Q.4 [a]. Design a hybrid algorithm that combines features of Particle Swarm Optimization and Genetic Algorithm to tackle the Travelling Salesman Problem (TSP), with a flowchart. [6||CO4||BTL6]

[b]. Discuss the concept of Pareto Optimality and Dominance. [2||CO4||BTL2]

[c]. Outline the key steps of genetic programming. [2||CO3||BTL2]

Q.5 [a]. Explain Lévy flights in the context of Cuckoo Search and their importance. [3||CO5||BTL2]

[b]. Evaluate the trade-offs of using a Cuckoo Search algorithm versus an Artificial Bee Colony Optimization algorithm for a high-dimensional optimization problem. What are the possible advantages and limitations of each approach? [4||CO5||BTL5]

[c]. Describe the key steps in Ant Colony Optimization. Analyze the application of Ant Colony Optimization in data mining, focusing on association rule mining. [4||CO5||BTL4]

Q.6 [a]. Explain the concept of evolutionary strategies and their types? [4||CO1||BTL2]

[b]. Explain the working of Multi-Objective Evolutionary Algorithm based on Decomposition (MOEA/D) [3||CO4||BTL2]

[c]. Discuss various types of parameter control in evolutionary computing. [3||CO1||BTL2]

***** END *****

Total no. of Pages: 02 175 Roll no.....

End Term Examination Nov-2024
Seventh Semester B.Tech. COE

Paper Code: CO425 Information and Network Security

Duration: 03 Hours Max Marks: 40

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

Q.1 Attempt any four parts:

a) Explain Shannon principle of confusion and diffusion in detail. |2||CO2||BTL1|

b) List all multiplicative Inverse pairs in modulus 20. |2||CO1||BTL2,3,5|

c) Why message authentication is required? Name few techniques available for authentication. |2||CO3||BTL1,2|

d) What are the design parameters for Feistal cipher network? |2||CO3||BTL1,2|

e) Describe the variants of P-boxes used in modern ciphers. |2||CO1||BTL1,2,4|

Q.2 a) Give the format of X.509 certificate showing the various elements of the certificate. Explain the format. |4||CO2||BTL1,2|

b) What are the problems associated with exchange of public keys? Suggest some possible solutions. |2||CO2||BTL1,2|

c) Distinguish between a mono-alphabetic and poly-alphabetic cipher. |2||CO2||BTL4|

Q.3 a) Explain RSA algorithm. Demonstrate the encryption and decryption function using RSA Algorithm.The two prime numbers are $p= 17$ and $q=29$. Determine N, E and D. |4||CO3||BTL1,3,5|

b) Describe the Triple Data Encryption Standard with two DES Keys. |4||CO3||BTL1,2|

P.T.O

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Q.4a) Why is SHA more secure than MD5? [4||CO4||BTL2,4]

b) Why is the SSL layer positioned between the application layer and the transport layer? Explain the working of Handshaking protocol. [4||CO4||BTL1,2]

Q.5 a) Explain the technical details of firewall with their types. [2||CO5||BTL1,3,5]

b) When is a Demilitarized Zone required? How it is implemented? [4||CO5||BTL2]

c) Prove that HMAC treat Message Digest as a black box. [2||CO4||BTL4]

END

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

SEVENTH SEMESTER

B. Tech.

END SEMESTER EXAMINATION November -2024

CO427 WEB TECHNOLOGY

Time: 3 Hours. *Max. Marks: 48*

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

Q1 (a) "ARPANET was among the first networks to use packet switching technology rather than traditional circuit-switching" justify this statement. Describe a practical scenario in which packet switching is more beneficial than Circuit switching. [2+2] [CO1] [BTL 2,3]

(b) Discuss the basic structure and significance of TCP/IP in Internet protocols and compare and contrast IPv4 and IPv6. Why was there a need to transition to IPv6? [2+2] [CO2] [BTL 5]

Q.2 (a) In what ways can file transfer protocols like FTP is used in web development and website maintenance? Provide practical examples. [2 +2] [CO1] [BTL 2]

(b) i. How does email filtering work, and what techniques are used to identify spam and phishing emails? [2] [CO2] [BTL 4,2]

ii. A company is migrating its website to a new hosting provider. Describe the steps you would take to update the DNS records to ensure a smooth transition, and explain any potential issues that could arise during propagation. [2] [CO3] [BTL 2]

Q.3 (a) Your organization wants to ensure their web pages load quickly on mobile devices. What specific optimizations would you implement for the mobile web, why are these changes necessary? [2 +2] [CO3] [BTL 3]

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(a) Discuss the impact of video-sharing platforms on traditional television and movie industries and discuss the role of blogs in online journalism. How do blogs compare to traditional news sources in terms of reliability and immediacy? [2 +2] [CO4] [BTL2]

Q.4 (a) A government agency wants to create an open data portal that connects data from various departments. Explain how Web 3.0 and the Semantic Web can support data interoperability and transparency. [2 +2] [CO3] [BTL 6]

(b) i. Compare the JDBC and ODBC. In what scenarios would you choose one over the other for database connectivity? [2] [CO4] [BTL 4

ii. Imagine a restaurant owner wants an interactive website that allows customers to view the menu, make reservations, and order online. How would you use client-side and server-side scripting to develop these features? [2] [CO4] [BTL 2,

Q.5 (a) An e-commerce website wants to increase sales by recommending similar products to customers. However, it also wants to avoid showing items that users have recently viewed but didn't purchase. Describe how you would design this recommendation system. [4] [CO] [BTL

(b) i. Explain how a search engine's crawling process works? Why is essential for a search engine to frequently crawl web pages, and what are challenges associated with it? [2] [CO] [BTL

ii. Describe the role of data preprocessing in a web mining framework [2] [CO5] [BTL

Q6 (a) Design a simple php based LogIn system that authenticates a user with a username and password. Briefly explain how would ensure the security of user credentials in your system? [3] [CO] [BTL

(b) Write short note on the following:

i. Ruby on Rails

ii. Web browser (Safari, Firefox) [2.5+2.5] [CO] [BTL

END

Total no. of Pages:03 Roll no.....

VII SEMESTER B.Tech

END TERM EXAMINATION *Nov-2024*

COURSE CODE CO429 **COURSE TITLE Neural Network**

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

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

Q.1 a) How Gradient Descent is different from Backpropagation. Explain using a suitable example. [2][CO1][BTL1]

b) Consider the function:

$$f(x,y)=3x^2+4y^2+2xy$$

where f(x,y) represents a cost function. Use gradient descent to find the values of x and y that minimize this function. Perform three iterations of gradient descent using the following parameters: Initial values: x=5, y=−3 and Learning rate, $\alpha=0.1$. [3][CO1][BTL3]

Q.2 a) Explain the basic mathematical concept and working principle of Perceptron model for training in neural network. Build a XOR gate using a network of perceptrons. [3][CO2][BTL1]

b) Given an input array of values:

$$x=[-3,-1,0,1]$$

Calculate the output of each value in x using both the sigmoid and ReLU functions. Also Draw the curve. [2][CO2][BTL3

Q.3 a) Explain the concept of Vanishing Gradient and Exploding Gradient in RNN.

b) Explain using block diagram, the different building blocks and the working concept of LSTM. What disadvantages of RNN were overcome using LSTM? [5][CO3][BTL3]

Q.4 a) Describe any two hyperparameters; using suitable diagrams and mathematical equations, that help train the neural network to overcome overfitting. [3][CO4][BTL3]

b) We have trained four models in the same dataset with different hyperparameters. In the following table we have recorded the training and testing errors for each of the models.

Model	Training Error	Testing Error
1	0.1	1.8
2	0.4	1.2
3	0.6	0.8
4	1.9	2.3

i)Which model would you select for this dataset?

ii)Which model looks like it's underfitting the data?

ii)Which model looks like it's overfitting the data?

[2][CO4][BTL6]

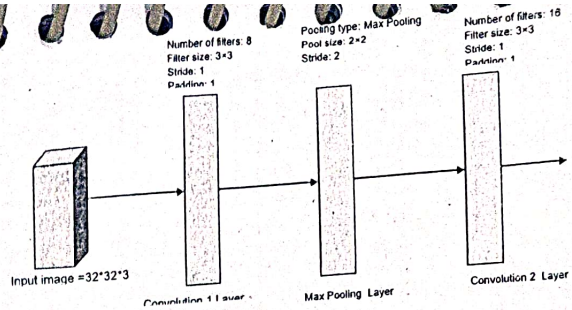
Q.5 a) How data augmentation can help in improving the generalization ability of your model. What are the different effective techniques of Data Augmentation? [5][CO4][BTL3]

b) What is the purpose of the bottleneck layer in autoencoder, and why does it have fewer neurons than the original input size? [5][CO4][BTL3]

Q.6 The network Drawn below contains two convolutional layer and one max pooling layer. The input image to the CNN is of size 32*32*3.

i)What is the output dimension of the feature map after the first convolutional layer?

ii)What is the output dimension of the feature map after the pooling layer?



iii)What is the output dimension of the feature map after the second convolutional layer? [5][CO4][BTL 2]

Q.7 Explain Generative Adversarial Network using a suitable block diagram [5][CO4][BTL1]

OR

Q.7 A company is developing a face recognition-based security system for office entry points. The system will identify employees and grant access to authorized personnel while denying entry to others.

a) How would you preprocess face images to improve recognition accuracy?

b) Propose a feature extraction method and explain why it is suitable for face recognition.?

c) What metrics would you use to evaluate the system's performance? [5][CO5][BTL4]

Q.8 Write a short Note on (any 4):

a) Application of Natural Language Processing

b) Neural Networks Tools and Libraries

c) Application of Digital Image Processing in Neural Network

d) Receiver Operating Characteristics and Area Under the Curve

e) Accuracy, Precision and Recall [10][CO5 & CO3][BTL1]

Q.4 Answer any TWO of the following:

[a] How does linear function approximation differ from nonlinear function approximation in terms of computational complexity and learning efficiency in large or continuous state spaces? [5] [L3, CO2]

[b] Explain the concept of function approximation in reinforcement learning. Why is it necessary, and how does it differ from traditional tabular methods for value prediction? [5] [L1, L2, CO2]

[c] An agent navigates a grid-world with 3 states S_1, S_2, S_3. The initial Q-values are $Q(S, A) = 0$. The agent starts at S_1, chooses A_1, and transitions to S_2 with a reward R=5. Using α=0.5 and γ=0.9, update $Q(S_1, A_1)$ after two episodes, where the agent takes the same trajectory. [5] [L3, L4, CO3]

Q.5 Answer any TWO of the following:

[a] Discuss the architecture used in Deep Q Networks (DQNs). What are the key hyper parameters in DQNs, and how do they affect training stability and convergence? [5] [L2, L3, CO1, CO2]

[b] Why does standard Q-learning overestimate Q-values, and how does Double DQN address this issue? [5] [L2, L3, CO3]

[c] How does prioritized experience replay improve the learning efficiency of DQN? Provide the mathematical intuition behind it. [5] [L1, L3, CO3]

----ALL THE BEST----

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

EIGHT SEMESTER

B. Tech

END TERM EXAMINATION **Nov-2024**

CO431 REINFORCEMENT LEARNING

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 Determine which reinforcement learning algorithm is best suited for the respective problem and why? [2x5=10] [L2, L3 ,CO1, CO3]

[a] An autonomous car must learn to control its acceleration and braking to maintain a safe distance from other vehicles in traffic.

[b] A trading agent needs to make decisions in the stock market, where the reward depends on maximizing long-term portfolio returns.

[c] An elevator system needs to minimize wait times by optimizing the movement of multiple elevators in a high-rise building.

[d] A warehouse robot must learn to find the shortest path to pick up items and deliver them to specific locations.

[e] A chatbot needs to learn to respond to user queries in a way that maximizes user satisfaction during customer support interactions.

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Q.2 Answer any TWO of the following:

[a] Why does Monte Carlo estimation not use bootstrapping in the same way as Dynamic Programming? How does this influence the estimation of state-values? How does the sampling of episodes in Monte Carlo methods affect the updates to the state-value function?

[5] [L1, L2, L3, CO2]

[b] In a simplified version of Blackjack, a player follows the following policy:

- If the player's hand sum is 20 or 21, they stick.
- Otherwise, they hit.

Consider the following four episodes (with no discounting, i.e., $\gamma=1$):

Episode 1: player_sum = 14, dealer_card = 8 → player hits → player_sum = 20 → player sticks → dealer_sum = 19 → win.

Episode 2: player_sum = 12, dealer_card = 6 → player hits → player_sum = 18 → player sticks → dealer_sum = 17 → win.

Episode 3: player_sum = 17, dealer_card = 9 → player sticks → dealer_sum = 20 → loss

Episode 4: player_sum = 15, dealer_card = 10 → player hits → player_sum = 22 → bust (loss).

Compute the state-value function V(s) for the player's sum of 12, 15, 16, and 18, using Monte Carlo First Visit and Every Visit methods. Compare and contrast both the methods. [5] [L4, L5, L6 CO3]

[c] Consider a grid-world environment with the following states and actions. A robot starts at S_1, and the goal is to reach S_4. The rewards and episodes are as follows:

Episode	1			2		
State-Action Pair	(S_1, A_1)	(S_2, A_2)	(S_4, Goal)	(S_1, A_1)	(S_3, A_2)	(S_4, Goal)
Reward	+1	+2	+10	+1	+3	+10

Using First-Visit Monte Carlo, estimate $Q(S_1, A_1)$. Assume a discount factor $\gamma=0.9$. [5] [L4, L5, L6, CO3]

Q.3 Answer any TWO of the following:

[a] How does the epsilon-greedy policy impact the exploration-exploitation trade-off in both SARSA and Q-learning, and what is the consequence of setting epsilon too high or too low in both algorithms?

[5] [L3, L4, CO1, CO2]

[b] A robot navigates a grid-world environment with three states: S_1, S_2, S_3 . The initial value function is:

$$V(S_1) = 5, V(S_2) = 3, V(S_3) = 0.$$

The robot starts in S_1, takes action A_1, and transitions to S_2 with a reward of R=4. The discount factor is $\gamma=0.9$, and the learning rate is $\alpha=0.5$. Update $V(S_1)$ using the TD(0) rule. [5] [L3, L4, CO3]

[c] Explain the architecture and learning process of actor-critic methods in reinforcement learning. How does the critic evaluate the actions taken by the actor, and how does the actor update its policy based on the TD error? [5] [L1, L2, CO2]

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

B.Tech. (CO) Seventh Semester

End-Term Examination Nov/Dec-2024

CO-433 Distributed Systems

Time: 3 Hours *Max. Marks: 40*

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

Q.1 a) Analyze the impact of virtualization on resource management and assess its implications on system scalability and flexibility in distributed architectures. [4] [CO1] [BTL-4]

b) Compare and contrast middleware approaches in distributed systems and recommend an approach for a real-time application. [4] [CO1] [BTL-2,4]

OR

c) Explain the design goals of distributed systems and how these goals can be achieved in a cloud-based client-server environment. [4] [CO1] [BTL-5]

Q.2 a) Explain the effectiveness of synchronous versus asynchronous communication for high-load distributed applications with an example to support your viewpoint. [4] [CO2] [BTL-2]

OR

b) Examine multicast communication's potential impact on network congestion and suggest strategies to manage it efficiently. [4] [CO2] [BTL-4]

c) Calculate the total transmission time for 50 KB of data in a Remote Procedure Call (RPC) if each RPC setup takes 5 ms, and data transmission speed is 1 MB/s. [4] [CO2] [BTL-5]

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Q.3 a) Evaluate the trade-offs between centralized, decentralized, and distributed mutual exclusion algorithms in terms of efficiency and reliability. [4] [CO3] [BTL-5]

b) Design an election algorithm for a distributed system where nodes frequently join and leave. Explain how it adapts to such dynamics. [4] [CO3] [BTL-6]

Q.4 a) Evaluate the limitations of primary-based consistency protocols for high-frequency data updates and recommend a suitable alternative. [4] [CO4] [BTL-5]

b) Discuss the impact of eventual consistency on user experience in social media platforms and suggest strategies to mitigate any negative effects. [4] [CO4] [BTL-2]

OR

c) Evaluate the effectiveness of different authentication methods (e.g., OAuth, multi-factor authentication) in securing cloud-based distributed applications. [4] [CO5] [BTL-5]

Q.5 a) Explain the process of constructing generator and parity-check matrices for a cyclic code and compare their computational complexity with that of other block codes. [4] [CO4] [BTL-2,4]

b) Investigate the role of memory in convolution codes and discuss how increasing the constraint length improves error correction. [4] [CO5] [BTL-2,6]

OR

c) Compare structured and attribute-based naming systems in terms of scalability and security and recommend the most suitable model for an enterprise environment. [4] [CO5] [BTL-4, 5]

Total no. of Pages:03

Roll no.....

SEMESTER-I

B. Tech

END TERM EXAMINATION *Nov-2024*

EC101: Basic Electronics and Communication Engineering

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

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

Q.1 (i) Sketch the transfer characteristics and drain characteristics for the JFET transistor with I_{DSS} = 12 mA and V_P = - 4V.

(OR)

Sketch the transfer characteristics and drain characteristics for an n-channel depletion type MOSFET with I_{DSS} = 12 mA and V_P = - 8 V for a range of V_{GS} = - V_P to V_{GS} = 1 V.

[4][CO1][BTL2]

(ii) Consider the network shown in Figure 1. Calculate the voltage gain A_V if V_i = 500 mV and R = 1 kΩ.

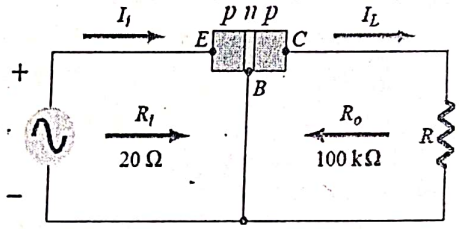

Figure 1

[4][CO2][BTL3]

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Q.2 (i) Simplify the following Boolean expression and draw logic circuit for the simplified expression.

$$Y = B(\bar{A} + \bar{C}) + \bar{A}\bar{B}$$

[4][CO3][BTL2]

(ii) Use K-map to simplify in SOP form and implement the logic circuit for the simplified expression using NOR gates only.

$$f(A, B, C, D) = \sum m(3, 4, 5, 7, 9, 13, 14, 15)$$

[4][CO3][BTL3]

Q.3 (i) Implement the following Boolean function using 8:1 multiplexer.

$$Y(A, B, C, D) = \sum(0, 1, 3, 4, 8, 9, 15)$$

(OR)

Implement 8:1 Multiplexer using 4:1 and 2:1 Multiplexers.

[4][CO4][BTL3]

(ii) Assume the JK flip flop, shown in Figure 2, is initially cleared. Determine the sequence of the Q output for six clock pulses if $J = \bar{Q}$ and K = 1. Draw the timing diagram also showing Clock pulses, J, K and Q.

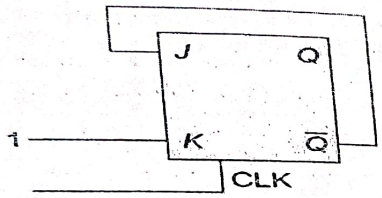

Figure 2

[4][CO4][BTL3]

Q.4 (i) In an FM system, determine the modulation index if the message frequency f_m is 500 Hz, amplitude of message signal A_m is 1.2 V and frequency deviation is 3.6 kHz. Determine the new deviation and bandwidth if amplitude of message signal A_m is increased to 5.4 V.

[4][CO5][BTL3]

(ii) A carrier wave $c(t) = 10\cos(2\pi 10^3 t)$ is DSB-SC modulated by a message signal $m(t) = 5\cos(100\pi t)$. Antenna resistance is 2 Ω. Determine:

(a) BW of the signal
(b) Total Transmitted Power
(c) Efficiency
(d) Plot the spectral components.

[4][CO5][BTL3]

Q.5 (i) Determine the sampling frequency required to sample the following signal to avoid aliasing:

$$x(t) = 3\sin(2\pi 10^3 t) + 2\sin(2\pi\, 660\, t)$$

[2][CO6][BTL3]

(ii) A message signal m(t) with analog voltage in the range of 0 V to 10 V is transmitted through 4–bit PCM system. Determine the number of quantization levels and maximum quantization error.

[2][CO6][BTL3]

(iii) Discuss Amplitude Shift Keying (ASK) and Frequency Shift Keying (FSK). Also draw the waveforms for message signal, carrier signal and modulated signal for both the cases.

[4][CO6][BTL2]

END

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Total no. of Pages: 03

Roll no.....

3rd SEMESTER B.TECH.

END TERM EXAMINATION NOV-2024

Course Code: EC-201

Course Title: Probability and Random Processes

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

Note : All five questions are compulsory, and marks are indicated. Assume suitable missing data, if any.

Q.1 (a) Consider the binary communication channel shown in the Figure. Let (X, Y) be a bivariate random variable (r.v.), where X is the input to the channel and Y is the output of the channel. Let $P\{X = 0\} = 0.5$, $P\{Y = 1|X = 0\} = 0.1$, and $P\{Y = 0|X = 1\} = 0.2$. (a) Find the joint probability mass functions (pmf) of (X, Y), (b) Find the marginal pmf's of X and Y, and (c) Are X and Y independent? [4][CO1][BTL6]

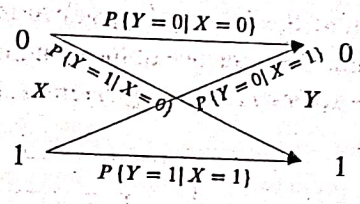

Figure: Binary communication channel

Q.1 (b) Let the joint probability density function (pdf) of the random variable X and Y be $f_{XY}(x, y) = \begin{cases} 1 & ; \quad 0 < |y| < x < 1 \\ 0 & ; \quad elsewhere \end{cases}$. Determine $E\{X|Y\}$ and $E\{Y|X\}$. [3][CO1][BTL-2-4]

Q.1 (c) Derive the characteristic function, $\emptyset_X(\omega)$ for a Gaussian r.v. X, having a mean (μ) and variance (σ^2). [4][CO1][BTL-2-4]

Q.2 (a) Explain the Chebyshev and Markov inequalities. [3][CO3][BTL-2-3]

Q.2 (b) If the Gaussian random variable, X with mean $(\mu = 0)$ and variance (σ^2), is applied in $Y = AX^2$ where A is a constant and Y is a function of random variable X. Find out the pdf, $f_Y(y)$. [3][CO2][BTL-2-4]

Contd...2

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Q.2 (c) Explain the following random processes: [4][CO4][BTL-2-4]

(i) Strict-sense stationary (SSS) processes

(ii) Wide-sense stationary (WSS) processes

(iii) Ergodic processes

(iv) Markov processes

Q.3 (a) Let $Y(t)$ be the output of an LTI system with impulse response $h(t)$ when a WSS random process $X(t)$ is applied as input. Prove the following expressions of autocorrelations and power spectral densities. [4][CO4][BTL-2-4]

(i) $R_{XY}(\tau) = R_{XX}(\tau) * h^*(-\tau)$

(ii) $R_{YY}(\tau) = R_{XY}(\tau) * h(\tau)$

(iii) $S_{XY}(\omega) = S_{XX}(\omega) * H^*(\omega)$

(iv) $S_{YY}(\omega) = S_{XY}(\omega) * H(\omega)$

Q.3 (b) The joint probability density function of two random variables X and Y is given as: [3][CO2][BTL-2-5]

$$f_{XY}(x,y) = 0.1\delta(x)\delta(y) + 0.12\delta(x-4)\delta(y) + 0.05\delta(x)\delta(y-1) + 0.25\delta(x-2)\delta(y-1) + 0.3\delta(x-2)\delta(y-3) + 0.18\delta(x-4)\delta(y-3)$$

Find and plot the marginal distribution of X and Y.

Q.3 (c) The probability density function of two statistically independent random variables X and Y are

$$f_X(x) = \frac{1}{2}u(x-1)exp\{-(x-1)/2\}$$

$$f_Y(y) = \frac{1}{4}u(y-3)exp\{-(y-3)/4\}$$

Find the probability density function of the random variable (W) where $W = X + Y$. [3][CO2][BTL-2-5]

Q.4 (a) X and Y are independent Rayleigh random variables with common parameter, σ^2. Determine the probability density function of the random variable (Z) where $Z = \frac{X}{Y}$. [3][CO2][BTL-2-5]

Contd...3

Q.4 (b) A vector random variable, X has a mean vector and correlation matrix given by: [4][CO3][BTL-2-6]

$$E(X) = \begin{bmatrix} 2 \\ -1 \\ 1 \end{bmatrix} \quad \text{and } R_{XX} = \begin{bmatrix} 13 & 2 & 3 \\ 2 & 10 & 3 \\ 3 & 3 & 10 \end{bmatrix}$$

A new random vector is formed according to $Y = AX$ where the matrix A is given by $A = \begin{bmatrix} 1 & 0 & -1 \\ 0 & -1 & 1 \\ -1 & 1 & 0 \end{bmatrix}$. Find the mean vector, correlation matrix and covariance matrix of Y.

Q.4 (c) A random process is represented as $X(t) = ACos(\omega t + \theta)$ where ω is a constant. A is a random variable that has a magnitude of $+1$ and -1 with equal probability, θ is a uniformly distributed random variable between 0 and 2π. Assume A and θ to be the independent random variables.

(i) Is $X(t)$ a WSS process?

(ii) Is $X(t)$ a mean-ergodic process? [3][CO4][BTL-2-5]

Q.5 (a) A random process is represented as:

$$X(t) = ACos(t) + BSin(t); -\infty < t < +\infty$$

Where A and B are independent random variables each of which has a value -2 with probability $1/3$ and a value $+1$ with probability $2/3$. Show that $X(t)$ is a WSS process. [3][CO4][BTL-2-5]

Q.5 (b) Consider a two-state Markov chain with the transition probability matrix

$$P = \begin{bmatrix} 0.9 & 0.1 \\ 0.2 & 0.8 \end{bmatrix}$$

(i) Find the n −step transition probability matrix, P^n.

(ii) Find P^n when $n \to \infty$. [3][CO5][BTL-2-6]

Q.5 (c) A simple random walk, X_n in one direction is represented as:

$$X_n = \sum_{i=1}^{n} Z_i; X_0 = 0 \text{ and } n = 1,2,3,\ldots$$

Where Z_i is the independent identically distributed random variables with $P\{Z_n = 1\} = p$ and $P\{Z_n = -1\} = q = (1-p)$. Determine the mean, variance, and autocorrelation of the above random walk. [3][CO5][BTL-2-6]

Total no. of Pages: 03

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3rd (Third) SEMESTER

B.Tech.

END TERM EXAMINATION **Nov-2024**

COURSE CODE: EC201 **COURSE TITLE: Analog Electronics-I**

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

Note :
(i) Attempt any five (5) questions.
(ii) All questions carry equal marks.
(iii) Assume suitable missing data, if any.

Q.1

(a) Explain with diagram the energy bands of metal, semiconductor and insulator. Also explain direct and indirect semiconductors. [2+2][CO1]

(b) Distinguish between avalanche breakdown and zener breakdown with diagram. The 6.8V zener diode in the Fig.1 have $V_z = 6.8$ V, $I_z = 5$ mA, $r_z = 20\ \Omega$ and $I_{zk} = 0.2$ mA. The supply voltage Vdd id +10 V. Determine the output voltage Vo with no load. [2+2][CO2]

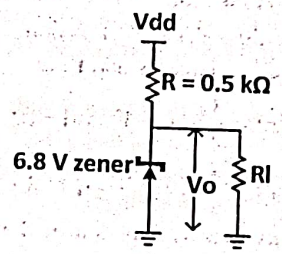

Fig. 1

Q.2

(a) Consider a peak rectifier fed by a 60-Hz sinusoid having a peak value of $V_p = 100$ V. Let the load resistance R = 10 kΩ. Determine the value of the capacitance C that will result in a peak-to-peak ripple of 2 V. Also, calculate the fraction of the cycle during which the diode is conducting and the average and peak values of the diode current. [2+2][CO2]

(b) Explain the Ebers-Moll model of an npn transistor with suitable diagrams. Consider an npn transistor with $V_{BE} = 0.7$ V at $I_C = 1$ mA. Solve V_{BE} for $I_C = 0.1$ mA and $I_C = 10$ mA. [3+1][CO3]

Q.3

(a) Illustrate the large signal operation of grounded emitter circuit supporting with its transfer characteristics. Also describe briefly the term Early effect. [3+1][CO3]

(b) Describe the operation of BJT as a switch. The transistor in Fig. 2 is specified to have β in the range of 50 to 150. Determine the value of Rb that results in saturation with an overdrive factor of at least 10. [3+1][CO3]

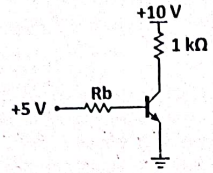

Fig. 2

Q.4

(a) Distinguish between an enhancement and depletion type N-MOSFET. Also summarize the difference between N-MOSFET and P-MOSFET based on their V-I characteristics. [2+2][CO4]

(b) An enhancement-type NMOS transistor with $V_t = 0.7$ V has its source terminal grounded and a 1.5 V dc applied to the gate. Demonstrate in what region does the device operate for (i) $V_D = 0.5$ V (ii) $V_D = 0.9$ V and (iii) $V_D = 3$ V (where V_D is the drain voltage). [4][CO4]

Q.5

(a) Design the circuit of Fig. 3 so that the transistor operates at $I_D = 0.4$ mA and $V_D = 0.5$ V. The NMOS transistor has $V_t = 0.7$ V, $u_n C_{ox} = 100$ uA/V^2, L = 1 um and W = 32 um. Assume $V_{DD} = +2.5$ V, $V_{SS} = -2.5$ V, $\lambda = 0$). [4][CO4]

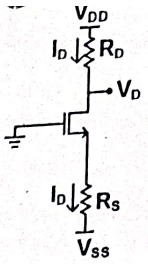

Fig. 3

(b) Describe with diagram an active-loaded MOS differential pair. [4][CO5]

Q6.

(a) Distinguish between RC coupled amplifier and transformer coupled amplifier along with their diagram, frequency response, advantages and disadvantages. [4][CO5]

(b) A MOS differential pair shown in Fig. 4 operates at bias current I of 0.8 mA and employs transistors with W/L = 100 and $u_n C_{ox} = 0.2$ mA/V^2. Using $R_D = 5$ kΩ and $R_{SS} = 25$ kΩ, determine the differential gain, common mode gain and common mode rejection ratio in dB. [4][CO5]

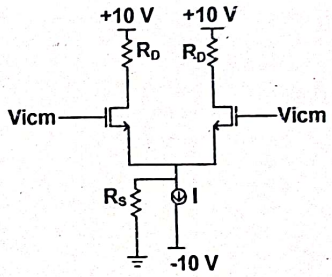

Fig. 4

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

3rd SEMESTER B.Tech.(EC)

END TERM EXAMINATION *Nov-2024*

COURSE CODE- EC203 COURSE TITLE- Digital Design-1

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

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

Q.1 A) A combinational circuit is defined by the following equations

F1=ABC+A'B'C

F2=A'+B'+C+D

F3=A+B+C'D+A'D

F4=ACD+AC'D'+BC'D+BCD'

Design a circuit which will implement these four equations using a decoder with NAND gates external to decoder.

[4][CO1][BTL6]

B) Develop a circuit that resolves priority among eight active low flag inputs f0 to f7, where f7 has the highest priority. Design a circuit by using a encoder and NAND gates. The outputs of encoder should be active high. [4][CO1][BTL5]

Q.2 A) Design a 3 bit synchronous counter using SR-FF, which can count up or down depending on a mode control signal M. Explain the operation in up and in down mode. [4][[CO2][BTL6]

B) With neat circuit diagram, explain the conversion technique implemented in a weighted resister type D to A converter of 4 bits input. If reference voltage is 15 volts, than calculate the analog voltage output for input binary 1101. [4][[CO4][BTL5]

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Q.3 A) What are the advantages of semiconductor memorie. the salient points of different types of semiconductor r. with their applications. [4][CO3][L

B) Implement the Boolean expression F4 given in question ... using PAL. [4][CO3][BTL5]

Q.4 A) With neat circuit diagram, explain the operation of dual slope A/D converter. State its advantages over other A/D converters. [4][CO4][BTL2]

B) With neat sketch, explain the working of Astable multivibrator and examine how it can generate square wave of different frequencies. [4][CO4][BTL3]

Q.5 A) Compare the performance of ECL logic family with TTL logic family. Explain the operation of a ECL OR gate with circuit diagram. [4][CO5][BTL2, L5]

B) What is Logic family? State their types and explain different characteristics of digital ICs. [4][CO5][BTL1]

Q6 A) Determine the don't care combinations in the following Boolean expression BE+B'DE', which is a simplified version of the expression A'BE+BCDE+BC'D'E+A'B'DE"+B'C'DE'. [2][CO1][BTL4]

B) Design a Mod 40 Asynchronous UP counter which counts 0 to 39 and repeat. [2][CO2][BTL4]

C) Implement the logic of a binary full adder using diode matrix ROM. [2][CO3][BTL3]

D) How the Schmitt trigger converts a sinusoidal signal to square wave signal. [2][CO4][BTL2]

Total no. of pages:02 *Roll No.....*

THIRD SEMESTER **B.Tech (ECE)**

END-SEMESTER EXAMINATION **NOVEMBER-2024**

EC-205 SIGNALS & SYSTEMS

TIME: 03 Hrs. **Maximum Marks: 40**

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

Q1.(i). Determine whether or not the signals below are periodic and for each signals that is periodic, determine the fundamental period. **CO1** **[4]**

a) $x[n] = \sin(\pi + 0.2n)$ b) $x[n] = \exp(j\frac{\pi}{16}n)\cos(n\pi/17)$

(ii). A continuous-time LTI system is described by **CO2** **[4]**

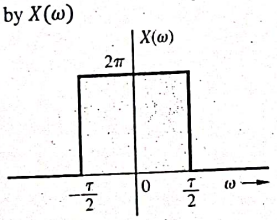
$$\frac{dy(t)}{dt} + 4y(t) = 2x(t).$$

Determine the expression for the frequency response $H(\omega)$ of the LTI system and evaluate the output $y(t)$ for unit step input.

Q2.(i). Formulate the impulse response of a $-\pi/2$ ***radians*** phase shifter LTI system with a frequency response $H(\omega)$, given as: **CO2** **[4]**

$$H(\omega) = -j\,sgn(\omega) = \begin{matrix} -j & for\ \omega > 0 \\ j & for\ \omega < 0 \end{matrix}$$

(ii). Determine and sketch $x(t)$ for the frequency response of a low pass filter represented by $X(\omega)$

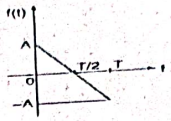


CO2 **[4]**

Q3.(i). Determine the Laplace transform of the following signals and also specify the ROC **CO2** **[4]**

a) $x(t) = e^{-2t}U(t) - e^{2t}U(-t)$

b) X(t) as given



(ii). An LTI system is initially relaxed and is represented by the equation **CO2** **[4]**

$$y''(t) + 3y'(t) + 2y(t) = 2x(t)$$

a) Determine transfer function [H(s)] of the system

b) Find response of the system to an input $x(t) = 4e^{-3t}U(t)$ **CO3** **[4]**

Q4.(i). Find the initial value and final value of the following z-transforms.

(ii). a) $X(Z) = \frac{1}{1-Z^{-2}}$ b) $X(Z) = \frac{Z^{-2}}{1-1.8\,Z^{-2}+0.8\,Z^{-2}}$ **CO3** **[4]**

Find the inverse z-transform of

$$X(z) = \frac{1 - z^{-1} + z^{-2}}{\left(1 - \left(\frac{1}{2}\right)\right)(1 - 2z^{-1})(1 - z^{-1})} \quad with\ ROC\ 1 < |z| < 2.$$

CO4 **[4]**

Q5.(i). Explain the sampling theorem and aliasing phenomenon.

(ii). Assess which of the following sampling rates is/are suitable to avoid aliasing for sampling $x(t) = 3\cos(6\pi t) + \sin(18\pi t) + 2\cos(28\pi t)$ according to the Nyquist sampling theorem. **CO4** **[4]**

a) 36 Hz

b) 18 Hz

Q6.(i). Describe the energy spectral density for an energy signal $x(t)$. **CO5** **[4]**

(ii). Compare and determine the energy of $x_1(t) = e^{3t}u(-t)$ and $x_2(t) = e^{-3t}u(t)$ using the energy spectral densities of signals $x_1(t)$ and $x_2(t)$. **CO5** **[4]**

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

IIIrd SEMESTER

B.Tech.(ECE)

End-Term Examination (*Nov, Dec-2024*)

EC 207: Engineering Analysis and Design

(Network Analysis and Synthesis)(Reappear)

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

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

Q.1 (a) For the Figure 1(a), calculate the value of V_1, i_1, and i_2.

(b) For the circuit in Figure 1(b), find value of load resistor to be connected across terminals A-B to absorb maximum power from the circuit? What is that power?

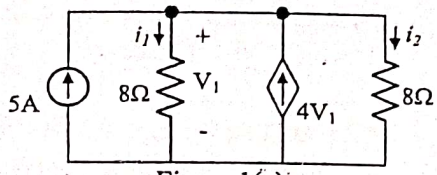

Figure 1(a)

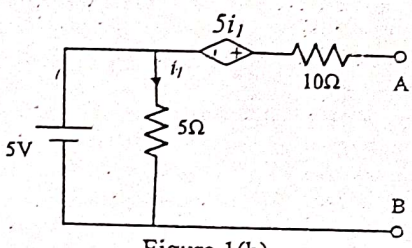

Figure 1(b)

[5+5=10][CO1, CO3]

Q.2 (a) The switch 'S' in Figure 2(a) has been in position 'a' for a long time. At t = 0, it moves to position b. Calculate $i(t)$ for all $t \geq 0$.

(b) In the network of Figure 2(b), an exponential voltage $v(t) = 4e^{-3t}$ is applied at t = 0. Find the expression for current $i(t)$. Assume zero voltage across capacitor at t = 0.

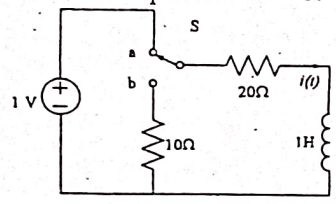

Figure 2(a)

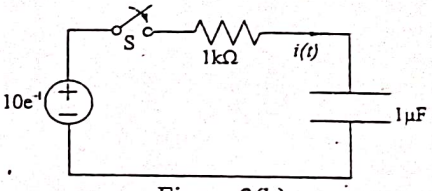

Figure 2(b)

[5+5=10][CO2, CO3]

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Q.3 (a) For the Figure 3(a), the circuit was in steady state with the switch in the position 1. Find the current i(t) for t > 0 if the switch is moved from the position 1 to 2 at t = 0. [5] [CO2, CO3]

(b) Compute the 'z' parameters of the circuit in Figure 3(b). [5] [CO4]

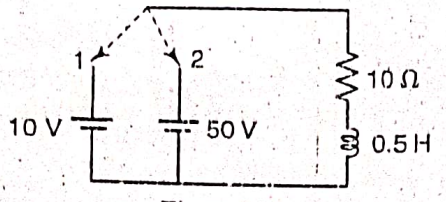

Figure 3(a)

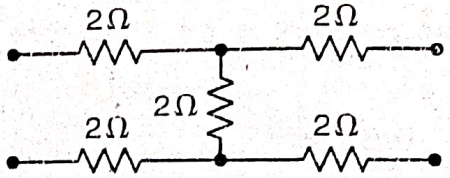

Figure 3(b)

Q.4 (a) Find the y-parameters for the network shown in Figure 4(a)

(b) Determine the 'Z' parameters for the network in Figure 4(b). Comment on symmetry and reciprocity of the network.

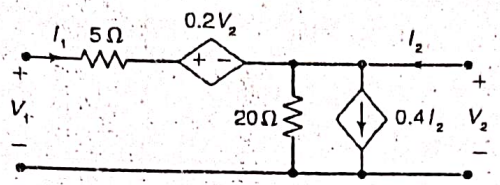

Figure 4(a)

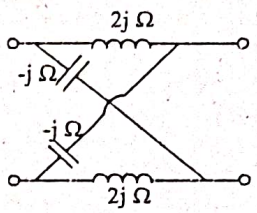

Figure 4(b)

[5+5=10][CO4]

Q.5 (a) Test whether $P(s) = s^5 + 5s^3 + 4s$ is Hurwitz or not?

(b) Test whether following network function is positive real or not?

$$F(s) = \frac{1s^2 + \frac{3}{4}s + \frac{3}{4}}{s^2 + s + 4}$$

[5+5=10][CO5]

Q.6 Realize the Foster and Cauer forms of the following impedance function.

$$Z(s) = \frac{2(s+2)(s+4)}{(s+1)(s+3)}$$

[10][CO5]

Total no. of Pages: 03 Roll no.....

1st SEMESTER

M.Tech.

END TERM EXAMINATION *Nov-20.*

COURSE CODE EC207 COURSE TITLE Analog Electronic

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

Note : Question 1 is **compulsory**.
Attempt any **FOUR** questions from the remaining.
Assume suitable missing data, if any.
All questions carry equal marks.

Q.1(a) In an open circuit P-N junction, explain the reason of formatio depletion region close to the junction only? [M 2][CO 1]

(b) Draw the small signal equivalent of the circuit shown in Fi considering $V_A = \infty$. [M 2][CO 2][

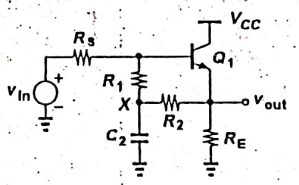

Fig. 1

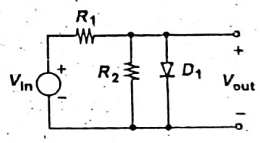

Fig. 2

(c) What is the use of inserting emitter resistance in Common-Em amplifier circuit and why this resistance is bypassed using em bypass capacitance? [M 2][CO 5]

(d) How do g_m and $V_{GS} - V_{TH}$ change if both W/L and I_D are double [M 2][CO 1]

Q.2(a) Calculate Common-Base large signal short circuit current using Ebers-Moll representation of BJT. [M 4][CO 1]

(b) Show the input/output characteristic of the circuit illustrate Fig. 2 assuming a constant-voltage model. [M 4][CO 3]

Q.3 (a) For the biasing circuit shown in Fig. 3, determine the R_3 so that I_B = 2mA. Assume β =49, V_{BE}= 0.7V, V_{CC}= 12V, R_1 =2 kΩ, R_2 = 25 kΩ. [M 4][CO 5][L3]

(b) In amplifier circuit shown in Fig. 4 the BJT used has β_0 =200. Assuming V_{CC} = 9V, R_1 = 10 kΩ, R_E = 1 kΩ, R_L = 1 kΩ, C_1 = C_2=∞ and input source having resistance of R_s=10 kΩ. Compute the values of

(i) Emitter current and base voltage [M 2] [CO 5][L3]
(ii) The voltage gain V_{out}/V_{in}. [M 2] [CO 4][L3]

Q.4(a) The circuit shown in Fig. 5 provides constant current of I_{out} as long as the circuit to which collector is connected maintains the BJT in active region. Show that under active region operation the I_{out} is given by [M 4][CO 5][L4]

$$I_{out} = \alpha_F \frac{V_{CC}\left|R_2/(R_1+R_2)\right| - V_{BE}}{R_E + (R_1//R_2)/(\beta_F+1)}$$

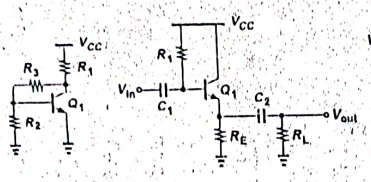

Fig. 3

Fig. 4

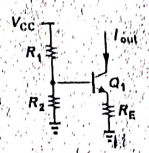

Fig. 5

(b) Design the CS stage shown in Fig. 6 for a voltage gain of 5 and an output impedance of 1 kΩ. Bias the transistor so that V_{DS} is higher than V_{GS}-V_T by 100 mV. Assume the capacitors are very large and R_G = 10 kΩ.(Assume $\mu_n C_{ox}$ = 200 μA/V² and V_T = 0.4 V) [Hint: Find g_m, R_D, and W/L of transistor M_1] [M 4][CO 2][L3]

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Q.5(a) Construct small signal model of the circuit given in Fig. 7 and compute g_m and r_o. (Assume $\mu_n C_{ox}$ = 200 μA/V², V_T = 0.4 V, λ = 0.1 V⁻¹ and W/L = 20/0.18) [M 4][CO 2][L3]

(b) Analyze the circuit of Fig. 8 and compute R_1 and R_2 such that the input impedance is at least 20 kΩ.Assume I_D = 1 mA and W/L = 20/0.18. [M 4][CO 5][L4]

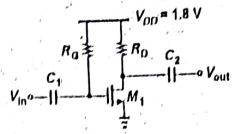

Fig. 6

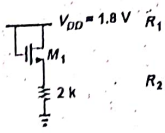

Fig. 7

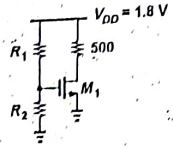

Fig. 8

Q.6 For the circuit of Fig. 9, evaluate the following

(a) V_{out} /V_{in} and output voltage if the circuit is driven by a 75 Ω, 50 μV source,

(b) Input resistance R_i and output resistance R_0.

[M 8], [CO 4], [L5]

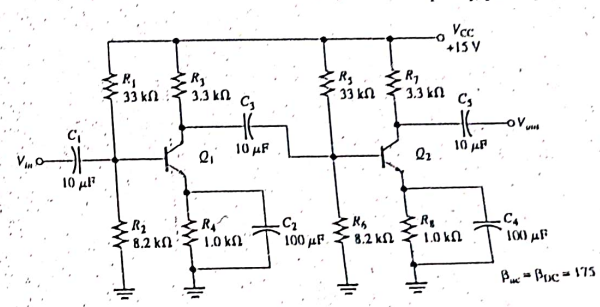

Fig. 9

Total no. of Pages: 03 Roll no.....

3rd SEMESTER

B.Tech [ECE]

END TERM EXAMINATION **Nov-2024**

EC 209, Communication systems

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

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

ATTEMPT ANY 4 QUESTIONS

Q.1 **a)** Derive equation of an FM in terms of Bessel coefficients. [2] [CO2] [BLT 2]

b) A message signal $5\cos(2\pi * 10^3 t)$ is amplitude modulated with carrier signal $10\cos(2\pi * 10^6 t)$, sketch time domain and frequency domain representation of modulated signal. Also calculate modulation index and bandwidth of the signal. [3] [CO2] [BLT 3]

c) Explain quadrature null effect in DSB-SC system. Draw the circuit diagram of a ring modulator and explain the process of generating DSB-SC using this traditional method. [5] [CO2] [BLT 2]

Q.2 **a)** Draw block diagram of a PCM system. Compare PCM with DPCM system. [2] [CO3] [BLT 2]

b) State and prove sampling theorem by explaining the frequency domain analysis of sampled signal [3] [CO3] [BLT 2]

c) An FM signal is given by [5] [CO2] [BLT 3]

$$s(t) = 10cos(2\pi * 10^6 t + 8sin(4\pi * 10^3 t))$$

Calculate:

i. Max. Phase deviation and Max. frequency deviation
ii. Modulation index (β)
iii. Bandwidth of signal
iv. Transmitted power
v. Modulation index (β) if message signal frequency is doubled.

Q.3 **a)** Explain modulation and demodulation process of PAM signal. [2] [CO3] [BLT 1]

b) Explain the necessity of pre-emphasis and de-emphasis in FM. Also draw the circuit of pre-emphasis and de-emphasis filter and its frequency response. [3] [CO5] [BLT 2]

c) Draw an FM receiver model in the presence of white gaussian noise. Derive the Figure of merit of a single-tone modulated FM system. Compare the FOM of the FM system with that of a fully modulated AM system, highlighting the differences in performance. [5] [CO5] [BLT 4]

Q.4 **a)** Explain different types of noise in a communication system. [2] [CO4] [BLT 1]

b) Consider a continuous-time signal $x(t) = cos\,(2\pi f_1 t)$, where $f_1 = 1\,kHz$. The signal is sampled at a sampling frequency f_s. [3] [CO3] [BLT 3]

i. Sketch the time-domain representation of the signal x(t)
ii. Sketch the frequency-domain spectrum of the signal before sampling.
iii. If the sampling frequency is $f_s = 2.5\,kHz$, sketch the frequency-domain spectrum of the sampled signal.
iv. Explain whether aliasing occurs in this scenario, and justify your answer with reference to the sampling theorem.

c) With the context of Delta Modulation: [5] [CO3] [BLT 3]

i. Draw the block diagram of its transmitter and receiver.
ii. Define slope overload noise and granular noise
iii. For a sinusoidal signal $x(t) = Acos(\omega_m t)$ applied to delta modulator with a step size 'δ' and sampling interval 'T_s'. Show that slope overload distortion can be avoided if: $A > \frac{\delta}{\omega_m T_s}$

Q.5 **a)** A white noise of having two-sided power spectral density is $4Kw/Hz$ is passed through a low pass filter whose cut-off frequency is 2 KHz. Calculate white noise power [2] [CO4] [BLT 2]

b) Explain indirect method of generating FM signal. [3] [CO2] [BLT 2]

c) A sinusoidal message signal of $6\cos(6\pi * 10^3 t)$ is transmitted through a 16 level PCM system having sampling rate five times Nyquist rate, calculate the following: [5] [CO3] [BLT 4]

i. Sampling rate
ii. Step size of each quantization levels
iii. Maximum quantization error
iv. Transmission bandwidth and Noise power
v. SNR (in dB)

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Total no. of Pages:2 Roll no. 200

3rd SEMESTER B.Tech

END TERM EXAMINATION *Nov/Dec-2024*

COURSE CODE: EC251 COURSE TITLE: BASIC ELECTRONICS AND INSTRUMENTATION

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

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

Q.1 An amplifier with gain A=40dB is connected to a negative feedback network. The feedback factor is 0.06. Due to replacement of active device the internal gain of the amplifier is change by 20%. What would be the percentage change in the gain of feedback amplifier. [M=3][CO2]

Q.2 Draw and explain the characteristics of junction field effect transistor. [M=2][CO1]

Q.3 Determine the output voltage V_0 of the inverting amplifier shown in Fig. 1 for $v_I = 2V, R_1 = 4k\Omega, R_2 = 15k\Omega, R_3 = 10k\Omega$, and $R_4 = 50k\Omega$.

[M=4][CO3]

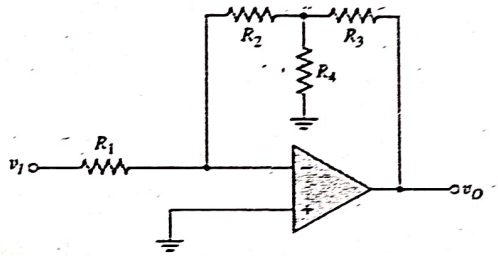

Fig.1

Q.4 Simplify the following Boolean Expression using K-map in sum of product form (SOP) form. Also implement using logic gates. [M=5][CO4]

Y(A,B,C,D)- $\sum$ m (1, 3, 4, 9, 10, 11, 14, 15)

Q.5 Drive the output voltage equation of integrator circuit using OPAMP with the help of suitable circuit diagram. [M=4][CO3]

Q.6 (a) Design Ex-NOR gate using NAND and NOR. [M=3][CO4]

(b) Convert the following [M=3][CO4]

$(543.325)_8 = (\quad)_{10} = (\quad)_{16} = (\quad)_2$

Q.7 (a) Draw and Explain the input-output characteristics of common emitter (CE) configuration of NPN transistor with the help of circuit diagram. [M=3][CO1]

(b) Differentiate between positive and negative feedback. [M=2][CO2]

Q.8 (a) Draw a diagram to illustrate the operation and working of a capacitive pressure transducer. [M=3][CO5]

(b) Explain the working and waveform of linear variable differential transducer (LVDT). [M=3][CO5]

Q.9 The Zener diode regulator circuit shown in Fig. 2 has an input voltage that varies between 10 and 20 V, and a load resistance that varies between R_L = 20 and 80. Assume a 4.6 Zener diode is used, and assume $I_{Z(min)} = 0.1 I_{Z(max)}$ [M=5][CO4]

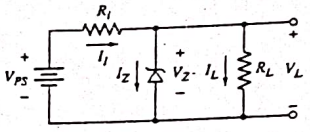

Fig. 2

a. Calculate the maximum Zener current
b. Find the value of R_i required
c. The minimum power rating of the diode.

Total no. of Pages: 3 *Roll no.....*

3rd SEMESTER **B.Tech. (CSE/IT)**

END TERM EXAMINATION ***Nov-2024***

EC261 ANALOG ELECTRONICS

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) Draw and Explain the Centre Tapped Full Wave Rectifier and Calculate its Ripple Factor, Efficiency, and PIV. [4M][CO1][Un, An]

(b) For the pn junction for which $N_A = 10^{18}/cm^3$, $N_D = 10^{16}/cm^3$, $A = 10^{-4} cm^2$, and $n_i = 1.5 \times 10^{10}/cm^3$, let $L_p = 5$ μm, $L_n = 10$ μm, D_p (in the n region) = 10 $cm^2/V \cdot s$, and D_n (in the p region) = 18 $cm^2/V \cdot s$. The pn junction is forward-biased and conducting a current I = 0.1 mA. Calculate: (a) I_S; (b) the forward-bias voltage V; and (c) the component of the current I due to hole injection and that due to electron injection across the junction. [4M][CO1][An]

Q.2 (a) A zener diode exhibits a constant voltage of 5.6 V for currents greater than five times the knee current I_{ZK} is specified to be 1 mA. The zener is to be used in the design of a shunt regulator fed from a 15-V supply. The load current varies over the range of 0 mA to 15 mA. Find a suitable value for the resistor R. What is the maximum power dissipation of the zener diode? [4M][CO1][A]

(b) Design the circuit in Fig. 1 to provide an output voltage of 2.4 V. Assume that the diodes available have a 0.7-V drop at 1 mA. [4M][CO1][A]

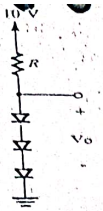

Fig. 1

Q.3 (a) Explain the working principle of n channel JFET. What is pinch-Off in JFET. Draw its drain and transfer characteristics. [4M][CO4][Un]

(b) The amplifier of Fig. 2 utilizes an n-channel JFET for which V_p= -2.0 V, I_{DSS} =1.65 mA. It is desired to bias the circuit at I_D =0.8 mA, using V_{DD} = 24 V. Assume $r_d >> R_D$. Find (a) V_{GS} (b) g_m (c) R_s and (d) R_d, such that voltage gain at least 20 db, with R_S bypassed with a very large capacitance C_s. [4M][CO4][An]

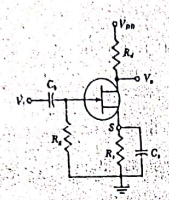

Fig. 2

Q.4 (a) Consider an npn transistor whose base-emitter drop is 0.76 V at a collector current of 5 mA. What current will it conduct at v_{BE} = 0.70 V? What is its base-emitter voltage for i_C = 5 μA? [4M][CO2][A]

(b) Discuss the transistor as an amplifier. Draw its Small Signal Model and write expressions of voltage gain. [4M][CO2][Un]

Q.5 (a) Draw and Explain the RC Phase Shift Oscillator and derive its expressions for oscillation frequency using a small signal model. [4M][CO5][A]

(b) Discuss all feedback topologies and write about the advantages of negative feedback topology. [4M][CO5][Un]

Q.6 (a) Design a voltage divider bias circuit with collector and emitter resistance to achieve output voltage zero voltage, V_{CEQ} = 3 V, V_{CC} = 6V, V_{EE} = -6V, R_1 and R_2 = 90 kΩ and β=150. [4M][CO3][An]

(b) Discuss the input and output characteristics of a common emitter amplifier and derive its current and voltage gain. [4M][CO3][Un]

Q.7 (a) Explain the Inverting and Non-Inverting Operational amplifier and derive its voltage gain. [4M][CO6][Un]

(b) Draw the operational amplifier as a summing, integrator, and differentiator and write its expressions. [4M][CO6][A]

Total No. of Pages: 02

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III-SEMESTER

B.Tech.

END TERM EXAMINATION Nov-2024

EC271 Digital Electronics

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

Note : Attempt any eight questions

Q1. (a) Implement the following function using single 3:8 decoder [2] [CO-4]

$f(x,y,z) = M(2,3,4,5,7)$

$f(w,x,y,z) = M(1,3,5)$

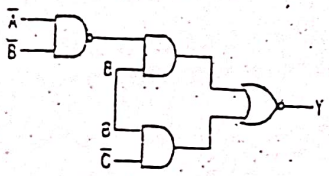
(b) What is the magnitude comparator ? Design a two bit digital comparator by writing truth table, relevant expression and logic diagram. [3] [CO-4]

Q 2. (a) Implement $f(a,b,c,d) = m(0,1,5,6,7,10,15)$ using. [2.5][CO-4]

i) 8*1 mux with a ,b,c as select lines

ii) 4*1 mux with a,b as select lines

(b) For the given figure No. 1, derive the Boolean expression of Y [1] [CO-1]



(c) Compare TTL and CMOS logic families on the basis of following: i) Propogation delay ii) Power dissipation iii) Fan-out [1.5] [CO-2]

Q 3. (a) Using K map, minimize the expression F(A,B,C,D) $=\sum m(1,2,3,8,14,15) + d(0,4,6,10)$. [3] [CO-2]

(b) Realize the Boolean expression $Z=ABC + AD + CD'$ using NAND gates only. [2] [CO-1]

Q 4. Describe function of full subtractor circuit with its truth table, K-map simplification and logic diagram. [5] [CO-3]

Q 5. Explain SISO and SIPO shift registers in detail. Consider the input sequence as 1011. [5] [CO-5]

Q 6. Draw the logic diagram and timing sequence of a 4-bit ring counte [5] [CO-5

Q 7. Explain the working of R-2R ladder type DAC. [5] [CO-3]

Q 8. (a) Explain a 3 bit asynchronous up counter. Draw the timing diagram and truth table. [3] [CO-5]

(b) Draw the logic diagram of the J-K flip flop and explain it. Wh is the advantage of J-K flip flop over S-R flip flop. [2] [CO-5]

Q 9. (a). Implement an 8x1 Mux using 2x1 Mux. [1] [CO-4]

(b) What is a Race Around Condition. How can it be rectified. Explain in detail with diagram. [4] [CO-5]

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

5th SEMESTER B.TECH.

END TERM EXAMINATION NOV-2024

Course Code: EC-301

Course Title: Digital Communication

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

Note: All questions are compulsory and carry equal marks except Q1. Assume suitable missing data, if any.

Q.1 (a) Explain the quadrature sampling of bandpass signals. [2][CO1][BTL1-4]

Q.1 (b) Explain the Differential pulse code modulation (DPCM) and the derivation of the prediction error variance when optimum filter weights are used. [2][CO1][BTL2-6]

Q.2 (a) Consider a correlative sample, c_k obtained through a superposition of three successive weighted input sample values, b_k for a modified duobinary signalling with a precoder. The tap weights are represented by w_n. Create the decision rules for the output binary sequence, $\{c_k\}$. [3][CO2][BTL2-6]

$$c_k = \sum_{n=0}^{2} w_n b_{k-n};\ w_0 = 1, w_1 = 2, w_2 = 1$$

Q.2 (b) Explain the generalized correlative coding (partial response signalling) with necessary mathematical expressions and diagrams. [3][CO2][BTL2-6]

Q.2 (c) Explain the signal point vectors, signal space diagram with decision regions, and correlator receiver-based demodulator for the QPSK scheme. [3][CO4][BTL2-6]

Q.3 (a) Derive the expression for the probability of error for the Bipolar Non-Return-To-Zero (NRZ) waveform. [3][CO2-3][BTL1-5]

Q.3 (b) Apply the Gram-Schmidt procedure to the following set of signals: $S_1(t) = 1, -1 \le t \le 1$, $S_2(t) = Cos(\pi t/2), -1 \le t \le 1$, and $S_3(t) = Sin(\pi t), -1 \le t \le 1$. (a) Determine the orthonormal basis vectors for the signals, (b) Write the signals in terms of basis vectors. [3][CO3][BTL1-5]

Contd...2

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Q.3 (c) A polar NRZ waveform, representing the values $+1\,V$ for binary 1 and $-1\,V$ for binary 0, corrupted by additive white Gaussian noise whose variance is $0.2\,(Volt)^2$ is received by a Maximum-a-posteriori (MAP) receiver. Determine the probability of error for the MAP receiver when a-priori probability of 0.3 is considered for a binary 1. [3][CO3][BTL1-5]

Q.4 (a) Derive the power spectral density of QPSK and Minimum Shift Keying (MSK) signals. [3][CO4][BTL1-5]

Q.4 (b) Derive the expressions of the probability of error for the Matched filter receiver and correlation receiver. [3][CO3][BTL1-5]

Q.4 (c) Draw the signal constellation for a binary phase-shift keyed signal set if the two signals are $S_1(t) = \sqrt{\frac{2E_b}{T}}Cos(\omega_c t - \pi/4); 0 \leq t \leq T$ and $S_2(t) = \sqrt{\frac{2E_b}{T}}Cos(\omega_c t + \pi/4); 0 \leq t \leq T$. Determine the probability of error of the above signal set using the signal constellation diagram. [M3[CO4][BTL2-5]

Q.5 (a) A coherent matched filter detection receiver is used for equally likely Binary-FSK signals $S_1(t) = 0.5Cos(2000\pi t)$ and $S_2(t) = 0.5Cos(2020\pi t)$ with channel noise two-sided power spectral density of $N_0/2 = 0.001\ W/Hz$. Assume that the symbol duration is $T = 0.01$ Second. (a) Find the probability of bit error (P_e), (b) What will the probability of error (P_e) be for frequency spacing of $50\ Hz$? [3][CO3-4][BTL2-5]

Q.5 (b) The signal power received for a desired signal of $100\ Kbps$ bit rate signal is $1mW$. The chip frequency used is $100\ MHz$. A jamming signal is employed at the carrier frequency, the received power of which is $1\,W$. Noise power spectral density is $10^{-9}\ W/Hz$. Find (a) processing gain and (b) probability of error without and with jamming. [3][CO5][BTL2-5]

Q.5 (c) Explain the frequency-hopping spread spectrum modulation and demodulation system. [3][CO5][BTL2-6]

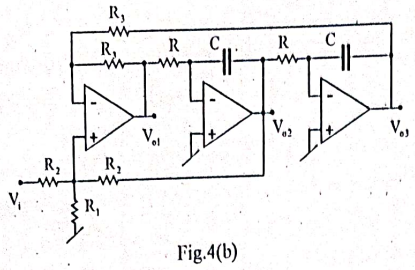

Fig.4(b)

5[a] Determine the input impedance of the circuit of Fig.5(a).If Z_L is a capacitor, comment on the realized circuit. [4][CO2][L3]

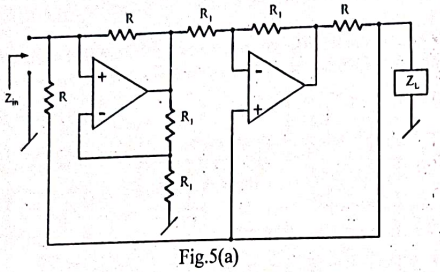

Fig.5(a)

5[b] Illustrate with a neat diagram a 4-quadrant Gilbert multiplier. [4][CO3][L3]

6 Discuss briefly about the following topics **(any TWO)** [a] PLL [b] VCO [c] 555 Timer applications [d] Precision full wave rectifier [e] Sallen key Filter [f] Log /Antilog Amplifier [4X2] [CO2, CO3, CO5] [L2]

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

FIFTH SEMESTER

B.Tech.(ECE)

END SEMESTER EXAMINATION *Nov 2024*

Course Code:EC303 **Course Title: Linear Integrated Circuits**

Time: 3 Hours *Max. Marks: 40*

Note: *Answer any FIVE questions.*
Use the answer sheet space judiciously
Assume suitable missing data, if any.

1[a] Briefly describe with neat diagram the different blocks of a typical operational amplifier(OP-AMP). [6][CO1][L2]

1[b] Calculate $(V_1 - V_2)$ for the level shifter circuit shown in Fig.1(b)Assume identical transistors with $V_{BE} = 0.7V$and very large values of β. [2][CO1][L3]

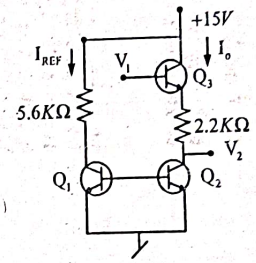

Fig. 1(b)

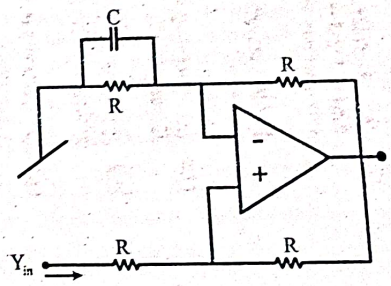

Fig.2(a)

2[a] Determine the input admittance of the circuit of Fig.2(a) and draw its equivalent circuit. [4][CO2][L3]

2[b] Determine the frequency of oscillation and condition of oscillation for the circuit of Fig.2(b)[Assume $A_1 = A_2 = \frac{\omega_t}{s}$] [4][CO2][L3]

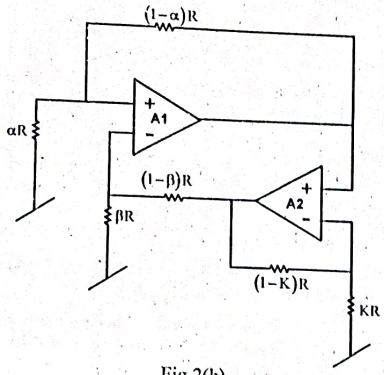

Fig.2(b)

3[a] Analyze second order filter of Fig.3(a), obtain the transfer function and find the parameters of this filter. Comment on the category to which transfer function belongs. [4][CO2][L4]

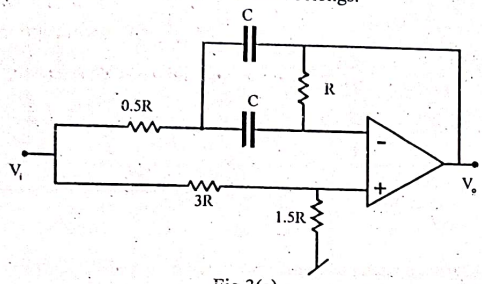

Fig.3(a)

3[b] Analyze the second order g_m –C filter of Fig.3(b), obtain the transfer functions, and find the parameters of these filters. Comment on the categories to which these transfer functions belong. [4][CO4][L4]

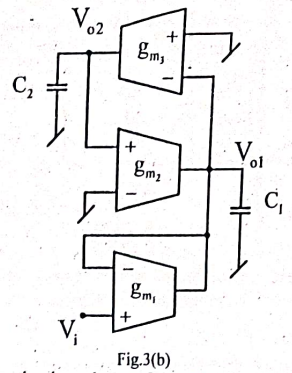

Fig.3(b)

4[a] Evaluate the floating impedance of the OTA based circuit of Fig.4(a) and comment on the simulated impedance. [4][CO4][L5]

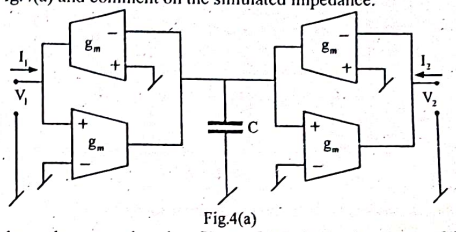

Fig.4(a)

4[b] Analyze the second order filter of Fig.4(b), obtain the transfer functions and find the parameters of these filters. Comment on the categories to which these transfer functions belong. [4][CO2][L4]

collector current is $1.97mA$. Determine the current gain and base current.

5[b] Assume at $T = 300\ K$, a silicon n-channel JFET has a gate doping concentration of $N_a = 10^{18}\ cm^{-3}$, and a channel doping concentration of $N_d = 2 \times 10^{16}\ cm^{-3}$. Determine the metallurgical channel thickness a, such that the pinch off voltage is $V_p = -2.5\ V$. [5][CO4]

6[a] Design a width of a MOSFET such that a specified current is induced for a given applied bias. Consider an ideal n-channel MOSFET with parameters $L = 1.25\mu m$, $\mu_n = 650\ cm^2/V-S$, $C_{ox} = 6.9 \times 10^{-8}\ F/cm^2$, and $V_T = 0.65\ V$. Design the channel width W such that $I_D(sat) = 4\ mA$ for $V_{GS} = 5\ V$. Also calculate the drain current for $V_{DS} = 4\ V$. [5][CO4]

6[b] Why GaAs is preferred over silicon for fabricating a MESFET? How it is different from a MOSFET in terms of construction. Sketch the cross-section of an n-channel MESFET and indicate voltage polarity for device operation. Explain the working principal of the device. [5][CO4]

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

FIFTH SEMESTER
B. Tech-ECE

End Semester Examination *December-2024*

EC-305, Semiconductor Device Electronics

Time: 3 Hours *Max. Marks: 50*

Note: *Answer any five questions*
All questions carry equal marks
Use the answer sheet space judiciously
Assume suitable missing data, if any.

1[a] Sketch the energy band diagram of zero- biased, forward biased and reverse-biased Schottky barrier diode. Consider a contact between tungsten and n-type silicon doped to $N_d = 10^{16}cm^{-3}$ at $T = 300\ K$. Determine the theoretical barrier height, built-in potential barrier and maximum electric field in a metal-semiconductor diode for zero applied bias. $\{Given: \emptyset_m = 4.55\ V, \chi = 4.01\ V, N_c = 2.8 \times 10^{19}cm^{-3}, \varepsilon_s = 11.7\}$ [6][CO3]

1[b] Derive the Einstein relation that connects the diffusion coefficient (D) and the mobility (μ) in semiconductors. [4][CO1]

2[a] Consider a p-n junction with a step junction (abrupt junction). Derive the expression for the electric field in the depletion region and the potential distribution across the [5][CO3]

9/16

junction. Discuss the effect of doping concentration on the width of the depletion region.

2[b] How is a p-n diode fabricated, and what are the key steps and materials involved in the manufacturing process of this semiconductor device? [5][CO3]

3 The energy band diagram pictured in Fig.1 characterizes a Si sample maintained at room temperature. Note that $E_F - E_i = E_G/4$ at $x = \pm L$ and $E_i - E_F = E_G/4$ at $x = 0$. Answer the following questions. [10][CO1]

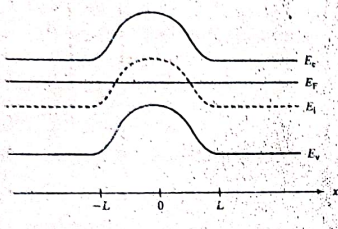

Fig.1

(i) The semiconductor is in equilibrium. How does one deduce this fact from the given energy band diagram?

(ii) What is the electron current density (J_N) and hole current density (J_P) at $x = \pm L/2$?

(iii) Roughly sketch n and p versus x inside the sample.

(iv) Is there an electron diffusion current at $x = \pm L/2$? If there is a diffusion current at a given point, indicate the direction of current flow.

(v) Sketch the direction of electric field $(\mathcal{E})$ inside the semiconductor as a function of x.

(vi) Is there an electron drift current at $x = \pm L/2$? If there is a drift current at a given point, indicate the direction of current flow.

4[a] If $E_C - E_F = 0.28\ eV$ in gallium arsenide at $T = 375\ K$, calculate the value of n_0 and p_0. Assume that bandgap does not change with temperature. $\{Given: N_C = 4.7 \times 10^{17}\ cm^{-3}, N_V = 7 \times 10^{18}\ cm^{-3}, E_G = 1.42\ eV\}$ [2][CO1]

4[b] Explain the mechanism of avalanche breakdown in semiconductor devices, highlighting the underlying physical principles. analyze the effect of temperature on the breakdown voltage during avalanche breakdown. [3][CO3]

4[c] Differentiate the enhancement and depletion MOSFET in terms of its construction and symbol. Draw the transfer characteristics for n-channel enhancement and depletion MOSFET. [5][CO4]

5[a] How to operate BJT in active mode? Discuss the appropriate biasing arrangement. Draw the symbol of npn and pnp BJT. The reverse saturation current of a npn transistor in CB configuration is $125\ \mu A$. For an emitter current of $2mA$, [5][CO5]

Total no. of Pages:02 Roll no. 212

V/VII-SEMESTER B.Tech

END TERM EXAMINATION Nov-2024

COURSE CODE: EC307, COURSE TITLE: Antenna Design

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

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

Q.1 a) An antenna has field pattern given by $E(\theta)=\cos^2(\theta)$ for $0^0 \leq \theta \leq 90^0$. Find the beam area of this pattern using direct and approximation methods [4M][CO1][L1]

b) Evaluate the radiation resistance of a radiating element having length L=5 m at frequencies (f) 30 KHz,15 MHz and 30 MHz respectively. Justify your answers [6M][CO2][L1,L5]

Q.2 a) Dipole antennas are popular can you justify why the half-wavelength dipole is the most popular dipole? Mention any four important reasons. [4M] [CO3][L5]

b) Find the electric and magnetic fields in the far-field region of an monopole antenna by the application of Image theory and determine the total radiated power, maximum directivity? [6M][CO3][L3]

Q.3 a) Design broadband Microstrip antenna for 5G wireless systems operating at 28 GHz. Choose substrate as RT duroid 5880 with a thickness of h=1.57mm, permittivity ϵ_r=2.2 and loss tangent of 9×10^{-4} with inset feed technique. [6M] [CO4] [L6]

b) The Sky-digital satellite receiving antenna is an offset parabolic reflector antenna with a dish diameter of about 40 cm. If the aperture efficiency factor is about 70%, estimate the directivity of this antenna. The central frequency is 12 GHz. [4M] [CO4] [L3]

[PTO]

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Q.4 (a) Derive array factor of N-element linear array with unifor amplitude and spacing. Prove the first side lobe level of antenna arra is -13.46 db. [6M] [CO5] [L3

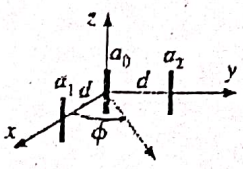
(b) By the application of pattern multiplication theorem, draw th array patterns of two-element arrays with currents having a relati phase shift $\alpha = kd$ and the distance between two elements i) $d = 0.5$ ii) $d = 0.25\lambda$, where k is propagation constant. (Assume antenn elements are Hertzian dipole) [4M] [CO5] [L3

Q.5 a) Explain the design principle of the Yagi–Uda antenna and estima the maximum directivity of a Yagi–Uda antenna with ten element

[4M] [CO3] [L2

b) Determine the gain of a two-dimensional array, consider three directed halfwave dipoles: one at the origin, one on the x-axis, ar one on the y-axis, both at a distance $d = \lambda/2$, as shown below

[6M] [CO5] [L4



Q.6 a) Derive the array factor (AF) of 90^0 corner reflector [4M] [CO4] [L

b) Explain the working principle of Log periodic dipole array (LPDA with neat sketch [2M] [CO3] [L

c) Determine the radiation resistance of loop antenna with number o N=10 turns and radius (a) is 1m. [2M] [CO3] [L1, L

d) Find the termination impedance of folded dipole antenna with 3 wires. [2M] [CO4] [L

Total no. of Pages: TWO Roll No: 214

5TH SEMESTER

B.Tech.

END TERM EXAMINATION

Nov-2024

COURSE CODE: EC309

COURSE TITLE:

BIO-MEDICAL ELECTRONICS & INSTRUMENTATION

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

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

Q.1 Describe with the help of a diagram, the important building blocks of a multichannel ECG machine. What is an ECG 'Lead'? What are the common types of artefacts encountered in ECG recordings? [5][CO1][BTL-I]

Q.2 What are the common methods used for modulation in bio-telemetry system? Explain the pulse-width modulator system with the help of a diagram. Explain the type of information which is essentially transmitted in a telemedicine system. [5][CO3][BTL-III]

Q.3 What do you mean by neo-natal monitoring? Comment upon its significance. [5][CO3] [BTL-I]

Q.4 What is Computed Tomography? Explain the technique with the help of a diagram: Explain the various scanning trajectories with the help of proper illustrations. [5][CO5] [BTL-I]

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Q.5 Describe the basic NMR imaging system with the help of a diagram. What is the significance of relaxation process in NMR imaging? [5][CO5] [BTL-II]

Q.6 How is ultrasound generated? Explain the role of frequency, focussing and active element diameter with reference to ultrasound transducers. [5][CO5] [BTL-II]

Q.7 What is an implantable pacemaker? Explain the basic requirements of an implantable pacemaker. What are the types of external pacemakers? [5][CO5] [BTL-I]

Q.8 What do you mean by thermal imaging? How it is beneficial in bio-medical diagnostics? What type of detectors are used in thermal imaging system? [5][CO5] [BTL-II]

Q.9 Discuss the significance of Artificial Intelligence in bio-medical sciences with reference to the latest development in the related field. [5][CO4] [BTL-VI]

Q.10 What are X-rays and list their properties? Explain the basis of diagnostic radiology with the help of a diagram. [5][CO2] [BTL-I]

Q.11 What do you mean by patient monitoring systems? Why it is required? Comment upon the types available. [5][CO5] [BTL-II]

Q.12 Write short note on any **TWO**: [5][CO2] [BTL-II]

A] Biosensors

B] Tissue and cell typing

C] Digital radiography

Total no. of Pages: 03

Roll no.....

5th SEMESTER, B. Tech.

END TERM EXAMINATION

Nov-2024

COURSE CODE: EC311 COURSE TITLE: Algorithm Analysis and Design

Time: 3 Hours

Max. Marks: 50

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

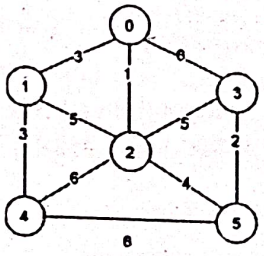
1. (a). Consider the instance of the 0/1 (binary) knapsack problem as below with P depicting the value and W depicting the weight of each item whereas M denotes the total weight carrying capacity of the knapsack. Find optimal answer using greedy design technique. Also write the time complexity of greedy approach for solving knapsack problem. [5] [CO3]

P = [40 10 50 30 60]
W = [80 10 40 20 90]
M = 110

1. (b). What is the difference between NP-Hard and NP-Complete problems? Can you give an example of an NP-Hard problem that is not NP-Complete? [5] [CO5]

2. (a). Prove that the time efficiency of Warshall's algorithm is cubic. Explain why the time efficiency of Warshall's algorithm is inferior to that of the traversal-based algorithm for sparse graphs represented by their adjacency lists. [5] [CO3]

2. (b). Write the Prim's Algorithm to find out Minimum Spanning Tree. Apply the same and find MST for the graph given below. [5] [CO3]



3. (a). A data is given in an array that determines the money stored in each locker in a row. Find the maximum money which can be robbed such that no two adjacent lockers are robbed. Illustrate this problem with the help of suitable example and write the algorithm or pseudocode for that. Show with the help of an example that Greedy approach will not work for this problem. [5] [CO5]

3. (b). Consider a set of characters with the following frequencies: [5] [CO4]

Character	Frequency
A	5
B	9
C	12
D	13
E	16
F	45

You are tasked with constructing an optimal Huffman tree using dynamic programming.

a. Construct the Huffman tree using the dynamic programming approach:
b. Calculate the average length of the codewords produced by the Huffman coding tree.
c. Compute the time complexity of the dynamic programming approach used in this problem and compare it with the greedy approach.

4. (a). Consider the following sequence of matrices with their dimensions:

- Matrix A1 has dimensions 10×20
- Matrix A2 has dimensions 20×30
- Matrix A3 has dimensions 30×40
- Matrix A4 has dimensions 40×30

You are asked to determine the optimal way to multiply these matrices using the Matrix Chain Multiplication algorithm with Dynamic Programming.

a. Construct the matrix chain multiplication problem and explain how to represent the subproblems using dynamic programming:
b. Using dynamic programming, compute the minimum number of scalar multiplications required to multiply the matrices in the optimal order. Trace the optimal parenthesization of the matrix chain multiplication using the table.
c. What is the time complexity of the Matrix Chain Multiplication algorithm using dynamic programming? [5] [CO3]

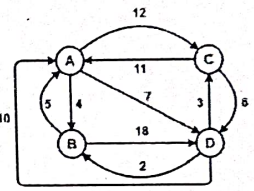
4. (b). Can the master method be applied to the recurrence $T(n) = 4\,T(n/2) + n^2 \lg n$? Why or why not? Give an asymptotic upper bound for this recurrence. [5] [CO1]

5. (a). Consider the following array of integers: [5] [CO2]

$$A = [10,20,15,30,40,50,25,5,60]$$

a. Heapify the given array to build a max-heap.
b. Sort the array using the Heap Sort algorithm. Demonstrate the sorting process by repeatedly extracting the maximum element from the heap and placing it at the end of the array. Show the state of the heap and array after each extraction.
c. Compute the time complexity of the Heap Sort algorithm. Justify why the time complexity is as stated.

5. (b). Solve Travelling Salesman Problem using Branch and Bound Algorithm in the following graph and show each and every steps. [5] [CO4]



Total No. of pages:3

Roll No.....

V TH SEMESTER **B.Tech (ECE)**

END SEMESTER EXAMINATION **Nov 2024**

EC-313 **MICROPROCESSORS AND INTERFACING**

Time :3 Hrs **Maximum Marks: 40**

Note: Question number 1. is compulsory. Attempt any 4 questions from the remaining. Assume missing data if any.

1	a.	Draw the timing diagram of following instruction of 8085 3005 H: JMP 4001 Explain all machine cycles	2	CO2 L 3
	b.	Why assembler directives are called as pseudo instruction? Give an example of assembler directive	2	CO1 L1
	c	Show the status of BHE & A0 pins when (i) 1 byte data is read from 3003H memory location (ii) 1 word is written to 2004H memory location	2	CO2 L3
	d	Differentiate between Asynchronous and Synchronous Modes of transmission of 8251	2	CO1 L1
2	a.	Differentiate between the following instructions i. MUL BL and IMUL BL ii. SAL and SAHF iii. TEST AL, 01 and CMP AL, 01 iv. LEA AX [4326] and LES AX [4326]	4	CO3 L4
	b.	Write an assembly language program to identify number of even numbers in an array of ten 8 bit numbers using 8086 processor	4	CO3 L3
3	a.	Write a far procedure to add fifty 16-bit numbers stored in consecutive memory location starting at displacement 0500H in DS = 0200H	4	CO3 L3

	b	Write an assembly Language program to arrange the given set of numbers in descending order using 8086	4	CO3 L3	
4	a	Write an assembly language program to find the given string palindrome or not	4	CO3 L3	
	b	Write a near procedure to find out the sum of 2 3x3 matrices specified in the memory.	4	CO3 L3	
5	a	Explain all modes of 8254 timer	4	CO4 L2	
	b	Write instructions to configure port A of 8255 as input port and Port B as output port. Write an assembly language program to read data from Port A and write it in Port B at an interval of 1millisecond	4	CO4 L5	
6	a	Initialise 8251 in 8085A system with following specification i. Asynchronous mode with 300 baud ii. 8 bit character length iii. No parity iv. 1.5 stop bits v. Baud rate factor X16 Assume that the address for 8251 ports are A0-A1	4	CO4 L5	
	b	Write an initialization routine for an 8259 (to be selected by addresses C0H and C1H) to set up for operation according to the foliowing Non-Buffered system environment, Normal EOI, 8085A system, single 8259 operation Not in SFNM, CALL address interval equal to 4. First CALL address for IR0 must be FOOH. Also IR2 and IR3 must be masked	4	CO4 L5	
7		Write short notes on any two i. Architecture of 8085 ii. Addressing modes of 8086 iii. 8086 interrupts iv. Memory organization of 8086	4+4	CO1 L1	

Num. of Pages: 4 Roll Num. .....

B. Tech. V/VII Sem.

END TERM EXAMINATION ***Dec-2024***

COURSE CODE: EC 319 **CMOS Analog ICs**

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

Note:
- All questions are compulsory.
- Clearly specify any assumptions you make.
- Unless specified, all MOSFETs are in saturation.
- Do not waste time re-drawing the given circuits.

1. In the 2-stage op-amp shown in Fig. 1, operating point conditions are: $I_{D5} = 2$ mA, $V_{ov1} = V_{ov2} = 0.2$ V (where V_{ov} means overdrive voltage), $I_{D7} = I_{D6} = 2$ mA, $V_{ov6} = 0.4$ V. $V_b = 0.9$ V, $V_{Tn} = 0.5$ V, and $V_{Tp} = -0.5$ V, $\mu_n C_{ox} = 100\mu A/V^2$ and $\mu_p C_{ox} = 50\mu A/V^2$. Assume $\lambda = 0.01\ V^{-1}$ for all transistors.

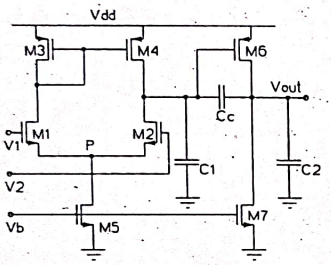


Figure 1: 2-stage unbuffered op-amp

(a) What is the gate to source voltage of M6, M3, and M4; considering M3 and M4 are identical and their currents are same. **[2][CO3][BTL3]**

(b) Find the sizes (W/L) of all 7 MOSFETs. **[7][CO3][BTL3]**

(c) Draw the small signal model of stage-2 and find the DC gain of stage-2. **[4][CO1][BTL2,3]**

2. (a) Analyse the frequency response of the gain of the amplifier shown in Fig. 2(a) **[6][CO5][BTL4]**

(b) For the circuit in Fig. 2(b), find the expressions for input capacitance C_{in}, and output pole frequency (output is at drain of M1) assuming that the current source is ideal. **[6][CO5][BTL3]**

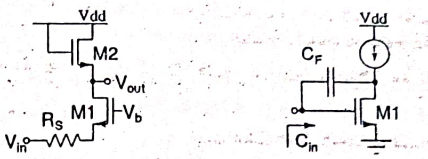


Figure 2: Frequency domain analysis

3. Consider the reference circuits in Fig. 3. M4 and M5 always have same sizes (identical transistors) and currents I_1 and I_2 are non-zero for all three circuits. $\mu_n C_{ox} = 100\ \mu A/V^2$, $V_{Tn} = 0.5$ V.

(a) For Fig. 3(a), if M1, M2, and M3 are identical with $W/L = 2\mu m/1\mu m$; and $I_1 = 0.1$ mA. find the values of V1, V2, and R. Also, what is the purpose of M2, M3, M4, and M5? **[7][CO4][BTL2,3]**

(b) With the help of Fig. 3(b) and (c), describe how Q6 helps in generating a current proportional to absolute temperature. **[6][CO4][BTL2]**

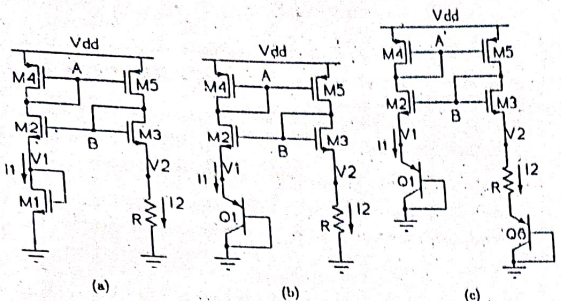


Figure 3: Reference circuits based on floating current mirror

4. (a) For the diff-amp in Fig. 4(a), draw the small signal model using line of symmetry concept and derive the gain v_{out}/v_{in}, where $v_{out} = v_X - v_Y$ and $v_{in} = v_{in1} - v_{in2}$.

[6][CO2][BTL2,6]

(b) Fig. 4(b) shows the Widlar current mirror. Note that the source voltages of $M1$ and M_{ref} are not same. Analyse the circuit using appropriate KVL and Ohm's law expressions. Design the value of R_P such that $I_1 = I_{ref}/2 = 0.5$ mA. $W/L = 20\mu m/0.18\mu m$ for both MOSFETs. Assume $\mu_n C_{ox} = 100\ \mu A/V^2$ and $\lambda = 0$.

[6][CO2][BTL4,6]

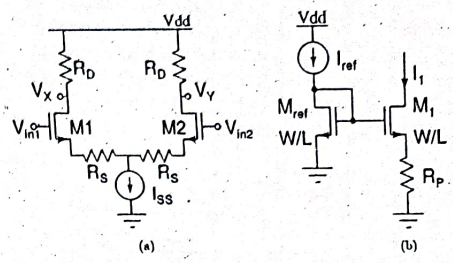


Figure 4

Total no. of Pages: 03

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B.Tech

END SEMESTER

END TERM EXAMINATION **Nov/Dec- 2024**

EC323 CONTROL SYSTEMS

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

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

Q1. (a) Obtain the transfer function of the system shown below in Fig.1 using block diagram reduction method

[5][CO1, L3]

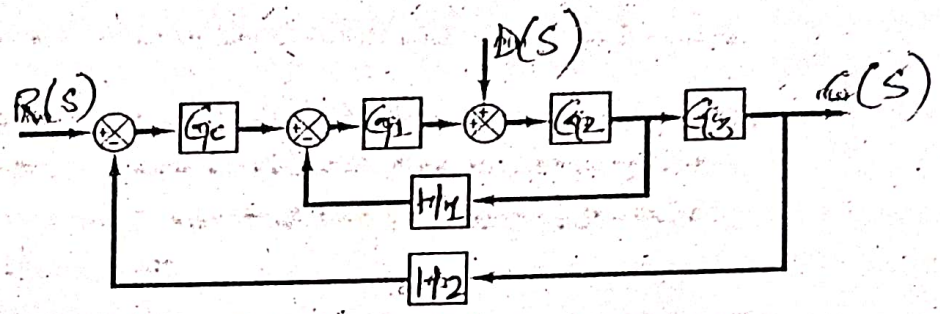

Fig. 1

(b) The engine, body and tires of a racing vehicle affect the acceleration and speed attainable. The speed control of the car is represented by the model as shown in the Fig.2 shown below:

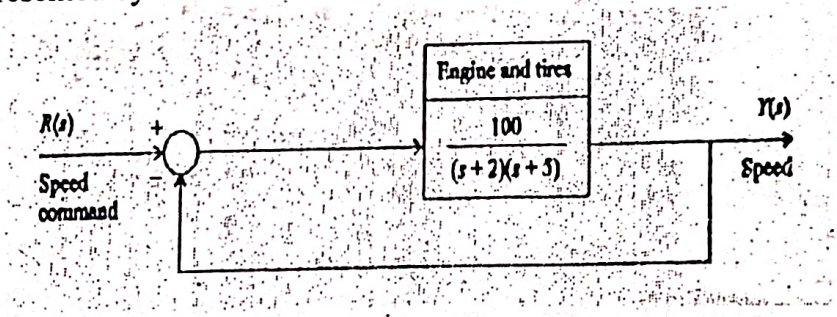

Fig.2

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(i) Calculate the steady state error of the car to a step command in speed.

(ii) Calculate the overshoot of the speed to a step command.

[2.5+2.5][CO2, L3]

Q2. For a unity feedback system with $G(s) = \frac{3s+\propto}{s(s+1)(s+5)}$, draw the root locus plot as parameter $\propto$ varies from 0 to ∞. Also determine the value of parameter $\propto$ for which the closed loop system becomes unstable. From the root locus plot, obtain the approximate location of the system poles with $\xi = 0.707$.

[10][CO3, L3, L5]

Q3. (a) Sketch the Nyquist plot and conclude on closed-loop stability of the following open-loop transfer function of the unity feedback control system:

$$G(s)H(s) = \frac{K}{s(s^2+s+4)}$$

[5][CO3, L5]

(b) Discuss the special cases of Routh Hurwitz criteria and determine the number of roots to the right of the vertical axis located at $s = -2$ for the following characteristic equation

$$s^4 + 10s^3 + 35s^2 + 50s + 24 = 0$$

[2+3][CO3, L2, L3]

Q4. (a) Draw the complete Bode plot for system having the open loop transfer function

$$H(j\omega) = \frac{10^4(1+j\omega)}{(10+j\omega)(100+j\omega)^2}$$

[5][CO4, L4]

b) Consider a unity-feedback control system with the open-loop transfer function. Determine the value of the gain K such that the phase margin is 50°. What is the gain margin with this gain K?

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

[5][CO4,L3]

Q5. (a) Obtain the state transition matrix of the following system:

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$$

(a) A system is described by the state equations :

$$\dot{X} = \begin{bmatrix}3 & 0\\ -1 & 1\end{bmatrix}X + \begin{bmatrix}-1\\ 1\end{bmatrix}U \text{ and } Y = [1 \quad 1]X$$

Determine the system's controllability and observability.

[5+5][CO5,L3]

Q6. Write short notes on the following:

a) Tachogenerator [2.5][CO1,L2]

b) Force-Voltage and Force-Current Analogy of control system [2.5][CO1,L2]

c) Properties of State transition matrix [2.5][CO5,L2]

d) Sensitivity of a negative feedback system [2.5][CO1,L2]

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

_____SEMESTER

B.Tech.

END TERM EXAMINATION ***Nov-2024***

COURSE CODE :EC 325 COURSE TITLE:Probability and Random Process

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

Note : All questions carry equal marks.Solve any 5 out of 6 questions. Assume suitable missing data, if any.

Q.1(a) In an Industrial process, the diameter of a ball bearing is an important component part. The Buyer sets specifications on the diameter to be 3.0 ± 0.01 cm. The implication is that no part falling outside these specifications will be accepted. It is known that in the process, the diameter of the ball bearing has a normal distribution with mean μ=3.0 and standard deviation σ=0.005. On the average, how many manufactured ball bearings will be scrapped?

(b) Distinguish among Wide Sense Stationary, Strict Sense Stationary and Non-Stationary processes.

[7 + 3][3,2#][3#]

Q.2(a) A multiple choice quiz has 200 questions each with 4 possible answers of which only 1 is the correct answer. What is the probability that shear guesswork yields from 25 to 30 correct answers for 80 of the 200 problems about which the student has no knowledge?

(b) Consider two independent random variables, X & Z, with means μ_x , μ_z and variance σ_x^2 & σ_z^2 respectively. Consider a random variable

$$y = \frac{x}{z}$$

Compute E(Y) & Var(Y). [4 + 6][1#][2#]

Q.3(a) Suppose that the shell life, in years, of a certain perishable food product packaged in cardboard containers is a random variable whose probability density function is given by

$$f(x) = \begin{cases} e^{-x} & ,x > 0 \\ 0 & ,else \end{cases}$$

Let X_1, X_2 & X_3 represent the shelf lives for three of those containers selected independently & find $P(X_1<2, 1<X_2<3, X_3>2)$.

(b) A complex random process V(t) is a linear combination of N complex signals:

$$V(t) = \sum_{n=1}^{N} C_n e^{jwot+j\theta n}$$

C_n is random variable representing random amplitude of the nth signal. On representing random phase, all random variables are UDF distribution.

[5 + 5][4,6#][3,4#]

Q.4(a) The data in the following table represents the number of hours of relief provided by 5 different brands of headache tablets administered to 25 subjects experiencing fevers of 38°C or more. Perform the analysis of variance and test the hypothesis at the 0.05 level of significance that the mean number of hours of relief provided by the table is the same for all 5 brands.

A	B	C	D	E
5.2	9.1	3.2	2.4	7.1
4.7	7.1	5.8	3.4	6.6
8.1	8.2	2.2	4.1	9.3
6.2	6.0	3.1	1.0	4.2
3.0	9.1	7.2	4.0	7.6

(b) From a group of 4 men and 5 women, how many committees of size 3 are possible.

(a) With no restriction?

(b) With 01 man and 02 women?

(c) With 02 men and 01 woman if a certain man must be on the committee [6 + 4][4,5#][4,5#]

Q.5(a) Vijay Lodge in Kotwali [illegible] demands for a room is poisson distributed variate with mean of 1.5. Calculate the proportion of days on which:

(i) No room is demanded.

(ii) Few demands for rooms are refused due to non-availaibility of rooms.

(b) In a two hypothesis problem H_0 and H_1 are two hypothesis. System is having two random variables having normal distribution. Let H_0 has mean of P_1 and H_1 has mean of P_2. System uses correlator in the beginning having magnitude 1 for $0<=t<=T$. Calculate the probability of type-II error. Use Maximum Likelihood principle and Bayes theory.

[4 + 6][2,4,5#][5,6#]

Q.6(a) Write short note on : [5 + 5][3,1#][4,5#]

i) Probability of Type-II Errors with derivation

ii) Linear Multi-Variate algebraic prediction-Detailed Derivation and example

Note :

- Number of questions is indicative in nature.
- Font: Times New Roman.
- Font Size: 16.
- [M]: Marks allocated to the question.
- [CO#]: Course outcome number
- [BTL#]: Bloom's Taxonomy Level
- General guidelines : https://www.dtu.ac.in/Web/notice/2023/dec/file1243.pdf

Total no. of Pages: 3 *Roll no.....*

VIIth SEMESTER **B.Tech. [ECE]**

END TERM EXAMINATION ***Nov-2024***

COURSE CODE: EC 407 COURSE TITLE: Optical Communication

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

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

Q.1. For a digital optical system, derive the value of BER (in terms of the factor Q) and the value of optimum threshold current, assuming Gaussian probability distribution for noise. Include both shot noise and thermal noise in your analysis. Comment on the significance of the Q factor. Show graphically, the relation between BER and the Q factor for this system. [5][CO4,5][L3]

Q.2 Consider an optical link of length 30 km is to operate at a wavelength of 1550 nm, and at a data transmission speed of 100 Mbps. The required bit error rate on the link is 10^{-9}. The power transmitted from the source is 0.01 mW. Splicing is done every 3 kms. Additionally, it is given that, splice loss is 0.4 dB/splice, connector loss is 1 dB/ connector and attenuation loss is 0.6 dB/km.

(a) Comment on the type of the optical source, fiber and detector that should be used for this link. Give appropriate reasons. [2][CO1][L3]

(b) Calculate the power budget of the given system and evaluate if it is viable or not. [3][CO5][L5]

Q.3 Show, with the help of energy state diagram, the principle of operation of EDFA. Derive the expression for gain of an EDFA. Analyze how the gain of an EDFA depends on the input optical power. [5][CO4][L4]

Q.4 Explain the concept of non-linearity in an optical fiber. Explain the concept of Second Harmonic Generation and critically comment if this is desirable or undesirable for an optical communication engineer. [5][CO2,5][L2,4]

OR

Explain the origins of non-linearity with the help of the polarization versus electric field equation. Apply the principles of non-linearity to explain the electro-optic effect. [5][CO2,5][L2,4]

Q.5 (a) A 5 km optical link consists of multimode step index fiber with a core refractive index of 1.5 and a relative refractive index difference of 1%. Estimate:

i. the delay difference between the slowest and fastest modes at the fiber output

ii. the maximum bit rate that may be obtained without substantial errors on the link assuming only intermodal dispersion [3][CO2][L3]

(b) Why are graded index fibers employed in optical fiber communication? Elaborate with a diagram. [2][CO2][L2]

Q.6 (a)Analyze the b-V graph of an optical fiber and explain how will you find out if a fiber is a single mode fiber? [3][CO1][L4]

(b) A single-mode step index fiber has a core diameter of 7 μm and a core refractive index of 1.49. Estimate the shortest wavelength of light which allows single-mode operation when the relative refractive index difference for the fiber is 1%. [2][CO1][L3]

Q.7 With the help of proper diagrams, elaborate the working of a photodetector showing clearly the drift, diffusion and the no-field zone. Why are PIN photodiodes preferred over PN photodiodes? [5][CO4][L2,4]

OR

What is Wavelength Division Multiplexing? Discuss the major parts of a generic WDM link with its applications in context of Narrowband and Wideband metro WDM network. [5][CO4][L2,4]

Q.8 A photodiode has a quantum efficiency of 70% when photons of energy 1.5×10^{-19} J are incident upon it. (a) At what wavelength is the photodiode operating? (b) Calculate the incident optical power required to obtain a photocurrent of 3.5 μA when the photodiode is operating as described above. [5][CO4][L3]

Q.9 With regards to optical feedback and oscillation in a Fabry PErot LASER cavity, elaborate the origin of longitudinal modes in the gain curve of a LASER. [5][CO3][L2]

Q.10 The radiative and non-radiative recombination lifetimes of the minority carriers in the active region of a LED are 50 ns and 100 ns respectively. If the peak emission wavelength is 0.86 μm at a drive current of 30 mA, determine:

i. Carrier recombination lifetime

ii. Power internally generated within the LED

iii. Power emitted out of the LED if the transmission factor at the LED-air interface is 68%. [5][CO3][L3]

----------END OF PAPER----------

Assignment in SIFT algorithm. [5] [CO-5] [BTL#2]

b) Define Integral Images. How concept of Integral Images improves the performance of SURF features over SIFT features. Write the expression for Hessian matrix for SURF feature computation. [5] [CO-5][BTL#2, #4]

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

VII SEMESTER

B.Tech.

END TERM EXAMINATION ***Nov-2024***

COURSE CODE: EC409 **COURSE TITLE: Computer Vision**

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

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

Q.1 a) State Central limit Theorem in context of ICA. Under which constraint blind source separation works using ICA. [2][CO-3] [BTL#1]

b) Define motion filed and optical flow using appropriate 3D model visualisation. Also, give one example to describe how optical flow is different from motion field. [2] [CO-3] [BTL#4]

c) A camera with a focal length of 0.06 captures an image of a world point $(1.5, 2.5, -1)$. If the focal length is halved, how do the image coordinates change? Provide the final image coordinates before and after the change in focal length. [2] [CO-1] [BTL#3]

d) Using the data provided in Table 1, find the probability of the species for a given entity, if its Color is Green, Legs are 2, Height is Tall, and not Smelly. [4] [CO4] [BTL#3]

Table 1

S.No. \ Features	Color	Legs	Height	Smelly	Species
1	White	3	short	yes	M
2	Green	2	Tall	No	M
3	Green	3	Short	Yes	M
4	White	3	Short	Yes	M
5	Green	2	Short	No	H
6	White	2	Tall	No	H
7	White	2	Tall	No	H
8	White	2	Short	Yes	H

Q.2 a) Name any two Non-Linear filters and mention when each of them is preferred and why? **[2] [CO-2] [BTL#5]**

b) For a 4×4 image patch I, with gray levels ranging from 0 to 2,

$$I = \begin{matrix} 0 & 0 & 1 & 1 \\ 0 & 2 & 1 & 1 \\ 2 & 2 & 1 & 0 \\ 2 & 1 & 0 & 0 \end{matrix}$$

find GLCM matrix at 0^0 and 135^0. **[3] [CO-2] [BTL#3]**

c) True or False. Justify your claim with appropriate explanation. **[2.5+2.5] [CO2] [BTL#5]**

I. Perwitt Operator is preferred over Sobel operator for edge detection.

II. closing operation is used to remove (with appropriate example)

Q3. a) What assumptions are used for optical flow estimation. Demonstrate how these assumptions are used to estimate optical flow representation. **[2][CO-5] [BTL#3]**

b) For a given image patch of [3 × 3] dimension, find that the centre pixel with value 20 is a corner or not, using $G_y = [-1 \quad 0 \quad 1]$ and $G_x = \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}$ gradient filters. **[3][CO-2][BTL#3]**

$$I = \begin{bmatrix} 10 & 15 & 10 \\ 15 & 20 & 15 \\ 10 & 15 & 10 \end{bmatrix}$$

c) An RGB image is scanned with a resolution of 200 dpi and has physical dimensions of 16 inches by 4 inches. If the image is represented with 12-bit color (4 bits for each color channel), what is the total size of the image in megabytes? **[2] [CO-1] [BTL#3]**

d) Explain steps of Expectation-Maximization Algorithm to show how it estimates maximum likelihood of an event to belong one cluster among k clusters each represented with normal gaussian distribution $(\mu_k(mean), \mathcal{E}_k(varaince))$. **[3] [CO-3] [BTL#4]**

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Q4. a) For a given Image patch of 4 × 4 ... only non-edge pixels (exclude boundary pixels). **[4] [CO-3] [BTL#3]**

$$I = \begin{bmatrix} 11 & 20 & 3 & 11 \\ 32 & 10 & 9 & 66 \\ 1 & 23 & 76 & 1 \\ 22 & 32 & 10 & 5 \end{bmatrix}$$

b) Given the data in Table 2, find the eigen values and Eigen vectors to reduce the dimension from two to one using the Principal Component Analysis (PCA) algorithm. **[3] [CO-3] [BTL#3]**

Table 2: Sample Data

Feature	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
X1	2	3	5	7	4
X2	4	5	7	8	6

c) Define LoG. It is used for which applications. Mention any one limitation of LoG. **[3] [CO2] [BTL#1]**

Q5. a) Cluster the following eight points (with (x, y) representing locations) into three clusters:

$A1(2, 10), A2(2, 5), A3(8, 4), A4(5, 8), A5(7, 5), A6(6, 4), A7(1, 2), A8(4, 9)$

Initial cluster centres are: $A1(2, 10)$, $A4(5, 8)$ and $A7(1, 2)$.

The distance function between two points a = $(x1, y1)$ and b = $(x2, y2)$ is defined as:

$$P(a, b) = |x2 - x1| + |y2 - y1|$$

Use K-Means clustering Algorithm to find the three cluster centres after the second iteration. **[3] [CO-2] [BTL#3]**

b) How sample weight is boosted in Adaboost algorithm for poor samples, Justify. Define the role of weight classifier in making final decision using the steps of Adaboost algorithm. **[3] [CO-4] [BTL#5]**

c) Describe Camera pin hole model for image formation. How aperture size affects image formation? **[4] [CO-1] [BTL#4]**

Chi-Square Right-Tail Probability ($\geq \chi^2$)

DF	0.995	0.99	0.975	0.95	0.9	0.1	0.05	0.025	0.01	0.005
1	---	---	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.300
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.041	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980	45.559
25	10.520	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	18.114	36.741	40.113	43.195	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.993
29	13.121	14.256	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.336
30	13.787	14.953	16.791	18.493	20.599	40.256	43.773	46.979	50.892	53.672
40	20.707	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766
50	27.991	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154	79.490
60	35.534	37.485	40.482	43.188	46.459	74.397	79.082	83.298	88.379	91.952
70	43.275	45.442	48.758	51.739	55.329	85.527	90.531	95.023	100.425	104.215
80	51.172	53.540	57.153	60.391	64.278	96.578	101.879	106.629	112.329	116.321
90	59.196	61.754	65.647	69.126	73.291	107.565	113.145	118.136	124.116	128.299
100	67.328	70.065	74.222	77.929	82.358	118.498	124.342	129.561	135.807	140.169

Chi-Square Distribution Table

Total No. of Pages: 4

Roll No. .....

SEVENTH SEMESTER **B.Tech.ECE**

END TERM EXAMINATION *Nov-2024*

EC455 : Data Analytics

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

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

Q.1 **a)** What are the measures of dispersion? **[2][CO-1] [L2]**

b) Define Bootstrapping and its importance **[2] [CO-4] [L4]**

c) Define bias and variance **[2] [CO-1] [L2]**

d) Explain the concept of a soft margin in SVM and why it's used? **[2][CO-4][L4]**

e) What is the difference between reward and value of the given state? Also state the role of discount factor in reinforcement learning. **[2] [CO-5][L2]**

Q.2 **a)** The specimen of copper wires drawn form a large lot have the following breaking strength (in kg. weight): 578, 572, 570, 568, 572, 578, 570, 572, 596, 544. Test (using Student's t statistic) whether the mean breaking strength of the lot may be taken to be 578 kg. Weight **[4] [CO-2][L3]**

b) Two research workers classified some people in income groups on the basis of sampling studies. Their results are given in table 1: Check whether the sampling techniques adopted by two investigators are similar or not? **[6] [CO-2][L3]**

Investigators	*Income groups*			*Total*
	Poor	*Middle*	*Rich*	
A	160	30	10	200
B	140	120	40	300
Total	300	150	50	500

Table: 1

Q.3 **a)** Calculate the two regression equations of X on Y and Y on X from the data given in table 2, taking deviations from an actual means of X and Y. Estimate the likely demand when the price is Rs.20. **[6][CO-3][L4]**

Price (Rs)	10	12	13	12	16	15
Amount demanded	40	38	43	45	37	43

Table: 2

b) Derive an expression of minimum distance classifier. [4] [CO-4][L2]

Q.4 a) In a bolt factory, three machines M_1, M_2, and M_3 manufacture 2000, 2500, and 4000 bolts every day. Of their output 3%, 4%, and 2.5% are defective bolts. One of the bolts is drawn very randomly from a day's production and is found to be defective. What is the probability that it was produced by machine M_2? [3'][CO-2][L5]

b) Find accuracy and misclassification rate of the binary classifier, where the test set consists of 130 points from class 1 and 150 points from class 2. The designed classifier classifies 110 points from 1 correctly and 20 points to class 2. Also, it classifies 120 points from class 2 correctly and 30 points to class 1. [3][CO-4][L5]

c) Discuss briefly about the LMS Learning law in perceptron learning. [2][CO-4][L2]

d) Discuss the importance of Lasso and Ridge Regression [2][CO-3][L2]

Q.5 a) Consider a data set consisting of 3 observations each with two features. The dataset is given in table 3. Perform principal component analysis on the dataset.

Observations	1	2	3
Feature 1	2.5	0.5	2.2
Feature 2	2.4	0.7	2.9

Table: 3

Hint: Eigen values of the matrix [1 0.937 0.937 1] are 1.937 with Eigen vector [0.707 0.707] and 0.063 with Eigen vector [-0.707 0.707].
[5][CO-4][L4]

b) Training instances are given in table 4, each having two attributes (x1 and x2). Compute the class label for test instance t1= (3, 7) using three-nearest neighbours (k=3). [5] [CO-4][L4]

Training Instance	X1	X2	Output
I1	7	7	0
I2	7	4	0
I3	3	4	1
I4	1	4	1

Table: 4

Q.6 a) Explain the concept of Q Learning with the help of Bellman equation with suitable example [5] [CO-5][L2,L3]

b) Discuss briefly about ensemble Learning. [3] [CO-6][L2]

C) What is the purpose of cross validation? [2][CO-5][L5]

Appendix: F-Distribution Table and Chi-Square distribution Table

t Table

cum. prob	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.98}$	$t_{.99}$	$t_{.995}$	$t_{.999}$
one tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
two tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02	0.01	0.002	0.001
df											
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31	636.62
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	0.000	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	0.000	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	0.000	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	0.000	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	0.000	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	0.000	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	0.000	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	0.000	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	0.000	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	0.000	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	0.000	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	0.000	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	3.232	3.460
80	0.000	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	3.195	3.416
100	0.000	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.174	3.390
1000	0.000	0.675	0.842	1.037	1.282	1.646	1.962	2.330	2.581	3.098	3.300
z	0.000	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.090	3.291
	0%	50%	60%	70%	80%	90%	95%	98%	99%	99.8%	99.9%
	Confidence Level										

T-Distribution Table

Total no. of Pages:03 *Roll no……..*

VII SEMESTER

B.Tech.

END TERM EXAMINATION ***Nov-2024***

COURSE CODE EC457

COURSE TITLE: NATURAL LANGUAGE PROCESSING

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

Note : All questions carry equal marks. Q1 is compulsory and attempt any four questions from Q2 to Q6.
Assume suitable missing data, if any.

Q.1 Describe the following: [10M (2 M each)][L1, L2]

i. Chart parsing. [CO2]
ii. Perplexity. [CO3]
iii. Probabilistic context-free grammar. [CO3]
iv. Auxiliary verbs and verb phrases. [CO1]
v. Need for morphological analysis and lexicon. [CO2]

Q.2 (i). Describe vector semantics and contrast the word2vec framework implementation using one-hot vector representation against word representation by a dense vector. [5M][CO4][L2, L5]

(ii). Illustrate sentiment analysis/classification using embeddings of each input word through Feedforward Neural Language modelling. [5M][CO4][L4]

Q.3 (i) (a) Illustrate how embeddings represent words in a text as vectors. From the following embedding data, compare the similarity between "cherry" & "information" and "digital" & "information".

	pie	data	computer
cherry	442	8	2
digital	5	1683	1670
information	5	3982	3325

[5M][CO4][L3, L5]

(ii). Using the Bigram model, derive the simplified expression for maximising $PROB(C_1, \ldots\ldots, C_T | w_1, \ldots\ldots, w_T)$ for POS tagging, where $C_1, \ldots\ldots, C_T$ is a sequence of lexical categories and $w_1, \ldots\ldots, w_T$ represents a sequence of words. *[5M][CO3][L3]*

Q.4 (i)Using the Viterbi algorithm, determine the POS tagging for the sentence: "Birds fly above trees" based on the Markov Chain and word count table given. The transition probabilities, start probabilities and word count corpus are as follows:

Markov Chain (Transition Probabilities)				
From/To	N (Noun)	V (Verb)	ART (Article)	P (Preposition)
<s> or ϕ (start of sentence)	0.4	0.3	0.2	0.1
N	0.2	0.5	0.1	0.2
V	0.3	0.4	0.1	0.2
ART	0.3	0.3	0.2	0.2
P	0.2	0.2	0.3	0.2

Word Count Table/ Summary of some of the word counts in the corpus					
Word	N	V	ART	P	Total
birds	64	1	0	0	65
fly	21	23	0	0	44
above	0	0	0	15	15
trees	53	0	0	0	53
others	800	350	200	290	1640
Total	938	374	200	305	1817

Emission probabilities/ Lexical generation probabilities/Observation Likelihoods Table				
Word	N	V	ART	P
birds	0.0683	0.0027	0	0
fly	0.0224	0.0615	0	0
above	0	0	0	0.0492
trees	0.0565	0	0	0

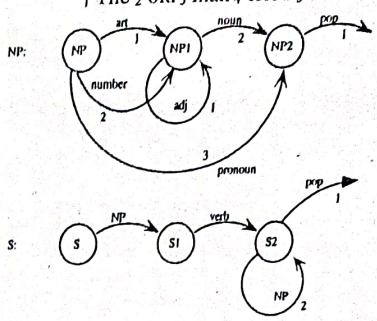
[5 M][CO3][L3]

(ii) Outline different ways of evaluating language models.

[5 M][CO3] L4]

Q.5 (i) Assess and demonstrate whether the CFG presented with the following RTN accepts the sentence:

1 The 2 old 3 man 4 cried 5 .



[5M][CO2][L3, L5]

(ii) Formulate a basic RNN-based encoder-decoder approach/architecture for machine translation and its training process. [5M][CO5][L6]

Q.6 (i). Explain Self-Attention Networks: Transformers and describe their advantages over basic RNNs in NLP. [5M][CO5][L2]

(ii). List three commercial uses of NLP in the modern age (real world) and discuss their challenges. [5M][CO1][L1, L2]

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Total No of pages:02 *Roll No:-*_____

FIRST SEMESTER B. TECH (OLD SCHEME)

END SEMESTER EXAMINATION NOV-2024

EE-101: BASIC ELECTRICAL ENGINEERING

TIME: 3:00 Hrs Max. Marks: 40

NOTE: *Attempt any Five questions.*

1. (a) State Maximum Power Transfer Theorem and derive the condition of maximum power transfer for the DC network. [4][CO1]
   (b)The potential difference at the terminals of a battery on open circuit is 2.18 V. When the battery supplies a current of 9 amperes the potential difference at the terminals is 2.02 V. Determine the internal resistance of the battery. [4][CO3]

2. (a) State and prove Tellegen's theorem with the help of an example. [4][CO1]
   (b) Find the values of half power- point frequencies in a series RLC circuit. Show that the resonance frequency of a series RLC circuit is the geometric mean of the lower and upper half-power frequencies. [4][CO2]

3. (a) Define the following terms with a suitable example: [4][CO1]
   i. Ideal and Practical voltage sources.
   ii. Equivalent Electrical Networks.
   iii. Power Triangle.
   iv. Form factor & peak factor.
   (b) Explain the two-wattmeter method of power measurement for a 3-phase balanced circuit. Input power to a 3-phase motor is measured by the two-wattmeter method. Two wattmeter readings are 5 kW and -1.5kW with a line voltage of 410 V. Calculate the total power, the power factor and the line current. [4][CO2, CO4]

4. (a) State Thevenin's and Norton's theorem. Also prove these theorem by giving a suitable example. [4][CO3]
   (b) What do you mean by controlled-sources? Explain their types also. [4][CO1]

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5. (a) Draw and explain the Hysteresis loop for a magnetic material. [4][CO1]
(b) Two coils have self-inductance of 3 H and 2 H respectively and the mutual inductance is 2 H. They are connected in series and a current of 4 A is passed through them. Calculate the energy of the magnetic field when the self and mutual fluxes are (i) in same direction, (ii) in opposition. Find also the coupling coefficient. [4][CO3]

6. (a) What do you understand by Quality factor. Derive the quality factor of the parallel RLC circuit at resonance. [4][CO2]
(b)With the help of a phasor diagram obtain the relationship between the line and phase values of voltages in 3-phase, star-connected system. [4][CO2]

7. (a) Open-circuit and short-circuit test on a 5kVA, 220/400 V, 50 Hz, single-phase transformer gave the following results: [4][CO5]

O.C. test: 220 V, 2 A, 100 W (l.v. side)
S.C. test: 40 V, 11.4 A, 200 W (h.v. side)

Determine the efficiency and approximate regulation of the transformer at full load 0.9 power factor lagging. [4][CO1]
(b) Write short note on any one of the following:
(i) Moving iron type instrument, (ii) Digital Voltmeters

Total no. of Pages:02 Roll no. 236

1st SEMESTER B.Tech.

END TERM EXAMINATION November-2024

COURSE CODE: EE-101

COURSE TITLE: Basic Electrical Engineering - I

Time: 03:00 Hours Max. Marks: 40

Note : First question is compulsory
Answer any FOUR questions from the remaining
Assume suitable missing data, if any

Q.1 Answer the following questions in brief. [1×8]

(a) The Thevenin resistance of a network can be negative. State True/False. Justify your answer. [1] [CO1][BTL2]

(b) In a balanced three-phase system with phase voltage V, the sum of instantaneous voltages is always _____. (3V, V/3, V, 0) [1] [CO3][BTL1]

(c) Find the reading of the wattmeter in Fig. 1. [1] [CO3][BTL4]

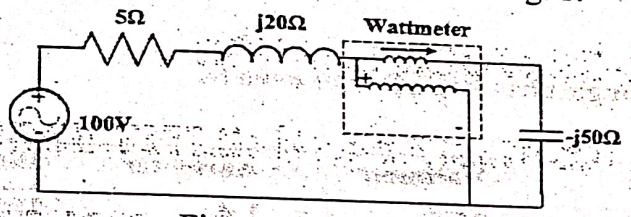

Fig. 1

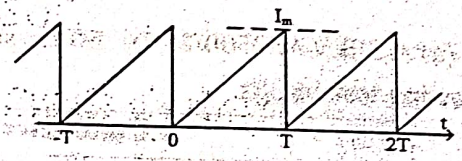

Fig. 2

(d) Find the RMS of the sawtooth current wave in Fig. 2. [1] [CO 2][BTL3]

(e) What are transformer cores made up of ? Why ? [1] [CO 4][BTL1]

(f) SC test on a transformer gives the core losses. [1] [CO 4][BTL1]

(g) Moving coil meters have deflecting torque proportional to square of the current passing through it. State True/False. Justify your answer. [1] [CO5][BTL3]

(h) In indicating instruments, damping torque brings the moving system back to zero position, when the voltage/current is removed. State True/False. Justify your answer. [1] [CO5][BTL2]

Q.2 (a) Determine the Thevenin equivalent circuit for the circuit given in Fig. 3.[5] [CO1][BTL4]

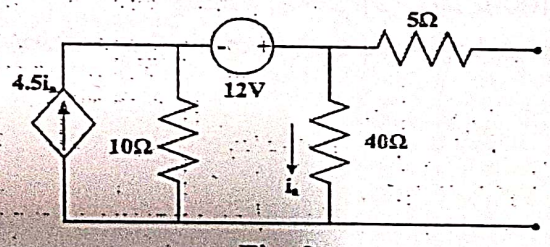

Fig. 3

(b) Draw the V-I characteristics of ideal and practical voltage sources. [3] [CO1][BTL1]

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Q.3(a) State and prove the maximum power transfer theorem for AC circuits [3] [CO2][BTL4]

(b) An inductive coil having resistance of 20Ω and inductance of 0.2H is connected in parallel with a 100μF capacitor. Calculate the frequency at which the circuit acts as non-reactive resistance R. Find the value of R. [5][CO2] [BTL3]

Q.4 (a) While measuring power in a 400V, 50Hz, three-phase balanced load, the readings of the wattmeters are 2000W and 4000W, with the former wattmeter had reading 'backwards'. Determine the total impedance per phase, if the load is star connected. [3][CO3][BTL1]

(b) Refer to Fig. 4. Determine the phase currents inside the delta connected load. Also find the total active power consumed by the three-phase load. Given V_{an}=110V rms, Z_L=10+j5 Ω, Z_Δ=75+j225 Ω. [5][CO3] [BTL5]

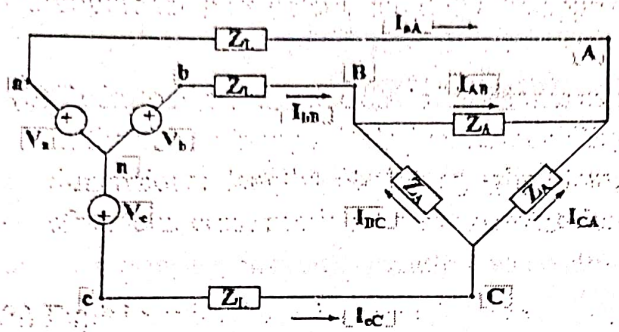

Fig. 4

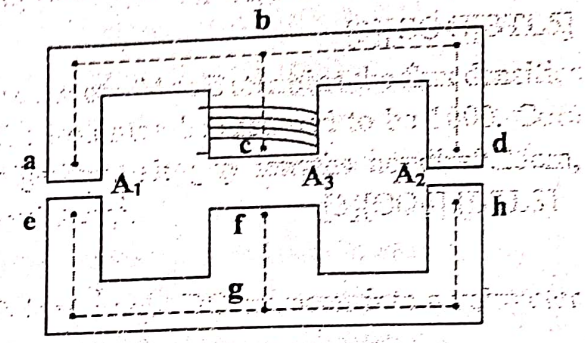

Fig. 5

Q.5 (a) A 20kVA, 2500/250V, 50Hz, single phase transformer gave the following test results:

Test	Conducted	Voltmeter	Ammeter	Wattmeter
Open circuit	On LV side	250V	1.4A	105W
Short circuit	On HV side	104V	8A	320W

Compute the parameters, and draw the approximate equivalent circuit referred to LV side. [3][CO4][BTL5]

(b) Refer to Fig. 5 where a coil of 500 turns carries a current of 4A. Determine the flux densities in the three air gaps. Relative permeability of the iron may be assumed to be 1000. Core dimensions: lengths ab=bd=eg=gh=20cm, bc=fg=7cm, air gap lengths ae=dh=0.25cm, cf=0.4cm, cross sectional areas A_1=A_2=5cm^2, A_3=10 cm^2. [5][CO4] [BTL3]

Q.6 (a) Explain, with neat diagrams, how to convert a 0-1mA range DC ammeter into a voltmeter used to measure 0-100 V DC. [3][CO5][BTL3]

(b) With the help of a neat diagram, briefly explain the working principle of a digital voltmeter. [5][CO5][BTL2]

Total No of pages:3

Roll No:.....

FIRST SEMESTER

B.TECH (EC/CE/PCT/EP/PE)

END SEMESTER EXAMINATION NOV-2024

EE-105 BASIC ELECTRICAL ENGINEERING-2

TIME:3HRS

MAX. MARKS:40

NOTE: ATTEMPT ANY FIVE QUESTIONS. ASSUME MISSING DATA IF ANY.

1(a) Find Thevenin's equivalent circuit for the network shown in Fig. 1 below at the left of terminals A-B. Also, draw its Norton equivalent circuit. [4] CO2]

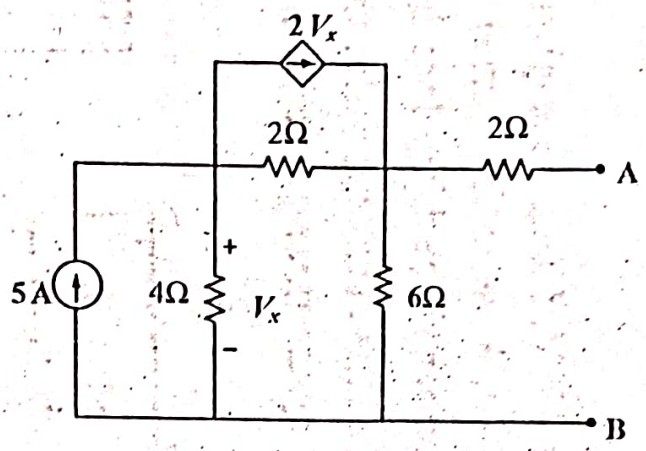

Fig. 1

(b) Using the superposition principle, find the voltage across 30 Ω resistance in Fig. 2 shown below. [4][CO1]

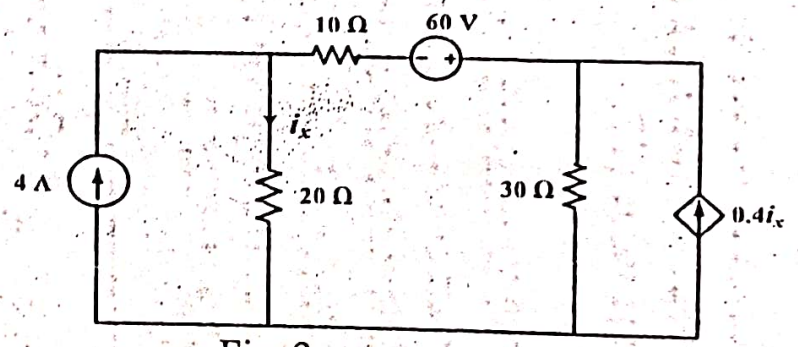

Fig. 2

2(a) State Maximum Power transfer theorem and derive the condition for maximum power transfer for the DC network. [4][CO2]

(b) Find the power across each resistance using the mesh analysis in fig. 3 shown below. [4][CO1]

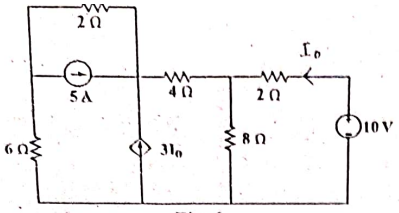

Fig. 3

3(a) A balanced star-connected load is supplied from a symmetrical three-phase, 400 V (line-to-line) supply. The current in each phase is 50 A and lags 30° behind the phase voltage. Find (a) phase voltage, (b) phase impedance, and (c) active and reactive power drawn by the load. Also, draw phasor diagram showing phase and line voltages and line currents. **[4][CO3]**

(b) Prove that the power in a three phase balanced circuit can be deduced from the readings of the two wattmeters. Draw the relevant connections. Input power to a three-phase motor is measured by the two-wattmeter method. The two-wattmeter readings are 4.8 kW and −1.6 kW with a line voltage of 400 V. Calculate (a) the total power , (b) the power factor, and (c) the line current. **[4][CO3]**

4(a) A sine wave of $v(t) = 200\sin 50t$ is applied to a 10Ω resistor in series with a coil. The reading of a voltmeter across the resistor is 120V and across coil 75 V. Calculate the active power, reactive power in the coil and power factor of the circuit. **[4][CO3]**

(b) A coil of inductance of 100 mH and resistance of 800 ohms is connected in parallel with a variable capacitor to change the resonance frequency of the circuit for radio-communication. **[4][CO3]**
If the resonance frequency of circuit, excited with a variable frequency voltage source of 10 V, is 5 kHz; determine the following:
(i) Capacitance of the capacitor (C).
(ii) Quality Factor (Q).
(iii) Bandwidth (BW) of the circuit.

5(a) A mild steel ring having a cross-sectional area of 5cm2 and a mean circumference of 40cm has a coil of of 200 turns wound uniformly around it. Calculate the reluctance of the ring and current required to produce a flux of 800 μWb in the ring. Take relative permeability of mild steel as 380. **[4][CO4]**

(b) *The self-inductance of two coils A and B connected in parallel are 150 mH or 250mH. Coil A, when isolated from coil B has a mutual inductance of 120mH. Calculate the equivalent inductance of the combination if mutual flux supports the individual flux. Also find the coupling factor between the coils.* **[4]**

6(a) *Explain principal of operation of Transformer and explain the working of a transformer under no-load and on load conditions.* **[4][CO**

(b) *A 100 kVA, 3300/200V, 50 HZ single-phase transformer has 40 turns on the secondary, calculate (i) the values of primary and secondary currents, (ii) the number of primary turns, (iii) the maximum value of flux, (iv) If the transformer has to be used on 25 Hz system, calculate the primary voltage, assuming that the flux is increased by 10 per cent .* **[4][CO5**

7(a) *With neat diagram explain the working of Permanent Capacitor single phase induction motor* **[4][CO5]**

(b) *A 3phase 440V 50Hz Induction motor has a full load speed of 1440 rpm. For this motor calculate* **[4][CO5]**
(i) Number of poles
(ii) Full load slip
(iii) Rotor frequency
(iv) Speed of stator field w.r.t stator

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

FIRST SEMESTER **B.Tech.(all)**

END SEMESTER EXAMINATION *Nov-2024*

EE-105 ELECTRICAL SCIENCE

Time:3:00 Hours *Max. Marks:70*

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

1.(a) Find current in 10Ω resistor of the network shown below in Fig.1(a) using nodal analysis. 7

1.(b) Use mesh analysis to evaluate three currents i_1 , i_2 & i_3 in the circuit shown in Fig.1(b) 7

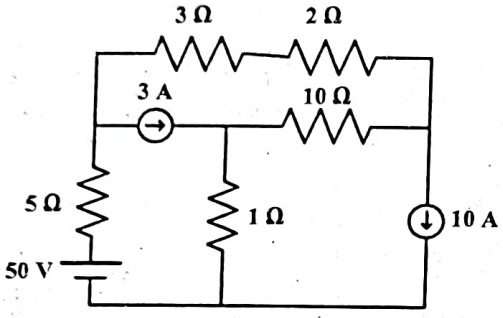


Fig.1(a)

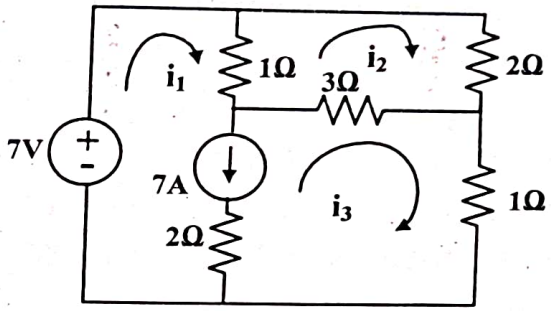


Fig.1(b)

2.(a) Determine the Thevenin's equivalent circuit with respect to terminal A &B in the circuit shown in Fig.2 and hence find the current flowing through 5Ω resistor. 7

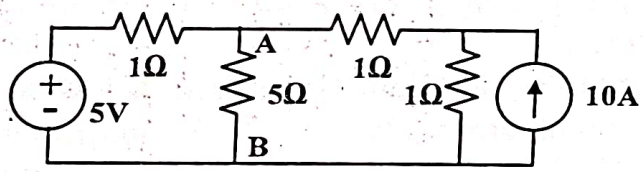


Fig.2

2.(b) Explain maximum power transfer theorem for DC circuits. Derive the expression for maximum power. 7

3.(a) In a series R-L circuit, the current and voltage are given as 7

$i = 1\cos(314t - 20^\circ)$, $v = 10\cos(314t + 10^\circ)$

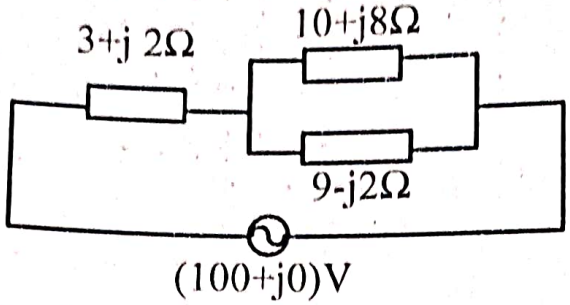
Find the values of R and L.

A 100Ω resistor is shunted by a 0.5H inductor in series with a

(b) capacitor C. A voltage of 220 V, 50 Hz is applied to the circuit. Determine (i) the value of C to give unity power factor, (ii) total current, and (iii) the current in the inductive branch. 7

4.(a) Explain RLC series resonance. Derive Resonance frequency. What is the relationship between frequency, bandwidth (BW) and quality factor (Q) in series resonance circuit. 7

4.(b) For the circuit shown below, find current in each branch of the network. 7



5.(a) Derive the relationship between line voltage & phase voltage and line current & phase current in 3phase star connected system. 7

5.(b) Three impedances of (4-j3)Ω are connected in star against a 440V 3-phase voltage source. Calculate (i)Line current(ii)Power factor (iii)Power supplied 7

6.(a) Explain measurement of three phase power using two wattmeter method and prove that $W_1+W_2=\sqrt{3}\ V_L I_L \cos\theta$. 7

6.(b) The two-wattmeter readings are 4.8 kW and –1.6 kW with a line voltage of 400 V. Calculate (a) the total power , (b) the power factor, and (c) the line current. 7

7.(a) Explain principal of operation of Transformer. Also derive the emf equation for primary and secondary winding of the single phase transformer. 7

7.(b) With the help of neat diagram explain the working of single-phase core type transformer under no load condition. 7

8 Write short notes on any two of the following 7,7

[a] Auto transformer

[b] Permanent magnet moving coil meter

[c] Superposition Theorem

(i) Find the equivalent π–network.

(ii) Find the input impedance when a load of $(3+j5)\Omega$ is connected across the output port.

(b) In the network of Fig 7, Find Z-parameters [CO-5]

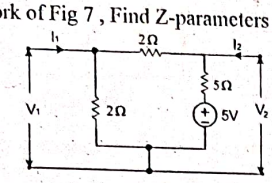


Fig 7

Total no. of Pages: 04 Roll no.....

III SEMESTER

B.Tech.

END TERM EXAMINATION ***Nov-2024***

EE-201 NETWORK ANALYSIS & SYSNTHESIS

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

Note : Question one is Compulsory.
Attempt Any Five.
All questions carry equal marks.
Assume suitable missing data, if any.

Q . 1 (i) Differentiate step, ramp & impulse input with examples. [CO 1-5]

(ii) Justify average value of inductor voltage is zero for a circuit.

(iii) For a standard two port network, justify the condition of reciprocity with examples.

(iv) Explain different types of network structures & their synthesis for a standard single port network.

(v) For an inductor, instantaneous change in current is possible or not, justify the statement with example.

Q. 2 (a) Find the current i for the circuit of Fig1. for $t>0$ when, [CO-1]
$v_s = 10e^{-2t}u(t)$ V

Assume the circuit is in steady state at $t = 0^-$

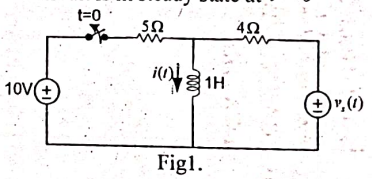


Fig1.

(b) Find $i(t)$ for $t>0$ for the circuit shown in Fig 2, when $R=3\Omega$, $L=1H$, $C=1/2F$, and $i_s=2e^{-3t}A$. Assume steady state at $t=0^-$. [CO-1]

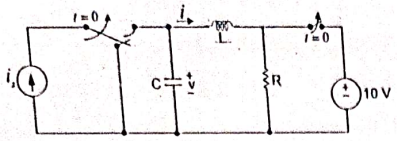


Fig 2.

Q. 3(a) Find the Nortons equivalent circuit of the ac circuit in Fig 3. [CO-3]

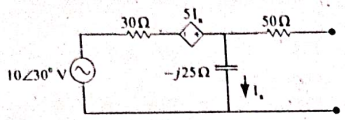


Fig. 3

(b) In the circuit of Fig. 4, find the current through the inductor as well as through the capacitor using the principle of Superposition theorem. [CO-3]

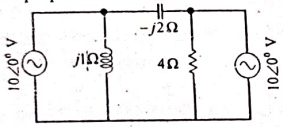


Fig. 4

Q.4 (a) Show the cut-sets for the graph of the network shown in Fig 5 and develop the fundamental cur-set matrix. [CO-2]

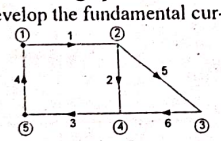


Fig. 5

(b) Develop the graph of the network shown in Fig 6. Obtain the tie-set matrix selecting a tree. [CO-2]

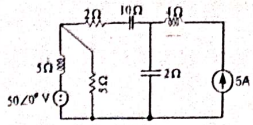


Fig. 6

Q5 (a) Define Positive Real (PR) Function and write its properties. Check whether the given function is PR or not. [CO-6]

$$F(s)=\frac{2s^3+2s+1}{s^3+2s^2+s+2}$$

(b) Explain whether the following function is LC driving point impedance or not [CO-6]

$$Z(s)=\frac{s(s^2+4)(s^2+16)}{(s^2+9)(s^2+25)}$$

Synthesize the $Z(s)$ in Fosters-I and Fosters-II Form.

Q.6 (a) Explain whether the following impedance function represents a RL or RC network and find its first Cauer Function and second Cauer form [CO-6]

$$Z(s)=\frac{(s+4)(s+6)}{(s+3)(s+5)}$$

(b) A 10 V step voltage is applied across a RC series circuit at $t=0$. Find $i(t)$ at $t=0^+$ and obtain the value of $di/dt|_{t=0^+}$. Assume $R=100\Omega, C=100\mu F$. Using Laplace transformation. [CO-4]

Q. 7(a) The current I_1 and I_2 at input and output port respectively of a two-port network can be expressed as: [CO-5]

$$I_1=5V_1-V_2$$
$$I_2=-V_1+V_2$$

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

IIIrd SEMESTER B.Tech.

END TERM EXAMINATION *Nov-2024*

EE-201n Numerical & Engineering Optimization Methods

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) Write an algorithm to solve algebraic equation using bisection method. [4][CO1][BTL1]

(b) Determine the root of the following equation correct upto 3 decimal places using Newton Raphson method.

$$x^3 - 2x - 5 = 0$$ [4][CO1][BTL3]

Q.2 (a) Using 4th order Runge Kutta method, find $y(0.2)$ for the following equation:

$$\frac{dy}{dx} = \frac{y-x}{y+x}$$

given that $y(0) = 1$ and $h = 0.1$. [4][CO1][BTL3]

(b) Convert the following Linear Programming Problem(LPP) to standard form:

$$\text{Minimize } Z = 3x_1 + 4x_2 + 7x_3$$

s.t.

$$6x_1 - 4x_2 \leq 5$$
$$3x_1 + 2x_2 + 5x_3 \geq 11$$
$$4x_1 + 3x_3 = -4$$
$$x_1, x_2 \geq 0 \text{ ; } x_3 \text{ is unrestricted.}$$ [4][CO2][BTL2]

Q.3 Solve the following Linear Programming Problem(LPP) by Simplex method:

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Maximize $Z = 3x_1 + 2x_2 + 5x_3$

s.t.

$x_1 + 2x_2 + x_3 \leq 430$

$3x_1 + 2x_3 \leq 460$

$x_1 + 4x_2 \leq 420$

$x_1, x_2, x_3 \geq 0$ [8][CO2][BTL4]

Q.4 (a) Minimize $f(x) = x^2 - 2.6x + 2$ in the interval [-2, 3] using Fibonacci method. Perform four (04) iterations. [4][CO3][BTL3]

(b) Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ starting from the point $X_1 = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ using Steepest Descent method. Perform five iterations and discuss the result. [4][CO3][BTL3]

Q.5 Minimize $f(x) = x^5 - 5x^3 - 20x + 10$ using Quadratic Interpolation method. Execute two refits. [8][CO3][BTL3]

Q.6 (a) State mathematically the constrained nonlinear problem. Name the various techniques used to solve the constrained problems. [4][CO4][BTL1]

(b) Explain in detail any one Penalty function method for optimizing a constrained nonlinear problem. [4][CO4][BTL2]

Q.7 A function $f(x, y) = x^2 + y^2$ is to be minimized. Perform two iterations of Particle Swarm Optimization (PSO) algorithm to update positions and velocities of particles. Clearly mention the Global best and Personal best in zeroth, first and second iteration. Assume necessary parameters as needed. [8][CO5][BTL4]

Q.8 Write notes on *any two* of the following: [4x2=8][CO5][BTL1,2]

(a) Advantages of PSO

(b) Operators of GA

(c) Univariate Method

(d) Pattern Search Method

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Total no. of pages: 1 *Roll No.....*

THIRD SEMESTER **B. Tech (EE)**

END SEMESTER EXAMINATION **Nov- 2024**

EE 203 Electronics Devices and Circuits

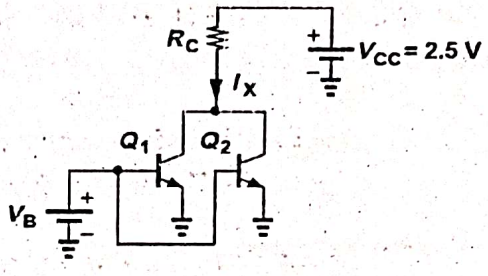
Time: 3hrs. Max. Marks:40

Note: Attempt any four question. All questions carry equal marks.

Q1. a) Consider the circuit shown in figure

i) If $I_{s1}=2I_{s2}=5x10^{-16}A$, determine V_B such as that $I_x = 1.2$ mA

ii) Find the value of R_C which place the transistor at the edge of the active mode.



[CO2][5]

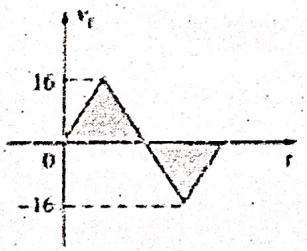
b) Realize AND and OR gate using diodes. **[CO1][5]**

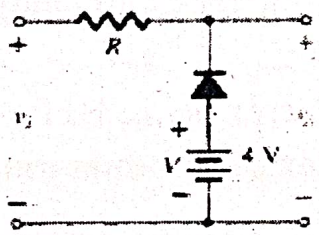
Q2. a) The built-in potential of a P-N junction diode is 0.7V at room temperature. What will be the built-in potential if doping concentrations on both sides are doubled.

[CO1][5]

b) Determine and plot the output voltage (Vo) for the circuit shown in figure

[CO1][5]





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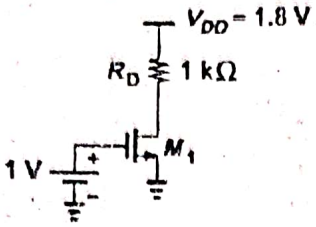
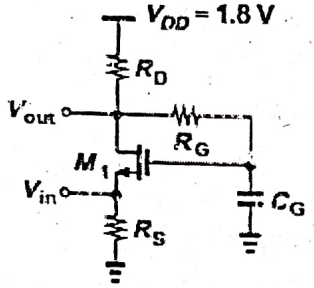
Q3) (a) Assume $\lambda=0$, $V_{TH}=0.4V$ and $\mu_n C_{ox}=200 microAmp/V^2$. Compute W/L of M_1 shown in figure. Such that the device operates at the edge of saturation. **[L1,2] [CO3][5]**



b) Figure shows a self-biased common gate stage where $R_G=10R_D$ and C_G serves as a low impedance so that the voltage gain is still given by g_mR_D. Design the circuit for a power budget of 5mW and a voltage gain of 5. Assume $R_S=10/g_m$, so that the input impedance remains approximately equal to $1/g_m$. **[L3] [CO3][5]**



Q4. a) Explain the Miller's theorem with suitable circuit. **[CO4] [5]**

b) Derive the effect of various capacitors in the low frequency response of common emitter npn amplifier with proper circuit diagram **[CO5][5]**

Q5 Briefly explain with suitable diagram and expression. **[10]**

i) CMRR for a differential amplifier using BJT

ii) Early Effect

iii) Current mirror using BJT

iv) Channel length modulation.

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Total no. of pages: 3

THIRD SEMESTER

END SEMESTER EXAMINATION

Roll No.....

B. Tech (EE)

November-2024

EE 203n: Electronics Devices and Circuits

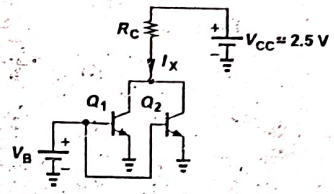
Time: 3hrs. Max. Marks:40

Note: Attempt any four question. All questions carry equal marks.

Q1. a) Consider the circuit shown in figure

i) If $I_{s1}=2\ I_{s2}=5x10^{-16}A$, determine V_B such as that $I_x=1.2$ mA

ii) Find the value of R_C which place the transistor at the edge of the active mode.



[L3,4] [CO1][5]

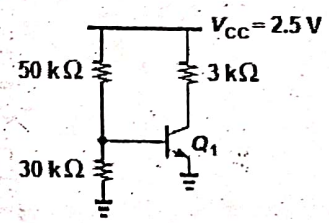
b) Realize AND and OR gate using diodes. **[L6] [CO1][5]**

Q2. a) In the given circuit $\beta=100$ and $V_A=\infty$.

i) If the collector current of Q_1 is equal to 0.5mA, Calculate the value of I_S.

ii) If Q_1 is biased at the edge of saturation, Calculate the value of I_s.

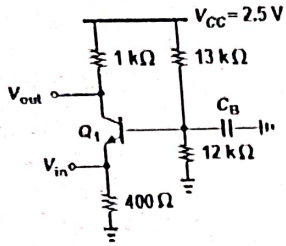
[L4,5] [CO2][5]



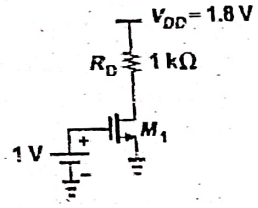
b) Consider the CB stage depicted in given figure β=100, $I_S = 8 \times 10^{-16}$, $V_A = \infty$ and C_B is very large. [L2,3] [CO2][5]

i) Determine the operating point of Q_1.

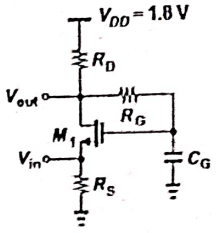
ii) Calculate the voltage gain and input output impedances of the circuit.



Q3) (a) Assume λ=0, V_{TH}=0.4V and $\mu_n C_{ox}$=200microAmp/V^2. Compute W/L of M_1 shown in figure. Such that the device operates at the edge of saturation. [L1,2] [CO3][5]

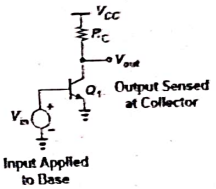


b) Figure shows a self-biased common gate stage where $R_G = 10R_D$ and C_G serves as a low impedance so that the voltage gain is still given by $g_m R_D$. Design the circuit for a power budget of 5mW and a voltage gain of 5. Assume $R_S = 10/g_m$, so that the input impedance remains approximately equal to $1/g_m$. [L3] [CO3][5]



Q4. a) Explain the Miller's theorem with suitable circuit.

b) The circuit shown in figure is biased with a collector current of 2mA and R_C =2kΩ. if β=100 and V_A =10V, determine the small signal voltage gain and input output impedances. [L1,4] [CO4][5]



Q5 Briefly explain with suitable diagram and expression. [10]

i) Difference between Zener breakdown and avalanche breakdown. [CO1][L2]

ii) Early Effect [CO2][L1]

iii) Differential amplifier using BJT [CO2][L1]

iv) Channel length modulation. [CO3][L2]

-END-

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Roll No.....

Total No. of Pages....

THIRD SEMESTER, B.TECH. ELECTRICAL ENGINEERING

END SEMESTER EXAMINATION (Nov, 2024)

EE-205, ELECTROMECHANICAL ENERGY CONVERSION AND TRANSFORMERS

Time: 3.00Hours Max. *Marks: 40*

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

1. (a) What do you understand by Core-type and Shell-type Transformers? Explain with the help of suitable diagrams. CO1 L1 4
   (b) Obtain the phasor diagram of a given single phase transformer when the secondary is loaded with a lagging p.f. load. CO1 L2 4

2. (a) Explain how we perform No-load Test and Short Circuit Test on a single phase transformer. How are the parameters of equivalent circuit obtained by performing these tests? CO2 L3 4
   (b) Obtain the equivalent circuit of a 200/400 Volt, 50Hz single-phase transformer from the following tests performed: CO2 L3 4
   OC Test : 200V, 0.7A, 70W on low voltage side
   SC Test : 15 V, 10A, 85W on High voltage side
   Calculate the secondary voltage supplying 5 kW at 0.8 p.f. lagging. the primary voltage being 200V. CO2 L3 4

3. (a) Explain the constructional features and the principle of operation of a D.C. generator. Also derive the Equation for the EMF developed. CO1 L1 4
   (b) Explain following with the help of neat sketches (i) Yoke (ii) armature core (iii) Front Pitch and Back Pitch, for lap and wave winding. CO1 L1 4

4. (a) How is the voltage Built-up in a DC shunt generator? What is the role of field resistance hence define critical field resistance. What do you understand by residual magnetism in a self-excited DC generator? CO2 L4 4
   (b) A 10 kW, 250 V, 6 pole DC shunt generator runs at 1000 rpm when delivering full load. The armature has 534 lap connected conductors. Full load cu-loss is 0.64kW. The total brush drop is 1 volt. Determine the flux per pole. Neglect the shunt current. CO2 L5 4

5. (a) What are the losses occurring in a D.C. machine. Derive the condition for maximum efficiency. CO3 L5 4
   (b) A shunt generator delivers 195A at a terminal voltage of 250 Volt. The armature and shunt field resistance are 0.02 ohm and 50 ohm respectively. Iron and friction losses equal 950 W. Find generated EMF (b) Cu-loss (c) B.H.P. of prime mover (d) commercial, mechanical and Electrical efficiency. CO3 L4 4

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6. (a) What do you mean by the Back EMF in DC motors? Develop the condition for maximum power and derive an expression for the armature torque developed. CO3 L5 4

(b) Obtain the following characteristics of DC series and shunt motors. CO1 L5 4

1. Torque (T_a) V/S Armature current (I_a),
2. Speed(N) V/S Armature current (I_a), and
3. Speed V/S Armature torque (T_a)

7. Write short notes on any two of the following: CO3 L4 4

(a) Starters in DC motors
(b) Armature reaction
(c) Losses in a Transformer

(i) Obtain the truth table.
(ii) Find the simplified output function in sum of products.
(iii)Find the simplified output function in product of sums.
(iv) Draw the logic diagram of (iii).

4. [a] A combinational circuit is defined by the following three functions: [CO3][BTL6]

$F_1 = \bar{x}\bar{y} + xy\bar{z}$

$F_2 = \bar{x} + y$

$F_3 = xy + \bar{x}\bar{y}$

Design the circuit with a decoder and external gates.

[b] Implement the full subtractor using multiplexers. [CO3][BTL5]

5. [a]Explain the bidirectional shift register with parallel load. Draw neat diagram. [CO5][BTL1]

[b]Design a counter with the following binary sequence: 0, 2, 4, 6, 8 and repeat. Use T flip-flops. [CO5][BTL6]

6. A sequential circuit has two flip-flops (A and B), two inputs (x and y), and an output (z). The flip-flop input functions and the circuit output function are as follows: [CO4][BTL5]

$JA = xB + \bar{y}\,\bar{B}$ $\quad KA = x\bar{y}\bar{B}$

$JB = x\bar{A}$ $\quad KB = x\bar{y} + A$

$z = xyA + \bar{x}\bar{y}B$

Obtain the logic diagram, state table and state diagram.

7. Write short notes on any two of the following. [CO6] [BTL1]
[a] Postulates of Ordinary algebra and Boolean algebra. Compare the Boolean algebra with ordinary algebra.
[b] BCD to Decimal Decoder
[c] RTL and DTL circuits
[d] TTL circuits

Total No. of Pages 02 *Roll No. .....*

THIRD SEMESTER **B.Tech. (EE)**

END SEMESTER EXAMINATION November-*2024*

EE-207 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.
F(A, B, C, D)=$D(\bar{A} + B) + \bar{B}D$ [CO1] [BTL2]

[b] Obtain the simplified expressions in sum of products for the following Boolean functions: Use karnaugh map method. [CO2] [BTL2]
(i) $F(A, B, C, D) = \sum(7, 13, 14, 15)$
(ii) $F(x, y, z) = \bar{x}yz + x\bar{y}\bar{z} + xyz + xy\bar{z}$

2. [a] Implement the following Boolean function with two and three level NAND Gates. [CO2] [BTL3]
F(x, y,z)=$\sum(0,6)$
[b] Implement the Boolean function F(x, y,z)=$\sum(0,6)$ with following gates.
(i) NOR-OR
(ii) NAND-AND [CO1] [BTL3]

3. [a] Implement the following functions using the don't-care conditions. Assume that both the normal and complement inputs are available.
$F(A, B, C, D) = \bar{A}\bar{B}\bar{C} + A\bar{B}D + \bar{A}\bar{B}C\bar{D}$ [CO2] [BTL5]
$d(A, B, C, D) = ABC + A\bar{B}\bar{D}$
With no more than two NOR gates.

[b] A combinational circuit has four inputs and one output. The output is equal to 1 when (1) all the inputs are equal to 1 or (2) none of the inputs are equal to 1 or (3) an odd number of inputs are equal to 1.[CO2] [BTL5]

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V SEMESTER, **B.Tech. EE**

END TERM EXAMINATION *Nov-2024*

EE-207a, Electromagnetic Field Theory

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

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

[1] (i) If $A = 10a_x - 4a_y + 6a_z$ and $B = 2a_x + a_y$, find (i) Component of A along a_y (ii) magnitude of (3A-B) and its direction (iii) unit vector along (A+2B) [CO1]

(ii) Find the gradient of each of the following functions where a and b are constants: (a) $f = ax^2y + by^3z$, (b) $f = ar^2 \sin\phi + brz\cos 2\phi$ [CO1]

[2] (i) Given point P (-2, 6, 3) and vector $A = ya_x + (x+z)a_y$, express P and A in cylindrical and spherical co-ordinates. Evaluate A and P in Cartesian, cylindrical and spherical systems [CO1]

(ii) Find the volume of a sphere of radius R centered at the origin using: (a) Rectangular co-ordinate system (b) Cylindrical co-ordinate system (c) Spherical co-ordinate system [CO2]

[3] (i) Given $F = x^2a_x - xza_y - y^2a_z$, calculate the circulation of F around the path shown in Fig. 1 [CO2]

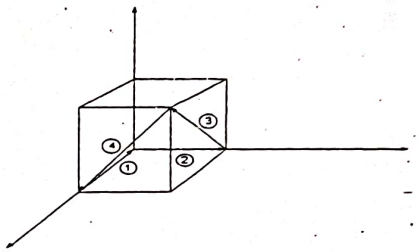

Fig. 1

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(ii) A circular disc of radius 'a' m is charged uniformly charge density of σ C/m^2.find the electric field at a poi from the disc along its axis

[4] (i) Point charges 5 nC and -2 nC are located at (2, 0, 4) and (respectively (a) Determine the force on a 1 nC point charge lo (1, -3, 7) (b) find electric field at (1, -3, 7)

(ii) The line sheet $0 \le x \le 1$, $0 \le y \le 1$, on $z = 0$ plane has density $\rho_s = xy(x^2 + y^2 + 25)^{3/2}\, nC/m^2$, Find (i) Total charge on the

[5] (i) A charge distribution with spherical symmetry has de follows, Determine E everywhere

$$\rho_v = \begin{cases} \frac{\rho_0 r}{R}, & 0 \le r \le R \\ 0, & r \ge R \end{cases}$$

(ii) A point charge of 5 nC is located at (-3, 4, 0) while 0, z = 0, carries uniform charge 2 nC / m,

(a) if V = 0, at O (0, 0, 0) Find V at A (5, 0, 1),

(b) if V = 100V, at B (1, 2, 1) find V at C (-2, 5, 3),

(c) if V = -5V at O, find V_{BC}. [C

[6] (i) Calculate the inductance of a solenoid of 200 turns wound on a cylindrical tube of 6cm diameter. The length of the tube i and the solenoid is air. [C

(ii) A coil of 1000 turns is wound on a Toroidal iron ring c radius 10 cm and cross section of 3 cm^2. Find the self induct the winding if the relative permeability of iron is 800? [C

[7] (i) A copper wire carries current of 1A. Determine displa current in the wire at 1 MHz for copper $\varepsilon = \varepsilon_0$ and $\sigma = 5.8 \times 10^7$

[C

(ii) A parallel plate capacitor has a plate area of 1.5 m^2 and separation of 5 mm. Three are two dielectrics in between the plat first dielectric has a thickness of 3 mm with a relative permittiv and the second has a thickness of 2 mm with a relative permittivi Find the capacitor [C

Q8. a) Draw the block diagram of an instrument that can deliver sine, triangular and square waves with a frequency range of 0.01 Hz to 100 Khz and explain its working? **[2 Marks] [CO4]**

b) Draw block diagram of Digital Storage Oscilloscope (DSO) and explain briefly its working. **[2 Mark] [CO4]**

Q9.) A.) Compare the specifications of RS-serial data lines (RS-232 C&D, RS-423, RS-422 and RS-485) in terms of mode of operation, allowed number of transmission and reception, Maximum data rate in bps and Maximum cable length (ft) **[2 Mark] [CO5]**

B.) What is Universal Serial bus (USB)? Explain the data transfer Modes in USB **[2 Mark] [CO5]**

Q.10) A.) A circuit consisting of a coil, a resistance and a variable capacitor connected in series is tuned to resonance using a Q meter. If the frequency is 500 kHz, the resistance 0.5 Ω and the variable capacitor set to 350 pF. Calculate the effective inductance and resistance of the coil if the Q meter indicates 90. **[2 Mark] [CO2]**

B.) Explain the working principle of the following **[2 Marks] [CO2]**

i.) True RMS Voltmeter

ii.) Analog Electronic Voltmeter

Q.11) A.) A simple shunted ammeter using a basic meter movement with an internal resistance of 1800 Ω and a full scale deflection current of 100 μA is connected in a circuit and gives a reading of 3·5 mA on its 5 mA scale. This reading is checked with a recently calibrated d.c. ammeter which gives a reading of 4.1 mA. The implication is that the first ammeter has a faulty shunt on its 5 mA range. Calculate **[2 Marks][CO2]**

(a) the actual value of faulty shunt;

(b) the correct shunt for the 5 mA range.

B.) Briefly describe the working of resistive hygrometer with figure. **[2 Mark] [CO3]**

Total no. of Pages: 04 Roll no.....

SEMESTER: III

B.Tech.

END TERM EXAMINATION ***Nov-2024***

EE251 Electronic Instrumentation & Measurement

(Old Scheme)

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

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

Q.1 A.) The four impedances of an A.C. bridge shown in Fig.1 are : Z1 = 400 Ω ∠50°; Z2 =200 Ω ∠40°; Z3 = 800 Ω ∠50° ; Z4 = 400 Ω ∠20° Find out whether the bridge is balanced under these conditions or not. **[2 Marks] [CO 1]**

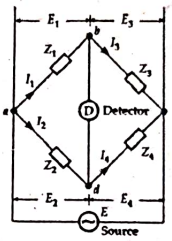

Fig.1

B.) **[2 Marks] [CO1]**

i.) What is the major advantage of Hay's bridge over Maxwell's inductance capacitance bridge?

ii.) Draw circuit and phasor diagrams of Schering Bridge

iii.) List the main type of errors

iv.) Depict the flow chart of different type of instruments

Q.2 A.) An bridge is used to measure the properties of a sample of sheet steel at 2 kHz. At balance, arm ab is Rx in series with Lx ; arm bc is R3 = 100 Ω ; arm cd is C4 =0.1 μF and arm da is R2 = 834Ω in series with C2= 0.124 μF. **[2 Marks] [CO1]**

i.) Determine which bridge is this?

ii.) Draw the circuit and its phasor diagram.

iii.) Derive balance conditions

iv.) Calculate the effective impedance of the arm ab under test conditions.

B.) Three resistors have the following ratings: R1=37 Ω ±5%, R2=75 Ω ±5%, R3=50 Ω ± 5%. Determine the magnitude and limiting error in ohm and in percent of the resistance of these resistances connected in series. **[2 Marks] [CO1]**

Q.3)

A.) A dynamometer ammeter is fitted with two fixed coils having a total resistance of 3.0 Ω and a total inductance of 0.12H, and a moving coil of resistance 30 Ω and an inductance of 0.003H. Calculate the error in reading when the instrument is calibrated with D.C. and used on A.C. 50 Hz with moving coil shunted directly across the field coils. **[2 Marks] [CO2]**

B.) Determine the reading obtained with a d.c. voltmeter in the circuit in Fig. 2 below when switch S is set to position 1 and then to position 2 and determine the reading obtained with a half wave and a full wave rectifier voltmeter. All the meters use a 100 μA full scale deflection meter movement and arc set on their 10 V d.c. or a.c. rms range.**[2 Marks] [CO2]**

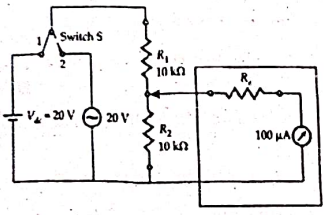

Fig.2

x 10⁻ Nm in an [illegible] bronze springs. Allowing a maximum stress of 65 MN/m² and taking the value of modulus of elasticity as 112.8 GN/m², calculate suitable dimensions for control strings. The width of spring strip is 1 mm. **[2 Marks] [CO2]**

B.) A moving coil voltmeter with a resistance of 20 Ω gives a full scale deflection of 120° when a potential difference of 100 mV is applied across it. The moving coil has dimensions of 30 mm x 25 mm and is wound with 100 turns. The control spring constant is $0{\cdot}375 \times 10^{-6}$ Nm/deg and Specific resistance for copper= $1{\cdot}7 \times 10^{-8}$ Ω m. **[2 Marks] [CO2]**

i.) Find the flux density in the air gap.

ii.) Find the diameter of copper wire of coil winding if 30 percent of instrument resistance is due to coil winding.

Q.5 A) Explain the operating principle of an LVDT. **[2 Marks] [CO3]**

B.) An ac LVDT has the following data. Input =6.3 V, Output =5.2 V, range ±0.5 in. Calculate **[2 Marks] [CO3]**

i.) The output voltage vs core position for a core movement going from +0.45 in. to -0.30 in.

ii.) The output voltage when the core is -0.25 in. from the centre.

Q.6 A.) How can the liquid level position be measured using resistive method. State its advantages and disadvantages. **[2 Marks] [CO3]**

B.) A capacitive transducer uses two quartz diaphragms of area 750 mm² separated by a distance of 3.5 mm. A pressure of 900 kN/m² when applied to the top diaphragm produces a deflection of 0.6 mm. The capacitance is 370 pF when no pressure is applied to the diaphragms. Find the value of capacitance after the application of a pressure of 900 kN/m² . **[2 Marks] [CO3]**

Q7. A.) Two sinusoidal voltage signals of the same frequency but with different peak amplitudes and with a phase difference are applied to the X and Y-plates of a CRO.

What is the shape of the Lissajous figure seen on the screen? If the Y-deflection trace maximum and minimum values are 5 mm and 2.5 mm, determine the phase difference between the two signals.**[2 Mark] [CO4]**

b.) The x-deflection plates of a CRT are 20 mm long and 5 mm apart. The centre of the plate from then screen is 25 cm away. Th e accelerating voltage is 3000 V. Determine the deflection sensitivity and the deflection factor. **[2 Marks] [CO4]**

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B.Tech. Electrical Engineering

Roll No.....

END SEMESTER EXAMINATION

5th SEMESTER

(Nov. 2024)

EE-301-Power Electronics

Time: 3:00 Hours

Maximum Marks:40

Note: Assume suitable missing data, if any.
Attempt all parts of a question at one place (Marks may not be awarded otherwise)
Q.1 is COMPULSORY attempt other four from the rest.

1 Draw the waveform/ characteristics depicting the **requisite details.**

CO 1,2,5

(a) I-V characteristics of Thyristor with depiction of holding current, latching current, forward breakover voltage.

(b) Reverse recovery characteristics of switching power diode and Schottky diode with depiction of I_{RR}, ΔQ_{RR}, and time(s) describing the snappiness factor

(c) Circuit diagram of auxiliary resonant commutation circuit with depiction of polarities on charged capacitor

(d) Current and Voltage waveform both on AC and DC sides of a full thyristorised AC-DC converter feeding a large inductive load with firing angle of near 30°.

(e) Output and current waveform (both on AC and DC sides) of diode rectifier feeding RL load having large inductance substantial source side inductance.

(f) Current and voltage waveform of single-phase AC voltage regulator feeding to purely inductive load (Thyristor Controlled Reactor) for $\alpha > 90°$ (say 120°). Draw the voltage waveform across the switches too.

(g) Waveform of inductor voltage, inductor current and capacitor current of buck convertor with reference to gating pulses.

(h) Waveform for Bipolar pulse width modulation depicting sinusoidal references with triangular carrier and output voltage. **1x8**

2 [a] From the basics, estimate the turn-on losses in the thyristor when connected to a DC source and feeding to a pure resistive load and a R-L (large inductive) load with parallel connected freewheeling diode. **2**

CO 1,2

[b] A 400-V, 40-A power MOSFET modulates power from a dc supply of voltage V_s=230V to a load that absorbs an average power of 3 kW. MOSFET data are: C_{iss}=2200pF, C_{oss}=500pF, C_{rss}=180pF, $V_{GS(TH)}$=3V, $R_{DS(ON)}$=0.1Ω, G=9S. The load comprises of a resistance in series with a large inductance. A freewheeling diode is connected across the load to allow the current to be virtually constant. The gate drive consists of a series resistance R_G=22 Ω and a rectangular-unipolar wave voltage supply with V_G =10V operating at a frequency of 25 kHz and a nominal duty cycle m =0.7 (time ratio of positive

for steady-state switching conditions (both switching & conduction losses). 6

3 [a] Design a turn-off RCD snubber for a power electronic switch feeding an inductive load. If the source voltage V_s=150V DC, load current I_l=10A, and fall time t_f=0.6μs. The switching frequency is f=100kHz, and the duty cycle is D=0.4. Assume the voltage on the switch reaches V_s simultaneous to the current through the switch reaches zero. Further, a time equal to 5-time constants is necessary to discharge the snubber capacitor when the switch is turned ON next. 4 CO 2-3

[b] Ten, 200 V reverse-blocking, ultra fast 35 ns reverse recovery diodes are to be employed in series in a 1500 V peak, string voltage application. If the maximum device reverse leakage current is 10 mA calculate for worst case conditions, the maximum value of sharing resistance(*commercially available resistance*) and the total power dissipation during blocking for static balancing. Further, for dynamic balancing of the string, estimate the minimum possible sharing capacitance for a worst case reverse recovery conditions occurring at maximum junction temperature, di/dt, and a value of Q=6μC. Estimate the energy loss due to capacitor discharge. 4

4 [a] A purely resistive load is supplied from an ideal single-phase supply of fixed voltage and frequency AC source, through an ideal diode bridge rectifier with an ideal SCR switch on the DC side connecting it in series with the load. The switch is gated synchronously during every half cycle at an angle α. Sketch the supply current waveform and the load current waveform for a switching angle α=60. Derive an expression for the rms value of the load current. 3

[b] Determine the average value of the load current drawn by a *1Ph* thyristorised rectifier fed from 230V,50Hz AC source having source inductance (L_s) of 11mH, when thyristors are fired at α = π/3. Assume $\omega L >> R$, to affirm constant current loading, while supplying to connected load(R=10 Ω, L large value). 2 CO 2,3,4

[c] A full controlled thyristorised AC-DC converter fed from 230V, 50Hz supply feeds to RL load (R=12Ω, L=100mH). For the firing angle α=60°, determine the power absorbed by the load and peak-peak current ripple. Verify whether the current is continuous or discontinuous. 3

5 [a] A step-down dc converter is used to convert a 100-V dc supply to 75-V output. The inductor is 200 μH with a resistive load 2.2 Ω. If the MOSFET power switch has an on time of 50 μs and conduction is continuous, calculate the rms values of the diode, switch, and load currents. 4 CO 2,3,4

[b] Design a boost converter having following specifications for CCM mode: V_{in}=48V[40V-75V]; V_{out}=110V; P_{out}=900W[150W-1200W]; f_s=100kHz, η=85%. 4

CO 2-

determine whether the current is continuous ... the output power, rms current, and input power factor for α = π/6.

[b] Discuss in brief details with circuit diagrams, waveforms the single phase to single phase, three phase to single phase cycloconverter. Compare the operation of single phase to single phase cycloconverter with dual converter.

OR

Discuss in brief details with waveforms the Bipolar and Unipolar Sinusoidal Pulse Width Modulation (SPWM) for a single phase bridge inverter. Compute the output of the inverter for Bipolar and Unipolar SPWM at fundamental frequency. Comment on the harmonic spectrum of the two schemes. 4

7 [a] Derive the expression for the load voltages (v_{an}, v_{bn}, v_{cn}) of the three phase thyristorised inverter for 180° conduction. Draw a neat diagram to support the analysis. 4

[b] A single phase full bridge Inverter feeding a RL load(L=30mH, R=10Ω) with square and quasi-square voltage. If V_{DC}=150V and f=50 Hz, compare the total harmonic distortions of the voltage for square and quasi-square voltage (*where pulse is chopped off symmetrically in each half & on each side by 30°*). 4 CO 2-5

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Total no. of Pages:

FIFTH SEMESTER B.TECH. ELECTRICAL ENGINEERING EXAMINATION, NOV, 2024

END SEMESTER

EE-303, POWER TRANSMISSION AND DISTRIBUTION

Time: 03:00Hours

Max.Marks:40

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

CO1 L4 2x4

1. Explain briefly:
   (a) Compare underground and overhead transmission systems
   (b) Discuss why series compensation increases the power transmission capability.
   (c) Explain reason for Ferranti effect to be evident on long lines
   (d) Skin effect and proximity effect

2. (a) Compute the flux linkages and the inductance for three phase line with equilateral spacing. CO2 L2 4

   (b) A 220kV, 50 Hz, 200km three phase line has conductors at the corners of a triangle with asymmetrical spacing of 6m, 6m, 12m. The conductor radius is 1.81cm. Compute the capacitance/ phase/km, capacitive reactance and charging current. CO2 L5 4

3. (a) Represent the nominal pi circuit of a medium length transmission line and draw itsphasor diagram. Compute its ABCD parameters. CO4 L2 4

   (b) A three phase 200km long high voltage line has Z=14.1+51.48 ohms. $y=j1.194 \times 10^{-3}$ siemens. Find the following (i) characteristic impedance (ii) propagation constant (iii) Parameter A (iv)Parameter C. CO4 L3 4

4. (a) Discuss factors and conditions influencing corona loss.How can this loss be reduced practically? CO3 L4 4

   (b) Compute (i) critical disruptive voltage (ii) visual critical voltage for a three phase line which is 160km long, diameter 1.036cm, 2.44m delta spacing, air temperature is 26.6°C, barometric pressure of 73.15cm of mercury, operating at voltage of 110kV at 50 Hz. Assume surface irregularity factor of 0.85 and m_v=0.72. CO3 L5 4

5. (a) Explain the need of grading of cables. Analyze the capacitive grading method considering three layers of dielectrics having different permittivities. CO3 L3 4

   (b) An insulator string designed for 66kV, has four discs. Assume the shunt capacitance between each joint and metal work is 10% of the capacitance of each disc. Find how the voltage is distributed across different discs and the string efficiency. CO1 L3 4

6. (a) An overhead line is supported between two supports A and B at the same level. Discuss the computation of sag and develop a suitable expression.[CO#2] [BTL#L3]

   (b) 230kV transmission line has parameters: weight of conductor=680kg/km. length of span=260m, tension=3000kg (maximum), factor of safety is 5. Find height above the ground at which the conductor needs to be supported if the required clearance from ground is 12m. CO2 L5 4

CO5 L4 4x2

7. Write short notes on any two of the following:
   (i) Design of Lightning arrestors
   (ii) Importance of High Voltage DC Transmission systemsand its main configurations
   (iii) Layout of power system network

Q5. Consider an LTI system for which the system function H(s) has the pole-zero pattern shown in Fig 4.

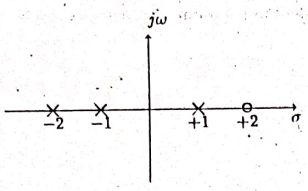

Fig 4

a) Develop all possible ROCs that can be associated with this pole-zero pattern. For each ROC, investigate whether the associated system is stable and/or causal. [5] CO[5] BLT[6]

b) Using the Partial Fraction method, determine the discrete time sequence x[n] which is absolutely summable and has the following z-transform [5] CO[5] BLT[3]

$$X(z) = \frac{1 - 2z^{-1}}{1 - \frac{5}{2}z^{-1} + z^{-2}}$$

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FIFTH SEMESTER B.Tech.[EE]

END-SEMESTER EXAMINATION (Nov.-2024)

EE-305 SIGNALS AND SYSTEMS

Time: 3 Hours *Max. Marks: 50*

Note: Attempt any four Questions including Question no.1 which is compulsory. Assume any data if missing and clearly mention the assumption.

Q1. a) Sketch the following continuous-time signal: [4] CO[1] BLT[2]

$x_1(t) = u(t-1) + u(t-2) - u(t-3) - u(t-4)$,

where $u(\cdot)$ denotes the continuous-time unit step function.

b) The following is the impulse response of continuous-time LTI system: $h(t) = \exp(-2|t|)$ [4] CO[2] BLT[2]

Determine whether the system is causal, stable. Justify your answer.

c) Consider a continuous time system whose response to a complex exponential input e^{j5t} is te^{j5t}. Determine whether the given information is sufficient to conclude that the system is definitely LTI or not. [4] CO[2] BLT[3]

d) Let x(t) be a periodic signal whose Fourier Series coefficients are [4] CO[3] BLT[3]

$$a_k = \begin{cases} 2, & k = 0 \\ j(\frac{1}{2})^{|k|}, & \text{otherwise} \end{cases}$$

Use Fourier Series properties to determine whether x(t) is an even signal or not.

e) Compute and sketch the Fourier transform of x (t) = rect (t/τ). [4] CO[3] BLT[2]

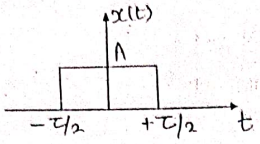
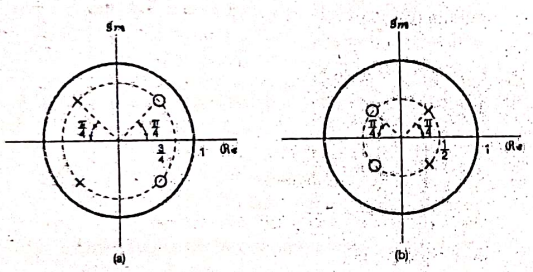


Fig 1

Q2. Suppose a second-order causal LTI system has been designed with a real impulse response $\mathbf{h_1[n]}$ and rational system function $\mathbf{H_1(z)}$. The pole-zero plot for $\mathbf{H_1(z)}$ is shown in Fig. 2(a). Now consider another causal second order system with impulse response $\mathbf{h_2[n]}$ and rational system function $\mathbf{H_2(z)}$. The pole-zero plot for $\mathbf{H_1(z)}$ is shown in Fig. 2(b). Determine a sequence $\mathbf{g[n]}$ such that the following three conditions hold: [10] CO[4] BLT[6]

(1) $h_2[n] = g[n]h_1[n]$
(2) $g[n] = 0$ for $n < 0$
(3) $\sum_{k=0}^{\infty} |g[k]| = 3$



Q3. (a) Consider a continuous-time linear time invariant (LTI) system whose response to the signal $x_1(t)$ in Fig 3(a) is the signal $y_1(t)$ illustrated in Fig 3(b). Determine and sketch the response $y_2(t)$ of the system to the input $x_2(t)$ depicted in Fig. 3(c) CO[3] BLT[4]

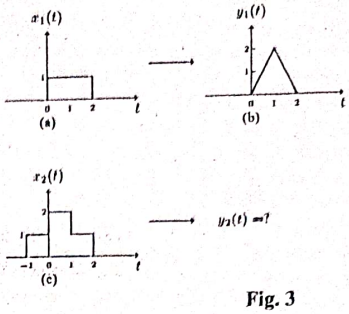


Fig. 3

(b) Consider a causal discrete-time LTI system whose input x[n] and output y[n] are related by difference equation [5] CO[4] BLT[5]

$$y[n] = 0.25\, y[n-1] + x[n]$$

Find the impulse response h[n] of this system and draw a block diagram representation of this system.

Q4. a) State the Nyquist Sampling Theorem for bandlimited low-pass signals. Also derive the conditions for perfect reconstruction of a bandlimited signal from its time-domain samples. [5] CO[4] BLT[1]

b) Determine the Nyquist rate for the following signals: [5] CO[4] BLT[3]

i) $x(t) = 1 + \cos(1000\pi t) + \sin(2000\pi t)$

ii) $y(t) = \left(\frac{\sin(400\pi t)}{\pi t}\right)$

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V/VII SEMESTER B.Tech.

ENDTERM EXAMINATION Nov-2024

EE307: POWER STATION PRACTICES

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) Explain in detail with suitable example i) Load curve ii) Load duration curve iii) Diversity factor iv) Demand factor v) Base load plant. [5][CO1][BTL#L1]

b) The yearly load duration curve of a power plant has the maximum load 500 MW and the minimum load is 400 MW. The capacity of the plant is 750 MW. Find (i) plant capacity factor. (ii) load factor, (iii) utilization factor. (iv) reserve capacity. [5][CO1][BTL#L3]

Q.2 a) Explain in detail the different types of tariff system used for billing for energy consumers. Which type of tariff is most suitable for billing a small industry consumer and why? [5][CO2][BTL#L1,L2]

b) A factory has a maximum demand of 550 kW, the load factor being 55% during working hours. The following two tariffs are available : (i) Rs 8 per kW of maximum demand plus 3 paise per kWh. (ii) a flat rate of Re 4 paise/kWh. Determine the working hours per week above which tariff (i) will be cheaper than tariff (ii). [5][CO2][BTL#L5]

Q.3 a) What are the causes for low power factor? Explain in details the various ways to improve the power factor of the electrical system. [5][CO2][BTL#L1,L2]

b) Derive the condition for most economical power factor of the system. A factory has an average demand of 400 kW and an annual load factor of 0·8. The power factor is 0·5 lagging. The tariff is Rs 90 per kVA of maximum demand per annum plus 4 paise per kWh. If loss free capacitors costing Rs 500 per kVAR are to be utilised,

find the value of power factor at which maximum saving will result. The interest and depreciation together amount to 10%. Also determine the annual saving effected by improving the p.f. to this value. [5][CO2][BTL#L2,L5]

Q.4 a) What are the different types of transformer substation? Explain the functioning of any ten equipment used in a substation. [5][CO3][BTL#L1]

b) Explain different bus bar arrangement in a transmission sub-station. Draw neat and clean diagram to explain. [5][CO3][BTL#L2]

Q.5 Write short notes on [10][CO4][BTL#L1]

i) Industrial Safety

ii) Permit to work

iii) Maintenance of transformers

iv) Hazards in industry

Q.6 a) What is the difference between grounding and earthing? Discuss the advantages and disadvantages of grounded and ungrounded system with suitable diagrams. [5][CO5][BTL#L2]

b) Explain the Arc Suppression Coil Grounding in detail. A 132 kV, 50 Hz, 3-phase, 100 km long transmission line has a capacitance of 0.012 μF per km per phase. Determine the inductive reactance and kVA rating of the arc suppression coil suitable for the line to eliminate arcing ground phenomenon. [5][CO5][BTL#L2,L3]

Q.7 a) What is running cost and fixed cost for a generating station? Explain in detail. A supply is offered on the basis of fixed charges of Rs. 3000 per annum plus 3 paise per unit or alternatively at the rate of 6 paise per unit for the first 40000 units per annum and 5 paise per unit for all the additional units. Determine the number of units per annum for which the cost under the two tariffs be equal. [5][CO2][BTL#L2, L4]

b) The load on a particular substation is likely to increase in near future. What are the various methods to meet the increase kW demand? Also compare the methods explained. [5][CO2][BTL#L6]

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

B.Tech. V/VII SEMESTER

END TERM EXAMINATION *Nov/Dec -2024*

EE 313a : Engineering Analysis and Design

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

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

Q.1 Find the transfer function, $G(s) = \theta_2(s)/T(s)$, for the rotational mechanical system shown in Fig. 1. [5][CO1][BTL3]

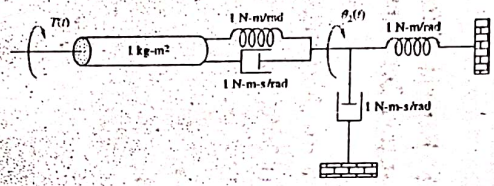

Fig.1

Q.2 Find the state-space representation of the electrical network shown in Fig. 2. The output is $v_0(t)$. [5][CO1][BTL3]

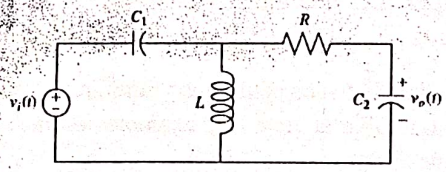

Fig. 2

answer in vector-matrix form.

$$T(s) = \frac{s(s+2)}{(s+1)(s^2+2s+5)}$$

(b) Find the transfer function $G(s) = Y(s)/R(s)$ for the following system represented in state space:

$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -3 & -2 & -5 \end{bmatrix} x + \begin{bmatrix} 0 \\ 0 \\ 10 \end{bmatrix} r$$

$$y = [1 \quad 0 \quad 0]x$$

[5][CO1][BTL3]

Q.4 Use Runge–Kutta method to find an approximate solution to the following initial value problem and compare the results to the actual value. [5][CO2][BTL3]

$$\frac{dy}{dx} = 1 + (x-y)^2, 2 \le x \le 3, y(2) = 1, with\ h = 0.5,$$

$$exact\ solution: y(x) = x + \frac{1}{1-x}$$

Q.5 Approximate the following integral using (i) Trapezoidal rule, and (ii) Simpson's rule. Compare the results of two methods. [5][CO2][BTL3]

$$I = \int_0^{\pi/4} e^{3x} \sin 2x\, dx$$

Q.6 The trapezoidal rule applied to $\int_0^2 f(x)dx$ gives the value 4 and Simpson's rule gives the value 2. What is $f(1)$? [5][CO2][BTL3]

Q.7 Differentiate between continuous time simulation and discrete event simulation. Give at least two examples of each type of simulation technique. [5][CO3][BTL2]

Q.8 Differentiate fixed time step simulation and variable time step simulation with their use cases. [5][CO3][BTL2]

Q.9 Discuss the role of functions in MATLAB programming. Explain the difference between script files, function files, and anonymous functions, with appropriate examples. [5][CO4][BTL2]

Q.10 Write a MATLAB program that:

- Accepts a user-defined square matrix A (3×3).
- Iterates through the matrix using nested loops to check if it is:
  - A diagonal matrix (A diagonal matrix in which all elements outside the main diagonal are zero).
  - A symmetric matrix (A symmetric matrix is a square matrix that is equal to its transpose).
  - An upper or lower triangular matrix (An upper triangular matrix is a square matrix in which all the elements below the main diagonal are zero and A lower triangular matrix is a square matrix in which all the elements above the main diagonal are zero).
- If none of these, converts A into a diagonal matrix by setting non-diagonal elements to zero. [5][CO4][BTL3]

Q.11 Discuss the different types of analyses that can be performed in PSPICE, such as DC analysis, AC analysis, transient analysis, and parametric sweep. Explain the applications of each type with suitable examples. [5][CO5][BTL2]

Q.12 Given the dc servomotor and load shown in Fig. 3, represent the system in state space, where the state variables are the armature current, i_a, load displacement, θ_L, and load angular velocity, ω_L. Assume that the output is the angular displacement of the armature. Do not neglect armature inductance. [5][CO6][BTL5]

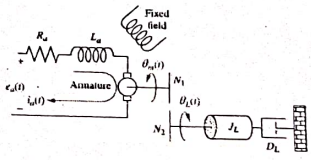

Fig. 3

Total no. of pages: 2 266 Roll No.....

FIFTH SEMESTER B. Tech (EE)

END SEMESTER EXAMINATION Nov. 2024

EE 315 Digital Control and State Variable Analysis

Time: 3hrs. Max. Marks:50

Note: Attempt any five questions. All question carries equal marks.

Q1. a) Determine the Z transform of $x(n)$ and draw its ROC.

$x(n) = \left[(0.5)^n \sin\left(\frac{n\pi}{4}\right)\right] u(n)$ [CO1][5]

b) Determine the z-transform, including the ROC, pole-zero-plot, for sequence

$x[n] = \left(\frac{1}{2}\right)^n u[n] + \left(-\frac{1}{3}\right)^n u[n]$ [CO1][5]

Q2. a) Find the eigenvalues and eigenvectors of the matrix.

$$A = \begin{bmatrix} 5 & 4 & 2 \\ 4 & 5 & 2 \\ 2 & 2 & 2 \end{bmatrix}$$ [CO2][5]

b) For the given matrix find the diagonalization of matrix.

$$A = \begin{bmatrix} 3 & -2 \\ -1 & 2 \end{bmatrix}$$ [CO2][5]

Q3 a) Consider the following state model of a continuous time system.

$$\dot{x}(t) = \begin{bmatrix} 1 & 1 \\ 0 & 2 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

$y(t) = x_1(t)$,

If the system is under a sampling process with period T, derive the discrete state model of the system. [CO3][6]

b) For the system $x'(t) = Ax(t) + Bu(t)$, where $A = \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$, compute $(e)^{At}$ using Cayley Hamilton method. [CO3][4]

Q4) a) Consider the system $x(k+1) = Ax(k) + Bu(k)$, $y(k) = Cx(k)$. where,

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$A = \begin{bmatrix} -2 & 1 \\ 1 & -2 \end{bmatrix}$, $B = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ and $C = [0 \quad 1]$,

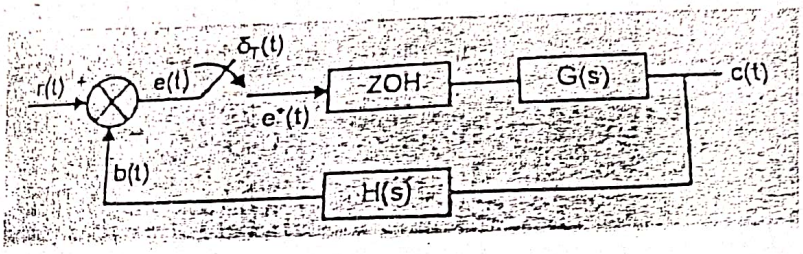
Show if the system is controllable. Find the transfer function Y(z)/U(z). Can you see any connection between controllability and the transfer function? [CO3][6]

b) Define the Controllability and Observability of a system. [CO3][4]

Q5) a) Find the canonical state variable representation and state transitio matrix for a given transfer function $G(s) = \frac{s+3}{(s+1)(s+2)^2}$ [CO4][5]

b) Construct the state model for a system characterized by the differenti equation. $\dddot{y} + 5\ddot{y} + 6\dot{y} = u$ [CO4][5]

Q6) a) For the sampled-data control system shown in figure where $G(s) = \frac{1}{s+1}$, $H(s) = \frac{1}{s}$ and ZOH $G_o(s) = \frac{1-e^{Ts}}{s}$. Assume sampling period is 1 second. [CO5][8]



b) Discuss and derive the relationship between the s plane and z plane [CO1][2]

Q7) a) Check the stability of the characteristic's equation using Jury's stability test. $z^4 - 1.7z^3 + 1.04z^2 - 0.268z + 0.024 = 0$ [CO5][5]

b) determine the stability of the characteristic's equation using Bilinea Transformation. $z^3 + 0.2z^2 - 0.25z + 0.05 = 0$ [CO5][5]

-END-

[4+3+3] [CO4 L4]

6. (i) What is Green Hydrogen Economy? What are the major challenges to use H_2 for carbon-free electricity? Explain the H_2 production chemistry on the polymer electrolyte membrane electrolyser.

(ii) Write short notes on (a)Solar thermal power generation, and (b) Tidal and Ocean thermal energy.

[6+4] [CO5 L3]

Total no. of Pages- 04

Roll no.....

FIFTH/SEVENTH SEMESTER **B.Tech. (EE)**

END SEMESTER EXAMINATION November- 2024

EE317: RENEWABLE ENERGY SYSEMS

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

Note: Answer any five questions. Each question carries equal marks. Assume the missing data suitably (if any).

1. (i) State the various types RES based installed generating capacity presently available in India, and the capacity development program by 2030 and beyond. What are the new technologies being explored in this areas? Specify the problems related to the grid integration of RE generation.

(ii) A PV system in a remote village needs to power up for the following loads:
40 Homes: 2 LED bulbs (15W each) in each home for 4-hours a day.
One School: One computer (200W), 2 fans (70W each) for 8-hours a day
Street lights: 12 CFL bulbs (18W each) for 12 hours a day
Determine the minimum PV panel rating required if the average solar resource is 4 kWh/m^2/day. [7+3] [CO1 L2, CO2 L3]

2. (i) State the market driven solar cell technologies. Draw the VI-characteristics of two similar PV-modules connected in parallel, and two dissimilar PV-modules connected in series. Explain the MPPT control mechanism in a grid connected PV system.

(ii) Calculate the bio-gas generated for a village having 49- families with total population of 245. The cattles' population in the village are 51- cows, 62-Oxes, and 26-Buffalos and the quantity of dung available from them are 10kg/day/cow,12kg/day/oxe and 15kg/day/buffalo.

the biogas plant, considering the following data:

(i) Gas produced on an average from 1-kg dung = 42 litres

(ii) Gas required for cooking/person/day=0.227m³

(iii)Gas required for lighting 2-lamps /family for an hour per day =0.252m³

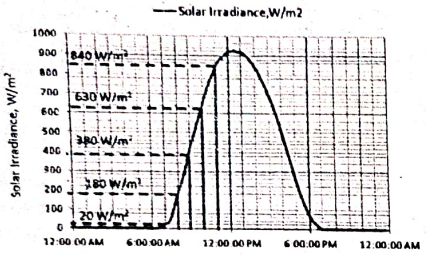
(iv) Gas required for lighting 5 -street lamps for an hour per day =0.63m³

(v) Retention time for slurry (density-1090kg/m³) in digester= 30-days

(vi) Temperature maintained in the digester = 35° C

[5+5] [CO2 L2, CO3, L6]

3. (i) Calculate the total solar energy resource incident over a day according to the following irradiance profile on a typical day.



(ii) If there is a requirement of 3kWh of energy/day from solar photovoltaics, Find the rating of PV panel to be mounted with 5 kWh/m²/day solar resource?

(iii) Find the output power from a solar cell at STC if its efficiency is 19%, and area of solar cell is 100 cm².

(iv) Calculate the power generated by HAWT with 50m long blade with a wind speed of 12 m/s and turbine efficiency of 40%. The site of the

installation is about 100 feet above sea level. Air density at 1000feet level is 1.16 kg/m³.

[3+2+2+3] [CO2 L5, CO3 L5]

4 (i) Derive the expression for extraction of wind energy in WT system and explain the Betz's law. Explain the Pitch, Stall and Yaw control mechanisms, and Low Voltage Ride Through technique in WTG system.

(ii) A 40 m diameter 3 bladed WT produces 700 kW of a wind speed of 14 m/s at a hub height of 100 m. Find (i) the rotational speed (rpm) of the rotor at a tip speed ratio of 5.0 (ii) tip-speed (m/sec) (iii) efficiency of the WT system. Assume air density=1.225 kg/m³.

(iii) State the electro chemistry of a Fuel cell. State the different types of the Fuel cells(FC) and the electrolytes used in these Cells? What are the major differences between the Fuel cell and Battery?

[4+3+3] [CO3 L3, CO5 L2]

5. (I) Give the classifications of small HEPs. Draw the basic configuration of SHPs under run-of-the river scheme. What are the types of generators used?

(II) Calculate the average power generated and determine the installed capacity of the small hydro power plant on the following system design data:

(a) Catchment area = $5x10^9$ m²
(b) Gross Head =30m
(c) Annual rainfall =1.25m
(d) Yield factor = 40%
(e) Overall efficiency=70%
(f) Load factor=40%

(iii) A run-of-the river hydropower station has a gross head of 330 m, net head of 324m and an average water flow of 1370 m³/sec through penstock. Calculate the maximum electricity generation (MW) from the station, considering the overall generator-turbine efficiency as 80%.

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B.Tech. EE *5th Semester*

END SEMESTER EXAMINATION *(NOVEMBER-2024)*

EE-321 SOFT COMPUTING TECHNIQUES

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

Note: 1. Attempt FIVE questions.
2. Assume suitable missing data, if any.

Q.1Draw block diagram and implement Fuzzy Logic Controller for nonlinear system using Mamdani model. [CO2,L1]

[b] Why defuzzification has been done? Explain centre of area method with suitable example. [5+5][CO2,L1]

Q.2 [a] A two input, single output, feedforward neural network has the hidden layer weights=[0.30 0.70;0.80 0.20] and output layer weights=[0.42 0.48] respectively. The bias values are 0.5,0.45 and 0.5 respectively. Consider a sigmoidal function as activation function in hidden layer. What is the output of the neural network if input is [0.55 0.79] ? [CO3,L4,5]

[b] Find change in weights for two epochs using backpropagation algorithm if given target is 0.28 and η=0.6. [5+5][CO3,L4,5]

Q.3 Draw architecture of different type of recurrent neural networks (RNN). Explain backpropagation algorithm of Elman network having 2-1-1 architecture. Derive mathematical expressions for change in weights. [10][CO3,L3,4]

Q.4[a] On November morning, you saw, "The temperature is about 18°C and air quality index(AQI) is 500 ." Represent this piece of information by

i) A crisp set (a crisp membership function), [CO2,L2]

ii) a fuzzy set.

[b] Compare biological neuron with artificial neuron. Write down the strength and weaknesses of a human brain with respect to a computer. [6+4][CO3,L1]

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Q.5 Why hybrid Fuzzy control is used? Explain Fuzzy PI control for a second order system with suitable membership functions, rule base and mathematical derivations. [8] [CO 4, L4, 4

Q.6 Explain different terms with examples (Any two)
[a] Membership functions [CO2, L1]
[b] Perceptron [CO3, L1]
[c] Activation functions [CO3, L1]
[d] Ant colony search [5 marks each] [CO5, L1]

Q.7 Explain basic concept of Genetic Algorithm along with detailed algorithm steps. [10] [CO5, L2]

Q.8 [a] What is the difference between unsupervised and supervised learning? [CO3,
[b] Maximize given function $f(x)=x_1^2+x_2^2$ using binary coded Genetic Algorithm. Use roulette wheel method as selection criterion. Where $0<x_1,x_2<10$, pop size=4, Gen size=4, single point crossover and no of bits for each variable are 4 bit respectively. [5+5] [CO5, L3]

distance function is Euclidean distance. Suppose initially we assign A1, B1, and C1 as the centre of each cluster, respectively. Use the K-Means algorithm to show the three cluster centres after the first round of execution. Also find out the final three clusters. [5] [CO5] [L3]

Total no. of Pages: 04 *Roll no.....*

V & VII SEMESTER

B.Tech

END TERM EXAMINATION ***Dec-2024***

EE323 FUNDAMENTALS OF MACHINE LEARNING

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

Note : All questions carry equal marks (10 marks).
Attempt "ANY 4" questions
Assume suitable missing data, if any.

Q.1

A. What is the output of the following code. Also write the complete steps involved. **[4][CO2][L2]**

```
def iChooseYou(pc):
    pc.append("Kamal")
    pc.sort()

faculty = ["Pankaj", "Neeraj"]
iChooseYou(faculty)
print(faculty)
```

B. Consider the following optimization problem:

minimize $f(x) = x^3 - 3x^2 + 2x + 1$, subject to $-1 \leq x \leq 2$

(i) Test whether f(x) is a convex function. **[2] [CO1] [L4]**
(ii) Find the optimal solution x* that minimizes f(x) over the given interval. [**2] [CO1] [L3]**
(iii) Find the minimum value of f(x) over the given interval. **[2] [CO1] [L3]**

Q.2 [Linear Regression + GD Optimization]

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. $y_1 = 4$.

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y	v	w
4	-30	1
6	-40	2
5	20	3

i. For the data above, suppose we arbitrarily pick $\vec{\beta} = [0.1, 12, 0.2]^T$. What is $\hat{y}_1$? [1] [CO4] [L3]

ii. For the data above, let $\vec{e}$ be the residual vector if $\vec{\beta} = [0.1, 12, 0.2]^T$. What is $|e_1|$? [1] [CO4] [L3]

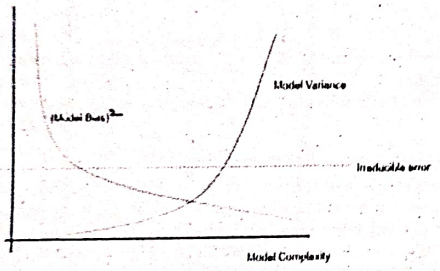
iii. Suppose that you have m = 14 training examples with n = 3 features. The normal equation is $\theta = (X^TX)^{-1}X^Ty$. For the given values of m and n, what are the dimensions of θ, X, and y? Show the calculations. [3] [CO4] [L2]

B. Write short notes on Gradient Descent Algorithm? Explain with a pseudo code? Now, consider the function $f(x, y) = x^2 + 2y^2$. Find the minimum value of $f(x, y)$ using gradient descent algorithm with a learning rate of 0.1 and starting point $(x, y) = (1, 1)$. Show two iterations. [5] [CO4] [L2]

Q.3 [Bias Variance trade off + Confusion Matrix]

A. What is meant by overfitting and underfitting of data with examples? [4] [CO3] [L2]

B. Sketch the MSE (Mean Squared Error) on the graph below. Where does its minimum occur? Draw a star on your MSE plot where the minimum occurs. Elaborate your answer. [2] [CO3] [L3]



C. For a C-class problem, the confusion matrix is a C×C matrix that tells us, fo any two classes c, c′ ∈ [C], how many instances of class c were classified a c′ by the model. In the example below, C=2, there were P+Q+R+S points in the test set where P, Q, R, S are strictly positive integers. Give expressions for the specified quantities in terms of P, Q, R, S. No derivations needed. Note that y denotes the true class of a test point and $\hat{y}$ is the predicted class for that point. [4] [CO3] [L4]

		Predicted class $\hat{y}$	
		+1	−1
True class y	+1	P	Q
	−1	R	S

Confusion Matrix

i. $P[\hat{y} = y \mid \hat{y} = 1]$
ii. $P[\hat{y} = 1 \mid y = 1]$
iii. $P[\hat{y} \neq y \mid \hat{y} = 1]$
iv. $P[y = \hat{y}]$

Q.4 [Dimensionality Reduction]

A. Explain why dimensionality reduction is useful in machine learning? What are the commonly used dimensionality reduction techniques in machine learning? Explain any one in brief. [5] [CO4] [L2]

B. Determine the Singular value decomposition (SVD) of the following 3×3 matrix "A"

$$A = \begin{matrix} 0 & 1 & 1 \\ \sqrt{2} & 2 & 0 \\ 0 & 1 & 1 \end{matrix}$$

Also, comment on how the eigenvalues and singular values are related? [5] [CO5] [L5]

Q.5 [Clustering]

A. Explain k-means algorithm with a pseudo code. Also, discuss the effects of outliers and initial seed points on the convergence of k-means clustering algorithm with suitable examples? [5] [CO5] [L2]

B. Suppose that the data mining task is to cluster the following eight points (with x, y representing location) into three clusters: A1(2, 10), A2(2, 5), A3(8, 4), B1(5, 8), B2(7, 5), B3(6, 4), C1(1, 2), C2(4,9). The

Total No. of Pages-02. 274 Roll No. .....

V / VII SEMESTER B.Tech. [EE]

END-SEM EXAMINATION *November-2024*

EE-325 INTERNET OF THINGS

Time: 3 Hour *Max. Marks: 50*

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

Q.1[a] Compare wireless sensor network versus IoT. [3] **CO2 L2**

[b] Discuss the IoT stack in detail with examples for each layer. [7] **CO1, CO4 L2**

Q.2[a] Explain the working of MQ-02 sensor and its interfacing with the Arduino microcontroller. How is MQ-05 different from MQ-02. [5] **CO4 L2**

[b] Explain the MQTT scheme: publish – subscribe pattern. Also explain the three levels QoS supported by MQTT. [5] **CO2 L2**

Q.3[a] Discuss the various types of CoAP – request – response layer messages. [4] **CO2 CO5 L2**

[b] Discuss the various types of transport protocols. [6] **CO2 CO5 L3**

Q.4[a] One of the PC on DTU network shows the IP address as 10.13.10.94. Which version of IP address is this? What should be its subnet mask? What is the class of this IP address and justify the use of this class of IP address for DTU network. [6] **CO3 L2 L3**

[b] Discuss IPV6 packet format. [4] **CO3 L3**

Q.5[a] Discuss and compare the three deployment models related to cloud computing. [5] **CO2 L2 L3**

[b] Enlist and discuss in brief the challenges related to IoT with cloud [5] **CO5 L3**

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Q.6 [a] Discuss the various criteria one should consider while selecting a cloud service provider. [5] **CO5 L2 L3**

[b] Discuss the various types of machine learning models. [5] **CO5 L2 L3**

Q.7[a] Discuss how IoT can be used for smart warehouse monitoring. [5] **CO6 L2 L3**

[b] How IoT can be used for water quality monitoring? Discuss the end-to-end solution. [5] **CO6 L2 L3**

Q.8 Write short notes on any two. [2x 5] **All CO's**

i. Machine learning.
ii. Components of BLE
iii. Uniform resource identifier
iv. Difference between cloud and fog computing.
v. Service field in IPV4

*****End****

Total No. of Pages : 03 Roll No. .....

V / VII SEMESTER **B.Tech. [EE]**

END-SEM EXAMINATION DEC-2024

EE327 Introduction to Python Programming

Time: 3 Hours *Max. Marks: 50*

Note: Question No. 1 is compulsory.
Attempt any 4 questions from the rest of the questions

Q.1 Fill in the blanks [10 x 1 = 10] **CO2 – CO6 L1 L2**

(i) Python is powerful because of dynamic _____ and no _____declaration.

(ii) Name of the Python library for manipulating numerical tables and time series is _____ and for 2D/3D data visualization is _____.

(iii) Arithmetic operators in Python have _____ to _____ associativity.

(iv) print ( ) in Python is _____ function whereas math, cmath are _____.

(v) An object is created from a class. A class describes two things: _____ & _____.

(vi) Two string comparison operators are _____ & _____ (any two).

(vii) Instead of using the **and** & **or** logical operators we can use _____ & _____ built-in function to get the same effect.

(viii) Two types of repetition control instructions in Python are _____ & _____.

(ix) Built-in function _____ is used to send output to the screen whereas _____ is used to receive console input.

(x) Container data types in Python are _____ & _____.

Q.2[a] Enumerate any 8 built-in functions that can be used with the lists. [4] **CO2 CO3 CO5 L1 L2**

[b] Compare the stack data structure with queue data structure. [3] **CO3 L1 L2 L3**

[c] Create a list of 5 names – 'Anshu', 'Amol', 'Aditya', 'Vivek', 'Gargi'
Perform the following operations on the list of names and display o/p after each operation:

- Insert a name 'Anshika' before 'Aditya'
- Sort all names in the list [3] **CO3 CO4 CO5 L4 L6**

Q.3[a] Refer the following program. Explain the output of each statement / instruction of the program:

```
tpl = (15,20,25,30,10)
print(tpl.count(30))
print(tpl.index(20))
print(tpl.index(45))
print(sum(tpl))
```

[5] **CO3 L4 L5**

[b] Two sets are defined as follows:

```
s = {3, 6, 9, 12, 15, 18}
t = {3, 12, 18}
```

What will be the output of the following operations / commands performed on above two sets:

```
print(s.issuperset(t))
print(s.issubset(t))
print(s.isdisjoint(t))
print(s|t)
print(s & t)
```

[5] **CO2 CO5 L4 L5**

Q.4[a] What will the following commands in the Python program do?

```
d1 = { }
d2 = {'A101': 'Amol' , 'A102' : 'Anil', 'B101' : 'Ram'}
d3 = {10 : 'A', 20: 'B', 30 : 'B'}
d4 = {10 : 'A', 20: 'B', 10 : 'Z'}
d5 = {10 : 'A', 20: 'B', 10 : 'A'}
```

As per the standard convention of Python syntax for d2 'A101' is known as _____ & 'Amol' is known as _____. [6] **CO3 L4 L5**

[b] What are functions? Write two main advantages of function. What are the two types of Python functions? [4] **CO2 CO5 L2**

Q.5[a] What do you understand by a recursive function? When can you use recursion? What are the two types of recursions? [5] **CO2 CO5 L2 L3**

[b] what are lambda functions in Python? Explain the lambda function with example. [5] **CO2 CO5 L1 L2**

Q.6[a] What are classes and objects? Discuss about classes and objects in Python programming. [5] **CO2 CO5 L1 L2**

[b] Enlist the features of inheritance. Also list the various types of inheritance. **[5] CO2 CO5 L1 L2**

Q.7[a] Differentiate between syntax errors, exceptions, and semantic errors. [3] **CO2 L1 L2**

[b] Explain the output of following program in Python:

```
Import matplotlib.pyplot as plt
Import numpy as np
xvalues = np.linspace(0, 2, 100)
yvalues = np.linspace(0, 2, 100)
plt.plt(xvalues, yvalues)
plt.title("Simple plot")
plt.xlabel( "X Values")
plt.ylabel( "Y Values")
plt.show
```

[7] **CO6 L5 L6**

Q.8 Write short notes on any two: [2 x 5 = 10] **CO1-6 L1**

(i) Map, filter, reduce
(ii) Modules and Packages
(iii) Five statistical parameters for data analysis
(iv) Inner function, scope and LEGB rule
(v) Five levels of logging in Python

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

5th/7th SEMESTER

B. Tech.

END SEMESTER EXAMINATION November-2024

EE 357 UTILIZATION OF ELECTRICAL ENERGY

Time: 3 Hours *Max. Marks: 50*

Note: Answer *All* questions. Question No. 1 is compulsory. Each question carry equal marks. Assume the missing data suitably (if any).

1. Answer the following questions in brief. **(10x1=10)**

(a) A room with an area of 6 x 9 m is illustrated by ten 80 W lamp. The luminous efficiency of the lamp is 80 lumens/W and the coefficient of utilization in is 0.65. Calculate the average illumination. **[CO-1]**

(b) Briefly describe the significance of solid angle in illumination technology. **[CO-1]**

(c) What is difference between spot welding and seam welding? **[CO-2]**

(d) What do you mean by atomic hydrogen arc welding. **[CO-2]**

(e) Write the name of any two commercial heating elements and their composition. **[CO-3]**

(f) List out modes of transfer of heat with applications. **[CO-3]**

(g) Briefly describe the electrolysis process. **[CO-4]**

(h) Briefly describe the significance of electroplating. **[CO-4]**

(i) Mention the names of commonly used refrigerants for air conditioning systems. **[CO-5]**

(j) Describe in brief the working of refrigerants in refrigeration and air conditioning. **[CO-5]**

2. (a) A lamp of 500 CP is placed 2 m below a plane mirror which reflects 80% of the light falling on it. Determine the illumination at a point 5 m away from the foot of the lamp which is hung 5 m above the ground. **[CO-1] [5]**

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(b) Describe the various types of lighting schemes. Briefly describe, their applications and limitations. [CO-1][5]

3. (a) Classify the electric welding techniques. With the help of neat diagram, discuss any one type of resistance welding. [CO-2][5]

(b) What are the various methods of resistance heating? Describe briefly any two methods of resistance heating. [CO-3][5]

4. (a) Six resistances, each of 60 Ω, are used in a resistance heating; how much power is drawn for the following connections.

(i) Supply is 400 V and three-phase, and they are connected in delta fashion.

(a) Two resistance units in parallel in each branch.

(b) Two resistance units in series in each branch.

(ii) Supply is 400 V and three-phase while the connection is a star combination of:

(a) Two resistance elements in series in each phase.

(b) Two resistance elements in parallel in each phase.

(iii) If the supply is a 25% tapping with an auto transformer, calculate the output of the oven. [CO-3][5]

(b) A plate of 2.35 cm^2 during electrolysis if a current of 1 A is passed for 90 min (the density of copper is 8.9 gm/cc and the ECE of copper is 0.0003295 gm/coulomb). Find the thickness of copper deposited on the plates? [CO-4][5]

5. Answer ***any two*** of the following in brief: [2x5 = 10]

(a) Induction heating [CO-3]

(b) Electrical circuit of an air conditioner [CO-5]

(c) Significance of polar curves [CO-1]

(d) Significance of Faraday's laws of electrolysis [CO-4]

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Total no. of Pages: 02 280 Roll no.....

VII SEMESTER B.Tech. Electrical (EE)

END TERM EXAMINATION *Nov/Dec-2024*

EE-407 INSTRUMENTATION AND MEASUREMENT

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) The resistance of an unknown resistor is determined by Wheatstone bridge. The solution for the unknown is stated as

$$R_4 = \frac{R_1 R_2}{R_3}$$

where limiting values of various resistances are: R_1= 200 Ω ±1%, R_2= 500 Ω ±2%, R_3= 300 Ω ±0.5%. Calculate (a) the nominal value of the unknown resistor, (b) the limiting error of the unknown resistor in Ω, and (c) the limiting error in percent of unknown resistor.

[4][CO1][BTL2]

(b) Define the following terms: Precision, sensitivity, Resolution and limiting error with suitable examples related to measurement of physical quantity. [4][CO1][BTL1]

Q.2 (a) The four arm of a bridge are:

Arm ab : an imperfect capacitor C_1 with an equivalent series resistance of r_1.

Arm bc : a non-inductive resistance R_3.

Arm cd : a non-inductive resistance R_4.

Arm da : an imperfect capacitor C_2 with an equivalent series resistance of r_2 in series with a resistance R_2.

A supply of 450 Hz is given between terminals a and c and the detector is connected between b and d. At balance:

R_2 = 4.8 Ω, R_3 = 2000 Ω, R_4 = 2850 Ω and C_2 = 0.5 μF and r_2 = 0.4 Ω.

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Calculate the value of C_1 and r_1 and dissipation factor for this capacitor. [4][CO2][BTL3]

(b) Draw circuit diagram of an AC bridge suitable for measurement of frequency and explain its working. [4][CO2][BTL2]

Q.3 (a) In an electrodynamometer instrument, the total resistance of voltage coil circuit is 8200 Ω and the mutual inductance changes uniformly from -173 μH at zero deflection to +175 μH at full scale, the angle of full scale being 95°. If a potential of 100 V is applied across the voltage circuit and a current of 3 A at a power factor 0.75 is passed through the current coil, justify what will be the deflection if the spring control constant is 4.63×10^{-6} N-m/rad? [4][CO3][BTL5]

(b) Explain working of digital storage oscilloscope (DSO) with the help of block diagram. [4][CO5][BTL2]

Q.4 (a) Explain working of photo-emissive cell, photoconductive cell, and photovoltaic cell. [4][CO4][BTL2]

(b) A Thermistor has a resistance of 3980 Ω at the ice point (0°C) and 794 Ω at 50°C. The resistance temperature relationship is given by: $R_T = aR_0\exp(b/T)$. Calculate the constants a and b. Calculate the range of resistance to be measured in case the temperature varies from 40°C to 100°C. [4][CO4][BTL3]

Q.5 (a) Explain in detail working of function generator with block diagram representing basic elements of it. [4][CO5][BTL2]

(b) List the devices used for measurement of pressure. Explain anyone method for measurement of low pressure. [4][CO4][BTL2]

Q.6 Develop a method for measurement of high impedance component using Q-meter. [8][CO3][BTL6]

Q.7 (a) Explain universal commands in IEEE-488 Instrumentation Bus. [4][CO5][BTL4]

(b) Explain working of digital storage oscilloscope (DSO) with the help of block diagram. [4][CO5][BTL3]

Total no. of Pages:3 Roll no.....

VII / V SEMESTER B.Tech (EE)

END TERM EXAMINATION Nov-2024

EE 409 SWITCH GEAR AND PROTECTION

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

Note: Question no.1 is compulsory. Answer any Nine from remaining. Assume suitable missing data, if any.

Q.1 Elaborate and justify the following statements:

[a] Instantaneous overcurrent relay should not be used for Backup protection.

[b]Restraining coil is necessary in percentage biased differential relay

[c]SF_6 circuit breaker is suitable for high voltage applications

[d] Load encroachment is a problem in distance relays

[e]Ratio error and Phase angle error of current transformer has effect on relay operation. [5][CO1,2,4,5][BTL2]

Q.2Explain with neat circuit diagram operation of an IDMT type over current relay. [5][CO1][BTL1]

Q.3What are the basic components of static relays? Explain the amplitude and phase comparator. [5][CO1][BTL1]

Q.4Describe the working principle of percentage biased differential scheme for alternator unit with neat circuit diagram. [5][CO2][BTL1]

Q.5What is meant by incipient fault? how it is protected in transformer with buchholz relay. [5][CO3][BTL1]

Q.6Explain the various characteristics of distance relay with their specific feature for protection transmission line. [5][CO4][BTL5]

Q.7What is meant by 3-Zone protection? Explain the scheme of zone protection for transmission line with distance relays. [5][CO4][BTL1]

Q.8Explain the following terms: (i) Percentage dc component at contact separation (ii) Duty cycle of circuit breaker (iii) Merz-Price protection (iv) Re striking voltage (v) Arching ground [5][CO4,5][BTL1]

Q.9(a)What is meant by inter turn fault in alternator? (b)An 11 kV, 50 Hz alternator is connected to a system which has inductance and

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capacitance per phase of 10 mH and 0.01 μF respectively. Determine (i) the maximum voltage across the breaker contacts (ii) Frequency of track transient oscillation (iii) the average R R R V (iv) the maximum R R R V. [5][CO4][BTL3]

Q.10An earth fault develops at point F on feeder shown in figure (a) and the fault current is 16000A. The IDMT relays at point A and point B are fed via 800/5 CTs. The relay at B has a plug setting on 125% and time setting (TMS) of 0.2. The circuit breakers take 0.2s to clear the fault and the relay error in each case is 0.12s. For a plug setting of 200% on the relay A, determine the minimum TMS on that relay for it not to operate before the circuit breaker at B has cleared the fault. A relay operating time curve is same as shown in figure b

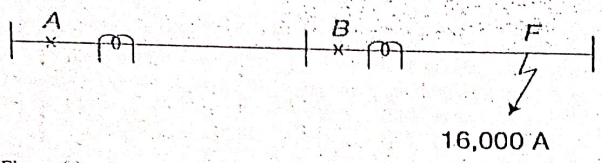


Figure (a)

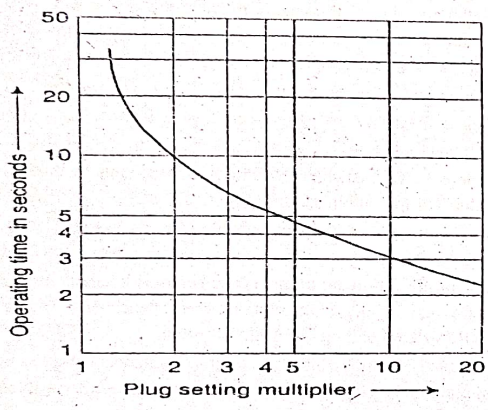
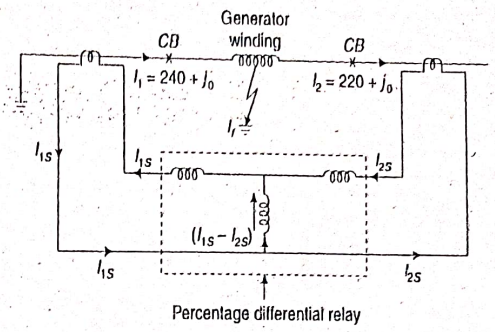


Figure (b)

[5][CO1][BTL3]

Q.11Figure below shows percentage differential relay applied to the protection of a generator winding. The relay has a 0.1 amp minimum pick-up and 10% slope of its operating characteristic on $(I_{1s}+I_{2s})/2$ versus $(I_{1s}-I_{2s})$ diagram. A high resistance ground fault occurred near the grounded neutral end of the generator winding while generator is carrying load. As a consequence, the currents flowing at each end of the winding is shown in the figure. Assuming CT ratios of 400/5 amperes, will the relay operate to trip the breaker?



[5][CO1][BTL3]

Q.12Explain any Two in brief:

(i) Current chopping phenomena in circuit breaker.

(ii) Compare SF6 and Vacuum circuit breaker.

(iii)Unit system and Non-unit system of protection. [5][CO5][BTL4]

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Total No. of Pages 02 Roll No. .....

V and VII-SEMESTER (Elective) B.Tech. [EE]

END SEM EXAMINATION Nov-2024

EE-425 IC TECHNOLOGY

Time: 3:00 Hours Max. Marks : 50

Note : Attempt any five question. All questions carry equal marks.
Assume suitable missing data, if any.
Draw neat and clean diagrams wherever necessary.

Q.1 (a) Explain crystal growth- float-zone process technique. What is the advantage of the Float-Zone technique over the Czochralski technique? [5][CO1][L1,L2]

(b) A silicon ingot, which should contain 10^{19} boron atoms/cm^3, is to be grown by the Czochralski technique. What concentration of boron atoms should be in the melt to give the required concentration in the ingot ? If the initial load of silicon in the crucible is 75 kg, how many grams of boron (atomic weight 10.8) should be added? The density of molten silicon is 2.53 g/cm^3. [5][CO1][L3]

Q.2 (a) State the different types of charges/traps at the Si-SiO_2 interface. [5][CO2][L2]

(b) Derive oxide thickness using Deal-Grove method of oxidation. Also, describe the linear and parabolic rate coefficients. [5] [CO2][L4,L5]

Q.3 (a) What is lithography? Describe three optical wafer exposure tools. [5][CO3][L2]

(b) Explain electron beam lithography and how it differs from X-ray lithography. [5] [CO3][L2,L4]

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Q.4 (a) Differentiate between Diffusion and Ion Implantation. State seven methods/types of diffusion mechanisms. [5] [CO4] [L1,L4]

(b) State and derive Fick's first and second laws of diffusion. [5] [CO4] [L1,L5]

Q.5 (a) What is deposition? Explain the process of physical vapour deposition. [5] [CO4] [L1,L5]

(b) Estimate the intrinsic RC value of two parallel AI wires 0.4micrometer x 0.4micrometer in cross section, 2mm in length, and separated by a polyimide (k=2.7) dielectric layer that is 0.5micrometer thick. The resistivity of AI is 2.7 microohm-cm. [5][CO4][L3]

Q.6 (a) Design and outline a step-by-step fabrication process for a Bipolar Junction Transistor (BJT). [5] [CO5] [L6]

(b) Design and outline a step-by-step fabrication process for a n-type MOSFET. [5] [CO5] [L6]

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

V/VII SEMESTER B.Tech. (EE)

END TERM EXAMINATION Nov-2024

EE427 Computer Architecture

Time: 03:00 Hours Max. Marks: 50

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

Q.1 Explain the following addressing modes i) Register Mode, ii) Immediate Mode, iii) Indirect Mode, iv) Absolute Mode
[5][CO2][BTL2]

Q.2 Explain briefly about Associate-mapped and set-associate mapped cache.
[5][CO4][BTL2]

Q.3 Define the term micro programmed control? Draw the basic organization of a micro programmed control unit and explain it.
[5][CO2][BTL1]

Q.4 Give the classification of Bus structure used in computer. Explain its interconnectivity with a neat diagram.
[5][CO1][BTL3]

Q.5 Explain about Direct Memory access in detail.
[5][CO2][BTL2]

Q.6 Draw a space time diagram for a six-segment pipeline showing the time it takes to process eight tasks.
[5][CO4][BTL6]

Q.7 Explain four possible hardware schemes that can be used in an instruction pipeline in order to minimize the performance degradation caused by instruction branching. [5][CO5][BTL5]

Q.8 Define vector architecture in detail. [5][CO5][BTL1]

Q.9 Explain memory hierarchy in detail. [5][CO3][BTL2]

Q.10 List basic computer registers and their functions. [5][CO1][BTL1]

Q.11 [a] Differentiate between stack and queue. [3][CO3][BTL4]

[b] Differentiate between polish and reverse polish notations with example. [2][CO2][BTL4]

Q.12 Explain dynamic scheduling in detail. [5][CO5][BTL2]

Draw the neat sketch of your system. Indicate the design procedure Comment on the **power rating** of the **solar panel, battery and power interface**. Also estimate the required no. of SPV panels and the battery. Assume the efficiency of the power converters to be 93%, Depth of discharge of the battery (DOD) to be 60%. Maximum solar irradiance availability is 4-7 kWhr/m^2/day.

Comment also on the area required for the SPV installation assuming 1kW of the SPV panel area to be 15m^2.

Q.9 Design a **SPV system for water pumping** which requires to draw **4000 litres** of water for the irrigation purpose. The total vertical lift is 13m with pump efficiency to be 30% and the mismatch factor of 0.85. Assume the water density to be 1000kg/m^3 and the value of g=9.8m/s^2. **[5]** [CO2, 3,4]

Draw the neat sketch of your system. Indicate the design procedure Comment on the power rating of the solar panel and the rating of the motor.

Q.10 Write short notes on the following **(Any three)** **[10]**

(a) Phase locked loop (PLL) based grid synchronization techniques. [CO2, 3,4,5]

(b) Multi-input interleaved converters in SPV system. [CO2, 3,4,5]

(c) Maximum power point tracking (MPPT) techniques. [CO3, 4,5]

(d) Multi-level inverters for SPV system. [CO3, 4,5]

(e) Grid interactive inverters. [CO3, 4,5]

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

Vth/VIIth-Sem *B. Tech [EE]*

End Semester Exam *(Nov/Dec.-2024)*

EE-429 Power Electronics Application to Photo Voltaic Systems

Time: 03hrs *Max. Marks: 50*

Note: Q.1(10 marks) is compulsory to attempt. Attempt 40 marks from Q.2 to Q.10. Derivation of all formulas with proper justification are mandatory wherever required. Assume suitable data if missing.

Q.1 Comment with proper justification for the following statements: **[10]**

(a) A power electronics interface is required for different loads in SPV system. [CO1]

(b) Continues conduction mode (CCM) is better than Discontinues conduction mode in SPV system. [CO1]

(c) Unipolar pulse width modulation (U-PWM) is more advantageous than bi-polar pulse width modulation (B-PWM). [CO1, 2]

(d) Sinusoidal PWM (SPWM) modulation technique has higher total harmonic distortion (THD) in output voltage. [CO2, 3]

(e) Amplitude modulation greater than one is not preferable in the SPV system. [CO2, 3]

Q.2 A monocrystalline SPV module/panel is presented in Fig.1, with an open circuit voltage V_{oc} of 45.2 V, short circuit current I_{sc} of 18.46A, and the maximum power P_{mp} of 650 W, V_{mp} of 37.4 V and I_{mp} of 17.38A at STC, has a temperature coefficient of V_{oc} equals to **-0.250%/°C**, temperature coefficient of I_{sc} equals to **0.040%/°C**, and the temperature coefficient of P_{mp} equals to **-0.34%/°C**. **[5]** [CO1, 2]

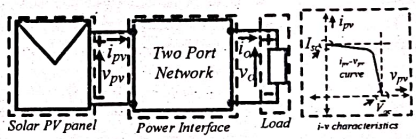

Fig.1 SPV schematic

For a SPV system, is it necessary to connect a **series diode** and the **shunt capacitor** at the output of the **SPV panel.** Design a **Boost DC-DC Converter** for obtaining an output voltage of **75V.** Consider the SPV module temperature to be at 50°C. Derive all the necessary expressions. Assume switching frequency of the system to be **20kHz,** voltage ripple less than 1% and current ripple less than 10%. Sketch all the waveforms associated with the converters. How the switching of the said converter is decided. Explain in detail.

Q.3 For the SPV schematic as presented in Fig.1, Design a **Buck-Boost DC-DC Converter** for obtaining an output voltage of **75V** at STC. Derive all the necessary expressions. Assume switching frequency of the system to be **20kHz,** voltage ripple less than 1% and current ripple less than 10%. Sketch all the waveforms associated with the converters. How the **switching** of the said converter is decided. Explain in detail. **[5] [CO1, 2]**

Q.4 Discuss the feasibility of using **isolated DC-DC converter** in SPV system. **[5] [CO2, 3]**

Explain in detail the operation of a forward DC-DC converter. Comment on the role of different windings in the forward converter. Derive all the expressions.

Q.5 The **forward DC-DC converter** used in the SPV system has parameters V_s=100 V, N_1/N_2=5, N_1/N_3=1, L_m =333 μH, R=2.5Ω, C=10 μF, and D=0.25, and the switching frequency is 100 kHz. **[5] [CO2, 3]**

(a) Determine the output voltage and output voltage ripple. (b) Sketch the all the currents. (c) Determine the power returned to the source by the tertiary (third) transformer winding from the recovery storage energy in L_m.

Q.6 The SPV system for AC load (residential) is presented in Fig.2 **[5] [CO2, 3,4]**

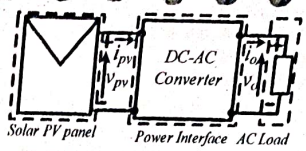

Fig.2 SPV schematic for AC load

Explain five crucial factors related to the inverters for the SPV system. Derive the output voltage of the DC-AC converter (inverter) in term of amplitude modulation. Discuss in detail different types of inverters used in the SPV system.

How much SPV output voltage is required to run a ceiling FAN of your house.

Q.7 The SPV system as presented in Fig.2 has the MPP voltage output of 250V. A single-phase inverter is interfaced with the SPV system with bipolar PWM technique. The load is an RL series combination with R=20 Ω and L =50 mH. The output has a fundamental frequency of 50 Hz. **[5] [CO3, 4]**

(a) Specify the amplitude modulation ratio to provide a 160-V rms fundamental frequency output. (b) If the frequency modulation ratio is 31, determine the total harmonic distortion of the load current.

Q.8 Design a **roof-top SPV system** to be installed in your house for the following residential load. **[5] [CO2, 3,4]**

S.No	Component	Total No.	Rated Power(W)	Usage (Hrs/day)
1	LED bulb	4	12	5
2	FAN	4	60	8
3	TV	1	120	3
4	Computer	2	230	4
5	Refrigerator	1	150	12
6	Washing machine	1	400	0.5
7	Air conditioner 1.5 ton	1	1500	1

Total No. of Pages 3 *Roll No.....*

Third Semester B.Tech. (Env. Engg.)

END SEMESTER EXAMINATION NOVEMBER-2024

EN-201n: Strength of Materials

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

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

Q.1 Answer the following: [2 x 4] [CO1, CO2, L_1, L_2]

(i) Explain the parallel axis theorem of moment of Inertia.

(ii) State the assumptions made in Euler's theory of buckling load.

(iii) Explain slenderness ratio of a long column which fails in buckling and its relationship with modulus of elasticity and crushing strength.

(iv) What you understand by the term "torsional rigidity or torsional stiffness" of a shaft?

Q.2 Calculate the normal stress (σ_θ) and shear stress (τ_θ) on an oblique plane inclined at an angle of 40° with the vertical as shown in Fig. 1. Find the resultant stress and its direction. [8] [CO2, L_3]

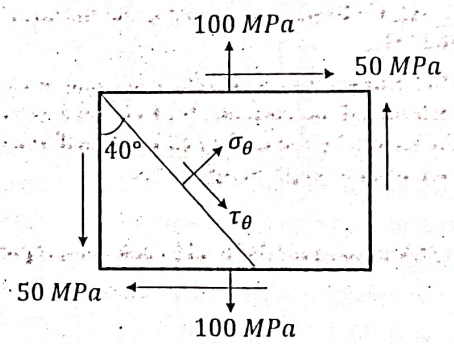

Fig. 1

Q.3 Show that the slope and deflection of the elastic curve at the free end A in the cantilever beam AB of length L, subjected to a moment M at the free end, as shown in the Fig. 2, would be $\theta_A = \frac{ML}{EI}$ ↺ and $y_A = \frac{ML^2}{2EI}$ ↓ respectively. Where EI is the flexural rigidity of the beam. [8] [CO3, L_2]

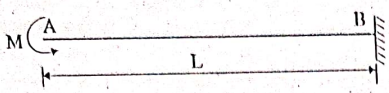

Fig. 2

OR

State and describe Mohr's moment area theorems of slope and deflection in a beam. [8] [CO3, L_2]

Q.4 Draw the SF and BM diagrams for the overhanging beam carrying loads as shown in Fig. 3. Show the values of principal ordinates and locate the point of contraflexure. [8] [CO4, L_3]

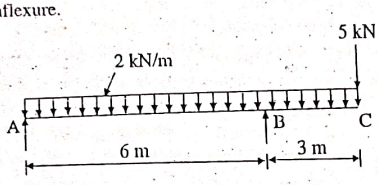

Fig. 3

Q.5 A solid aluminium shaft 100 cm long and of 5 cm diameter is to be replaced by a hallow steel shaft of the same length and the same outside diameter so that either shaft could carry the same torque and have the same angle of twist over the total length. What must be the inner diameter of the hallow steel shaft? Modulus of rigidity of steel may be taken as $0.85 \times 10^5\ N/mm^2$ and that of aluminium as $0.28 \times 10^5\ N/mm^2$. [8] [CO4, L_4]

Q.6 Consider a prismatic straight beam (Fig. 4) of length $L = 10\pi\ metre$ hinged at the two ends. The beam has a rectangular cross section of $10\ mm \times 20\ mm$. The young's modulus of elasticity (E) and the coefficient of linear thermal expansion (α) of the material of prismatic beam are, $E = 200\ GPa$ and $\alpha = 12 \times 10^{-6}/°C$ respectively. Evaluate the minimum temperature rise required to cause Euler's buckling of the beam? [8] [CO5, L_5]

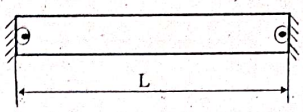

Fig. 4

Total no. pages one

292 Roll-No :

B.Tech Environmental Enginering

EN 205 Environmental Chemistry and Microbiology

End Semester Examination, Nov,2024

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

All questions carry equal marks. Attempt any four questions.

1.Write short notes on: (CO1 K2)

(a) Chemical equilibrium; (b) Redox reactions; (c) Entropy and Enthalpy

2.How water gets its chemical composition? Does atmospheric CO2 plays a role in river water chemistry? Give an example (CO2 K1)

3.What are different types of water in natural system? What are the major chemical parameters in different water types? (CO2 K2)

4.Differentiate water quality and water pollution? What are the criteria used in water quality? (CO1 K1)

5. Discuss various layers in the atmosphere? How dos t6he physical properties vary in all layers? (CO3 K1)

6.Write brief notes on:

(a) Stratospheric ozone and ground level ozone (CO3, K2)

(b) Temperature inversion (CO3 K2)

(C) BOD and COD in water quality (CO2K3)

7.How microbes are important in soil chemistry? What are differences between microbial population and Virus? Give some examples (CO5 K1)

8.(a) What is dose-response curve? Illustrate the same with one example. (CO6K3)

(b) Why E-coli is an important issue in water quality studies? (CO5K2)

(c) Green house gas and global warming potential (CO3K3)

Roll no.....

Total No. of Pages 3

Third Semester

B.Tech, (Environmental Engineering)

END TERM EXAMINATION

NOVEMBER-2024

EN 203n/EN 203: Surveying/ Engineering and Environmental Surveying

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 Define the following terms: [2 x 4] [CO2, L_1, L_2]

(a) Bench mark and Reduced level.

(b) Line of collimation and Axis of telescope.

(c) Contours and Relief.

(d) Base line and Check line in a topographical survey.

Q.2 (a) A field was surveyed by a chain and the area was found to be 51.53 Hectare [1 Ha = 10^4 Sqm]. If the chain used in the measurement was 0.8 per cent too long, what is the correct area of the field? [4] [CO2, L_2]

(b) Explain, how will you measure length of a line when chaining is free but vision is obstructed due to wooded area? [4] [CO2, L_2]

Q.3 Calculate the area enclosed within a closed traverse ABCD by independent co-ordinate method from the following data. [8] [CO5, L_3]

Line	Latitude in meter	Departure in meter
AB	+225.5	+120.5
BC	-245.0	+210.0
CD	-150.5	-110.5
DA	+170.0	-220.0

Q.4 A rectangular plot ABCD forms the plan of a pit excavated for construction of a reservoir. Calculate the volume of the excavation in cubic meter from spot level data given below. E is the point of intersection of diagonals AC and BD. Length AB = 80 m and BC = 50 m. [8] [CO5, L3]

Point	A	B	C	D	E
Initial level (m)	45.2	49.8	51.2	47.2	52.0
Final level (m)	38.6	39.8	42.6	40.8	42.5

Q5. Evaluate the ground elevation of point A and gradient between 60 m and 70 m contour lines, if the horizontal distance of point A from 60 m contour on the map is 1.0 cm and that from 70 m contour is 0.5 cm? The contour map is drawn on a scale of 1 cm = 10 m as shown in Fig. 1. [8] [CO4, L5]

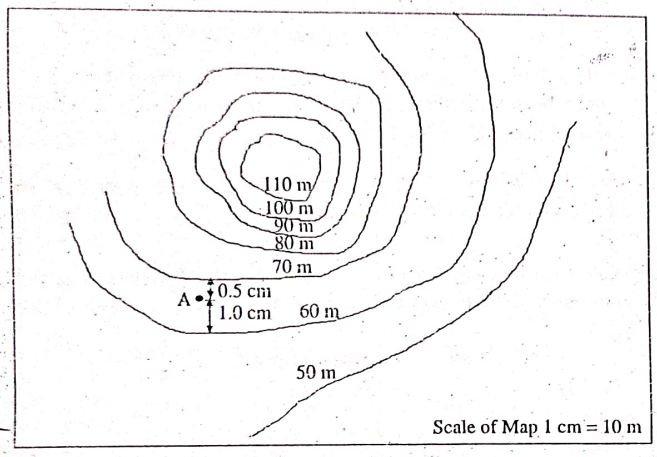

Fig. 1

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Q.6. The elevation of a point P is to be determined by observations from two adjacent stations of a tacheometric survey. The staff was held vertically upon the point and the instrument is fitted with an anallactic lens, the multiplicative constant of the instrument being 100. Compute the elevation of the point P from the following data, taking both the observations as equally trustworthy. [8] [CO4, L4]

Inst. St.	Height of Instrument (m)	Staff Point	Vertical Angle	Staff Reading (m)			Elevation of stations (m)
A	1.38	P	+10°12'	0.765	1.595	2.425	100.00
B	1.42	P	-12°30'	0.820	1.840	2.860	106.50

OR

Describe a substance bar. Explain with a neat sketch how subtense bar can be used to measure horizontal distance at a place where chaining is difficult due to rough topography or undulations. [8] [CO4, L2, L4]

Total No. of Pages 02

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Roll No. .....

IIIrd - SEMESTER

B.Tech.(Env. Engg.)

END TERM EXAMINATION

Nov-2024

EN207n: Water Treatment & Design

Time: 3:00 Hours

Max. Marks: 40

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

Q.1 (a) Classify the types of water demand.

[4][CO1][L2]

(b) Compute the population of the year 2010 and 2015 for a city whose population in the year 1980 and in the year 2000 were 25000 and 45000 respectively. Make use of geometric increase method.

[4][CO2][L3]

Q.2 (a) Explain the physical quality parameters of drinking water. Also give the maximum acceptable limits of the physical quality parameters for the potable water.

[4][CO1][L2]

(b) Why some diseases are called water borne diseases. How these could be controlled.

[4][CO1][L1]

Q.3 (a) In a continuous flow settling tank 3m deep and 60m long, what flow velocity of water would you recommend for effective removal of 0.025mm particles at 25 °C ? The specific gravity of particles is 2.65, and kinematic viscosity v for water may be taken as 0.01 cm^2/sec.

[4][CO3][L3]

(b) Explain any one of the following terms with diagram: -

(i) Intake structures.

(ii) Water distribution systems.

[4] [CO4] [L4]

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Q.4 (a) Two primary settling basins are 20 m in diameter with a 2.0 m side water depth. Single effluent weirs are located on the peripheries of the tank. For a water flow of 2500m^3/d, calculate (i) overflow rate in m^3/m^2.d. (ii) surface area and volume , (iii) detention time in hours, (iv) weir loading in m^3/m.d. [5][CO3][L6]

OR

(a) Two million litres of water per day is passing through a sedimentation tank which is 6 m wide, 15 m long and having a water depth of 3 m.

(i) Find the detention time for the tank.

(ii) What is the average flow velocity through the tank?

(iii) If 64 ppm is the concentration of suspended solids present in turbid raw water, how much dry solids will be deposited per day in the tank, assuming 75% removal in the basin, and average specific gravity of the deposit as 2.

(iv) Compute the overflow rate. [5][CO3][L6]

(b) Chlorine usage in the treatment of 30,000 cubic metre per day is 10 kg/day. The residual after 10 minutes of contact is 0.20 mg/l. Calculate the dosage in milligrams per litre and chlorine demand of the water. [3][CO3][L3]

Q.5 (a) 15 mg of copperas is consumed with lime at a coagulation basin, per litre water. Determine the quantity of copperas and the quick lime required to treat 20 million litres of water. [4][CO3][L5]

(b) Discuss how a slow sand filter differs from a rapid sand filter. [4][CO3][L2]

OR

(b) Identify the differences between domestic and Industrial water treatment. [4][CO5][L2]

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Total No. of Pages 2

Roll No.....

Third Semester

B.Tech. (Env. Engg.)

END SEMESTER EXAMINATION

NOVEMBER-2024

EN 207: Engineering Analysis and Design

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

Note: Answer any five questions.
Use of IS 456 :2000 is allowed.
Assume suitable missing data, if any.

Q.1 Draw an expression for limiting depth of neutral axis in a singly reinforced rectangular beam. [10][CO2, L_5]

Q.2 Compressive tests after 28 days on 150 mm cubes of concrete gave the following results:

28, 34, 30, 27, 30, 32, 27, 28, 34, 26 and 33 N/mm^2

Determine the characteristics strength of concrete. [10] [CO2, L_5]

Q.3 Design a RCC slab for a room of residential building having inside dimension 2 m x 5 m. The thickness of the supporting wall is 300 mm. Assume slab to be simply supported at the ends. Use M 20 concrete mix and F_e415 steel. Live load on the slab may be taken as 1.5 kN/m^2.

[10] [CO3, L_3]

OR

A reinforced concrete column 4 m long (effective length) and 400 mm in diameter is reinforced with 8 bars of 20 mm diameter. Find safe load the column can carry. Take M 20 concrete and F_e415 steel reinforcement. The column carries lateral ties. [10][CO3, L_3]

Q.4 Classify welded connections. Discuss advantages and disadvantages of welded connection over rivetted connection. [5 + 5] [CO2, L_4, L_2]

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Q.5 Calculate the maximum force which can be transmitted through the single covered double rivetted butt joint. If $\sigma_t = 150\ N/mm^2$, $\tau_s = 100\ N/mm^2$ and $\sigma_b = 300\ N/mm^2$ determine the efficiency of the joints. Take thickness of main plate as 12 mm and cover plates as 10 mm, diameter of rivet, $\emptyset = 22\ mm$ and pitch, $p = 75\ mm$. [10][CO4, L_5]

Q.6 Write short notes on the following: [2.5 x 4] [CO3, L_2, L_3]

(a) Stress-strain relationship of mild steel reinforcement
(b) Effective length of column.
(c) Slump test for workability of concrete
(d) Bulking of sand.

SECTION 3 GENERAL DESIGN CONSIDERATION

18 BASES FOR DESIGN

18.1 Aim of Design

The aim of design is the achievement of an acceptable probability that structures being designed will perform satisfactorily during their intended life. With an appropriate degree of safety, they should sustain all the loads and deformations of normal construction and use and have adequate durability and adequate resistance to the effects of misuse and fire.

18.2 Methods of Design

18.2.1 Structure and structural elements shall normally be designed by Limit State Method. Account should be taken of accepted theories, experiment and experience and the need to design for durability. Calculations alone do not produce safe, serviceable and durable structures. Suitable materials, quality control, adequate detailing and good supervision are equally important.

18.2.2 Where the Limit State Method can not be conveniently adopted, Working Stress Method (*see* Annex B) may be used.

18.2.3 *Design Based on Experimental Basis*

Designs based on experimental investigations on models or full size structure or element may be accepted if they satisfy the primary requirements of 18.1 and subject to experimental details and the analysis connected therewith being approved by the engineer-in-charge.

18.2.3.1 Where the design is based on experimental investigation on full size structure or element, load tests shall be carried out to ensure the following:

a) The structure shall satisfy the requirements for deflection (*see* 23.2) and cracking (*see* 35.3.2) when subjected to a load for 24 h equal to the characteristic load multiplied by 1.33 γ_f, where γ_f shall be taken from Table 18, for the limit state of serviceability. If within 24 h of the removal of the load, the structure does not show a recovery of at least 75 percent of the maximum deflection shown during the 24 h under the load, the test loading should be repeated after a lapse of 72 h. The recovery after the second test should be at least 75 percent of the maximum deflection shown during the second test.

NOTE—If the maximum deflection in mm, shown during 24 h under load is less than $40\ l^2/D$ where l is the effective span in m; and D is the overall depth of the section in mm, it is not necessary for the recovery to be measured.

b) The structure shall have adequate strength to sustain for 24 h, a total load equal to the characteristic load multiplied by 1.33 γ_f where γ_f shall be taken from Table 18 for the limit state of collapse.

18.3 Durability, Workmanship and Materials

It is assumed that the quality of concrete, steel and other materials and of the workmanship, as verified by inspections, is adequate for safety, serviceability and durability.

18.4 Design Process

Design, including design for durability, construction and use in service should be considered as a whole. The realization of design objectives requires compliance with clearly defined standards for materials, production, workmanship and also maintenance and use of structure in service.

19 LOADS AND FORCES

19.1 General

In structural design, account shall be taken of the dead, imposed and wind loads and forces such as those caused by earthquake, and effects due to shrinkage, creep, temperature, etc, where applicable.

19.2 Dead Loads

Dead loads shall be calculated on the basis of unit weights which shall be established taking into consideration the materials specified for construction.

19.2.1 Alternatively, the dead loads may be calculated on the basis of unit weights of materials given in IS 875 (Part 1). Unless more accurate calculations are warranted, the unit weights of plain concrete and reinforced concrete made with sand and gravel or crushed natural stone aggregate may be taken as 24 kN/m^3 and 25 kN/m^3 respectively.

19.3 Imposed Loads, Wind Loads and Snow Loads

Imposed loads, wind loads and snow loads shall be assumed in accordance with IS 875 (Part 2), IS 875 (Part 3) and IS 875 (Part 4) respectively.

19.4 Earthquake Forces

The earthquake forces shall be calculated in accordance with IS 1893.

19.5 Shrinkage, Creep and Temperature Effects

If the effects of shrinkage, creep and temperature are liable to affect materially the safety and serviceability of the structure, these shall be taken into account in the calculations (*see* 6.2.4, 6.2.5 and 6.2.6) and IS 875 (Part 5).

19.5.1 In ordinary buildings, such as low rise dwellings whose lateral dimension do not exceed 45 m, the

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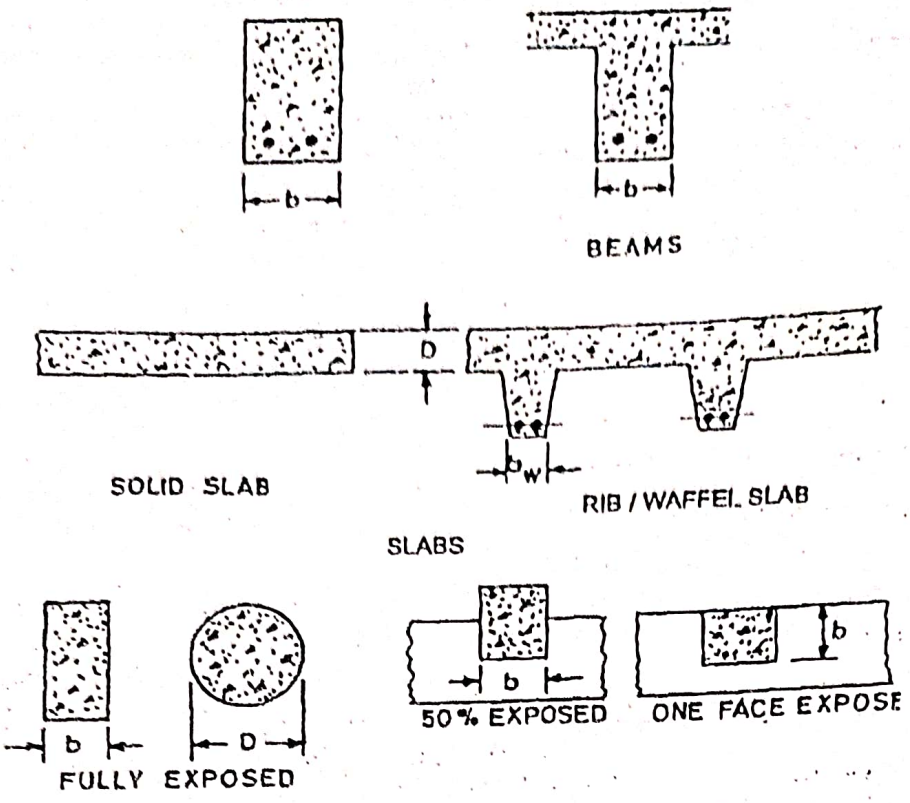


Fire Resistance h	Minimum Beam Width b	Rib Width of Slabs b_w	Minimum Thickness of Floors D	Column Dimension (b or D)			Minimum Wall Thickness		
				Fully Exposed	50% Exposed	One Face Exposed	$p<0.4\%$	$0.4\% \le p \le 1\%$	$p>1\%$
	mm	mm	mm	mm	mm	mm	mm	mm	mm
0.5	200	125	75	150	125	100	150	100	100
1	200	125	95	200	160	120	150	120	100
1.5	200	125	110	250	200	140	175	140	100
2	200	125	125	300	200	160	–	160	100
3	240	150	150	400	300	200	–	200	150
4	280	175	170	450	350	240	–	240	180

NOTES

1 These minimum dimensions relate specifically to the covers given in Table 16A.

2 p is the percentage of steel reinforcement.

FIG. 1 MINIMUM DIMENSIONS OF REINFORCED CONCRETE MEMBERS FOR FIRE RESISTANCE

22 ANALYSIS

22.1 General

All structures may be analyzed by the linear elastic theory to calculate internal actions produced by design loads. In lieu of rigorous elastic analysis, a simplified analysis as given in 22.4 for frames and as given in 22.5 for continuous beams may be adopted.

22.2 Effective Span

Unless otherwise specified, the effective span of a member shall be as follows:

a) *Simply Supported Beam or Slab*—The effective span of a member that is not built integrally with its supports shall be taken as clear span plus the effective depth of slab or beam or centre to centre of supports, whichever is less.

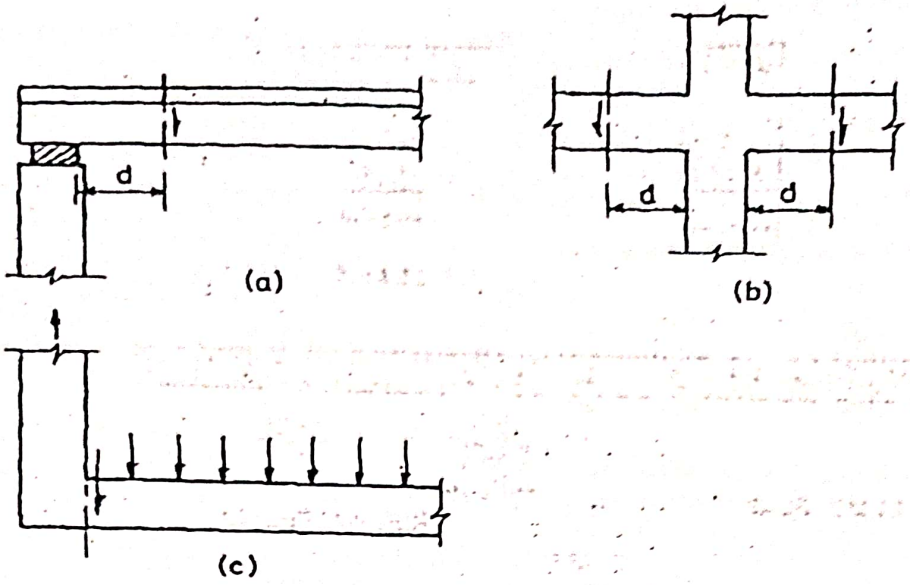


FIG. 2 TYPICAL SUPPORT CONDITIONS FOR LOCATING FACTORED SHEAR FORCE

but in no case greater than the breadth of the web plus half the sum of the clear distances to the adjacent beams on either side.

a) For T-beams, $b_f = \frac{l_0}{6} + b_w + 6D_f$

b) For L-beams, $b_f = \frac{l_0}{12} + b_w + 3D_f$

c) For isolated beams, the effective flange width shall be obtained as below but in no case greater than the actual width:

$$\text{T}-\text{beam}, b_f = \frac{l_0}{\left(\frac{l_0}{b}\right)+4} + b_w$$

$$\text{L}-\text{beam}, b_f = \frac{0.5\ l_0}{\left(\frac{l_0}{b}\right)+4} + b_w$$

where

b_f = effective width of flange,

l_0 = distance between points of zero moments in the beam,

b_w = breadth of the web,

D_f = thickness of flange, and

b = actual width of the flange.

NOTE — For continuous beams and frames, 'l_0' may be assumed as 0.7 times the effective span.

23.2 Control of Deflection

The deflection of a structure or part thereof shall not adversely affect the appearance or efficiency of the structure or finishes or partitions. The deflection shall generally be limited to the following:

a) The final deflection due to all loads including the effects of temperature, creep and shrinkage and measured from the as-cast level of the supports of floors, roofs and all other horizontal members, should not normally exceed span/250.

b) The deflection including the effects of temperature, creep and shrinkage occurring after erection of partitions and the application of finishes should not normally exceed span/350 or 20 mm whichever is less.

23.2.1 The vertical deflection limits may generally be assumed to be satisfied provided that the span to depth ratios are not greater than the values obtained as below:

a) Basic values of span to effective depth ratios for spans up to 10 m:

Cantilever	7
Simply supported	20
Continuous	26

b) For spans above 10 m, the values in (a) may be multiplied by 10/span in metres, except for cantilever in which case deflection calculations should be made.

c) Depending on the area and the stress of steel for tension reinforcement, the values in (a) or (b) shall be modified by multiplying with the modification factor obtained as per Fig. 4.

d) Depending on the area of compression reinforcement, the value of span to depth ratio be further modified by multiplying with the modification factor obtained as per Fig. 5.

where

l_{ex} = effective length in respect of the major axis,

D = depth in respect of the major axis,

l_{ey} = effective length in respect of the minor axis, and

b = width of the member.

It shall otherwise be considered as a slender compression member.

25.1.3 *Unsupported Length*

The unsupported length, l, of a compression member shall be taken as the clear distance between end restraints except that:

a) in flat slab construction, it shall be clear distance between the floor and the lower extremity of the capital, the drop panel or slab whichever is the least.

b) in beam and slab construction, it shall be the clear distance between the floor and the underside of the shallower beam framing into the columns in each direction at the next higher floor level.

c) in columns restrained laterally by struts, it shall be the clear distance between consecutive struts in each vertical plane, provided that to be an adequate support, two such struts shall meet the columns at approximately the same level and the angle between vertical planes through the struts shall not vary more than 30° from a right angle. Such struts shall be of adequate dimensions and shall have sufficient anchorage to restrain the member against lateral deflection.

d) in columns restrained laterally by struts or beams, with brackets used at the junction, it shall be the clear distance between the floor and the lower edge of the bracket, provided that the bracket width equals that of the beam strut and is at least half that of the column.

25.2 Effective Length of Compression Members

In the absence of more exact analysis, the effective length l_e of columns may be obtained as described in Annex E.

25.3 Slenderness Limits for Columns

25.3.1 The unsupported length between end restraints shall not exceed 60 times the least lateral dimension of a column.

25.3.2 If, in any given plane, one end of a column is unrestrained, its unsupported length, l, shall not exceed

$$\frac{100\,b^2}{D}$$

where

b = width of that cross-section, and

D = depth of the cross-section measured in the plane under consideration.

25.4 Minimum Eccentricity

All columns shall be designed for minimum eccentricity, equal to the unsupported length of column/ 500 plus lateral dimensions/30, subject to a minimum of 20 mm. Where bi-axial bending is considered, it is sufficient to ensure that eccentricity exceeds the minimum about one axis at a time.

26 REQUIREMENTS GOVERNING REINFORCEMENT AND DETAILING

26.1 General

Reinforcing steel of same type and grade shall be used as main reinforcement in a structural member. However, simultaneous use of two different types or grades of steel for main and secondary reinforcement respectively is permissible.

26.1.1 Bars may be arranged singly, or in pairs in contact, or in groups of three or four bars bundled in contact. Bundled bars shall be enclosed within stirrups or ties. Bundled bars shall be tied together to ensure the bars remaining together. Bars larger than 32 mm diameter shall not be bundled, except in columns.

26.1.2 The recommendations for detailing for earthquake-resistant construction given in IS 13920 should be taken into consideration, where applicable (*see also* IS 4326).

26.2 Development of Stress in Reinforcement

The calculated tension or compression in any bar at any section shall be developed on each side of the section by an appropriate development length or end anchorage or by a combination thereof.

26.2.1 *Development Length of Bars*

The development length L_d is given by

$$L_d = \frac{\phi\,\sigma_s}{4\tau_{bd}}$$

where

ϕ = nominal diameter of the bar,

σ_s = stress in bar at the section considered at design load, and

τ_{bd} = design bond stress given in 26.2.1.1.

NOTES

1 The development length includes anchorage values of hooks in tension reinforcement.

2 For bars of sections other than circular, the development length should be sufficient to develop the stress in the bar by bond.

used the horizontal distance between bars of a group may be reduced to two-thirds the nominal maximum size of the coarse aggregate, provided that sufficient space is left between groups of bars to enable the vibrator to be immersed.

c) Where there are two or more rows of bars, the bars shall be vertically in line and the minimum vertical distance between the bars shall be 15 mm, two-thirds the nominal maximum size of aggregate or the maximum size of bars, whichever is greater.

26.3.3 *Maximum Distance Between Bars in Tension*

Unless the calculation of crack widths shows that a greater spacing is acceptable, the following rules shall be applied to flexural members in normal internal or external conditions of exposure.

a) *Beams* — The horizontal distance between parallel reinforcement bars, or groups, near the tension face of a beam shall not be greater than the value given in Table 15 depending on the amount of redistribution carried out in analysis and the characteristic strength of the reinforcement.

b) *Slabs*

1) The horizontal distance between parallel main reinforcement bars shall not be more than three times the effective depth of solid slab or 300 mm whichever is smaller.

2) The horizontal distance between parallel reinforcement bars provided against shrinkage and temperature shall not be more than five times the effective depth of a solid slab or 450 mm whichever is smaller.

26.4 Nominal Cover to Reinforcement

26.4.1 *Nominal Cover*

Nominal cover is the design depth of concrete cover to all steel reinforcements, including links. It is the dimension used in design and indicated in the drawings. It shall be not less than the diameter of the bar.

26.4.2 *Nominal Cover to Meet Durability Requirement*

Minimum values for the nominal cover of normal-weight aggregate concrete which should be provided to all reinforcement, including links depending on the condition of exposure described in 8.2.3 shall be as given in Table 16.

26.4.2.1 However for a longitudinal reinforcing bar in a column nominal cover shall in any case not be less than 40 mm, or less than the diameter of such bar. In the case of columns of minimum dimension of 200 mm or under, whose reinforcing bars do not exceed 12 mm, a nominal cover of 25 mm may be used.

26.4.2.2 For footings minimum cover shall be 50 mm.

26.4.3 *Nominal Cover to Meet Specified Period of Fire Resistance*

Minimum values of nominal cover of normal-weight aggregate concrete to be provided to all reinforcement including links to meet specified period of fire resistance shall be given in Table 16A.

26.5 Requirements of Reinforcement for Structural Members

26.5.1 *Beams*

26.5.1.1 *Tension reinforcement*

a) *Minimum reinforcement*—The minimum area of tension reinforcement shall be not less than that

Table 15 Clear Distance Between Bars

(*Clause* 26.3.3)

f_y	Percentage Redistribution to or from Section Considered				
	-30	-15	0	+15	+30
	Clear Distance Between Bars				
N/mm²	mm	mm	mm	mm	mm
250	215	260	300	300	300
415	125	155	180	210	235
500	105	130	150	175	195

NOTE — The spacings given in the table are not applicable to members subjected to particularly aggressive environments unless in the calculation of the moment of resistance, f_y has been limited to 300 N/mm² in limit state design and σ_{st} limited to 165 N/mm² in working stress design.

Table 16 Nominal Cover to Meet Durability Requirements
(*Clause* 26.4.2)

Exposure	Nominal Concrete Cover in mm not Less Than
Mild	20
Moderate	30
Severe	45
Very severe	50
Extreme	75

NOTES

1 For main reinforcement up to 12 mm diameter bar for mild exposure the nominal cover may be reduced by 5 mm.

2 Unless specified otherwise, actual concrete cover should not deviate from the required nominal cover by $^{+10}_{0}$ mm

3 For exposure condition 'severe' and 'very severe', reduction of 5 mm may be made, where concrete grade is M35 and above.

Table 16A
Nominal Cover to Meet Specified Period of Fire Resistance
(*Clauses* 21.4 *and* 26.4.3 and *Fig.* 1)

Fire Resistance	Nominal Cover						
	Beams		Slabs		Ribs		Columns
	Simply supported	Continuous	Simply supported	Continuous	Simply supported	Continuous	
h	mm	mm	mm	mm	mm	mm	mm
0.5	20	20	20	20	20	20	40
1	20	20	20	20	20	20	40
1.5	20	20	25	20	35	20	40
2	40	30	35	25	45	35	40
3	60	40	45	35	55	45	40
4	70	50	55	45	65	55	40

NOTES

1 The nominal covers given relate specifically to the minimum member dimensions given in Fig. 1.

2 Cases that lie below the bold line require attention to the additional measures necessary to reduce the risks of spalling (*see* 21.3.1).

given by the following:

$$\frac{A_s}{bd} = \frac{0.85}{f_y}$$

where

A_s = minimum area of tension reinforcement,

b = breadth of beam or the breadth of the web of T-beam,

d = effective depth, and

f_y = characteristic strength of reinforcement in N/mm².

b) *Maximum reinforcement*—The maximum area of tension reinforcement shall not exceed 0.04 bD.

26.5.1.2 *Compression reinforcement*

The maximum area of compression reinforcement shall not exceed 0.04 bD. Compression reinforcement in beams shall be enclosed by stirrups for effective lateral restraint. The arrangement of stirrups shall be as specified in 26.5.3.2.

26.5.1.3 *Side face reinforcement*

Where the depth of the web in a beam exceeds 750 mm, side face reinforcement shall be provided along the two faces. The total area of such reinforcement shall be not less than 0.1 percent of the web area and shall be distributed equally on two faces at a spacing not exceeding 300 mm or web thickness whichever is less.

26.5.1.4 *Transverse reinforcement in beams for shear and torsion*

The transverse reinforcement in beams shall be taken around the outer-most tension and compression bars. In T-beams and I-beams, such reinforcement shall pass around longitudinal bars located close to the outer face of the flange.

26.5.1.5 *Maximum spacing of shear reinforcement*

The maximum spacing of shear reinforcement measured along the axis of the member shall not exceed 0.75 d for vertical stirrups and d for inclined stirrups at 45°, where d is the effective depth of the section

under consideration. In no case shall the spacing exceed 300 mm.

26.5.1.6 *Minimum shear reinforcement*

Minimum shear reinforcement in the form of stirrups shall be provided such that:

$$\frac{A_{sv}}{bs_v} \geq \frac{0.4}{0.87 f_y}$$

where

A_{sv} = total cross-sectional area of stirrup legs effective in shear,

s_v = stirrup spacing along the length of the member,

b = breadth of the beam or breadth of the web of flanged beam, and

f_y = characteristic strength of the stirrup reinforcement in N/mm² which shall not be taken greater than 415 N/mm².

Where the maximum shear stress calculated is less than half the permissible value and in members of minor structural importance such as lintels, this provision need not be complied with.

26.5.1.7 *Distribution of torsion reinforcement*

When a member is designed for torsion (*see* 41 or B-6) torsion reinforcement shall be provided as below:

a) The transverse reinforcement for torsion shall be rectangular closed stirrups placed perpendicular to the axis of the member. The spacing of the stirrups shall not exceed the least of x_1, $\frac{x_1 + y_1}{4}$ and 300 mm, where x_1 and y_1 are respectively the short and long dimensions of the stirrup.

b) Longitudinal reinforcement shall be placed as close as is practicable to the corners of the cross-section and in all cases, there shall be at least one longitudinal bar in each corner of the ties. When the cross-sectional dimension of the member exceeds 450 mm, additional longitudinal bars shall be provided to satisfy the requirements of minimum reinforcement and spacing given in 26.5.1.3.

26.5.1.8 Reinforcement in flanges of T- and L-beams shall satisfy the requirements in 23.1.1(b). Where flanges are in tension, a part of the main tension reinforcement shall be distributed over the effective flange width or a width equal to one-tenth of the span, whichever is smaller. If the effective flange width exceeds one-tenth of the span, nominal longitudinal reinforcement shall be provided in the outer portions of the flange.

26.5.2 *Slabs*

The rules given in 26.5.2.1 and 26.5.2.2 shall apply to slabs in addition to those given in the appropriate clauses.

26.5.2.1 *Minimum reinforcement*

The mild steel reinforcement in either direction in slabs shall not be less than 0.15 percent of the total cross-sectional area. However, this value can be reduced to 0.12 percent when high strength deformed bars or welded wire fabric are used.

26.5.2.2 *Maximum diameter*

The diameter of reinforcing bars shall not exceed one-eight of the total thickness of the slab.

26.5.3 *Columns*

26.5.3.1 *Longitudinal reinforcement*

a) The cross-sectional area of longitudinal reinforcement, shall be not less than 0.8 percent nor more than 6 percent of the gross cross-sectional area of the column.

NOTE — The use of 6 percent reinforcement may involve practical difficulties in placing and compacting of concrete; hence lower percentage is recommended. Where bars from the columns below have to be lapped with those in the column under consideration, the percentage of steel shall usually not exceed 4 percent.

b) In any column that has a larger cross-sectional area than that required to support the load, the minimum percentage of steel shall be based upon the area of concrete required to resist the direct stress and not upon the actual area.

c) The minimum number of longitudinal bars provided in a column shall be four in rectangular columns and six in circular columns.

d) The bars shall not be less than 12 mm in diameter.

e) A reinforced concrete column having helical reinforcement shall have at least six bars of longitudinal reinforcement within the helical reinforcement.

f) In a helically reinforced column, the longitudinal bars shall be in contact with the helical reinforcement and equidistant around its inner circumference.

g) Spacing of longitudinal bars measured along the periphery of the column shall not exceed 300 mm.

h) In case of pedestals in which the longitudinal reinforcement is not taken in account in strength calculations, nominal longitudinal reinforcement not less than 0.15 percent of the cross-sectional area shall be provided.

NOTE — Pedestal is a compression member, the effective length of which does not exceed three times the least lateral dimension.

26.5.3.2 *Transverse reinforcement*

a) *General*—A reinforced concrete compression member shall have transverse or helical reinforcement so disposed that every longitudinal bar nearest to the compression face has effective lateral support against buckling subject to provisions in (b). The effective lateral support is given by transverse reinforcement either in the form of circular rings capable of taking up circumferential tension or by polygonal links (lateral ties) with internal angles not exceeding 135°. The ends of the transverse reinforcement shall be properly anchored [*see* 26.2.2.4 (b)].

b) *Arrangement of transverse reinforcement*

1) If the longitudinal bars are not spaced more than 75 mm on either side, transverse reinforcement need only to go round corner and alternate bars for the purpose of providing effective lateral supports (*see* Fig. 8).

2) If the longitudinal bars spaced at a distance of not exceeding 48 times the diameter of the tie are effectively tied in two directions, additional longitudinal bars in between these bars need to be tied in one direction by open ties (*see* Fig. 9).

3) Where the longitudinal reinforcing bars in a compression member are placed in more than one row, effective lateral support to the longitudinal bars in the inner rows may be assumed to have been provided if:

i) transverse reinforcement is provided for the outer-most row in accordance with 26.5.3.2, and

ii) no bar of the inner row is closer to the nearest compression face than three times the diameter of the largest bar in the inner row (*see* Fig. 10).

4) Where the longitudinal bars in a compression member are grouped (not in contact) and each group adequately tied with transverse reinforcement in accordance with 26.5.3.2, the transverse reinforcement for the compression member as a whole may be provided on the assumption that each group is a single longitudinal bar for purpose of determining the pitch and diameter of the transverse reinforcement in accordance with 26.5.3.2. The diameter of such transverse reinforcement need not, however, exceed 20 mm (*see* Fig. 11).

c) *Pitch and diameter of lateral ties*

1) *Pitch*—The pitch of transverse reinforcement shall be not more than the least of the following distances:

i) The least lateral dimension of the compression members;

ii) Sixteen times the smallest diameter of the longitudinal reinforcement bar to be tied; and

iii) 300 mm.

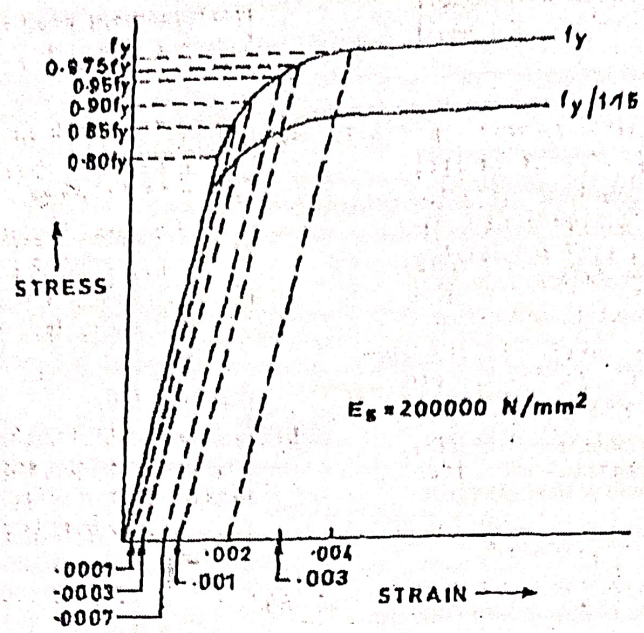
2) *Diameter*—The diameter of the polygonal links or lateral ties shall be not less than one-fourth of the diameter of the largest longitudinal bar, and in no case less than 16 mm.

d) *Helical reinforcement*

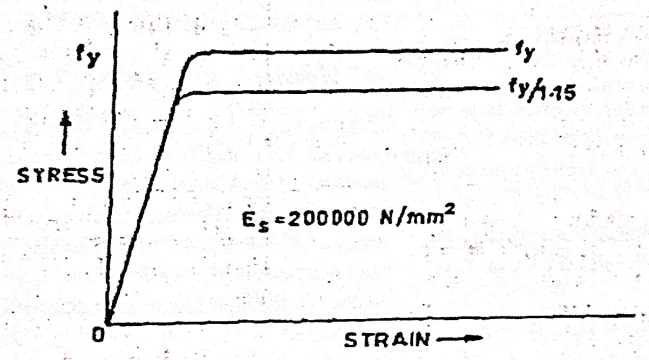
1) *Pitch*—Helical reinforcement shall be of regular formation with the turns of the helix spaced evenly and its ends shall be anchored properly by providing one and a half extra turns of the spiral bar. Where an increased load on the column on the strength of the helical reinforcement is allowed for, the pitch of helical turns shall be not more than 75 mm, nor more than one-sixth of the core diameter of the column, nor less than 25 mm, nor less than three times the diameter of the steel bar forming the helix. In other cases, the requirements of 26.5.3.2 shall be complied with.

2) The diameter of the helical reinforcement shall be in accordance with 26.5.3.2 (c) (2).

26.5.3.3 In columns where longitudinal bars are offset at a splice, the slope of the inclined portion of the bar with the axis of the column shall not exceed 1 in 6, and the portions of the bar above and below the offset shall be parallel to the axis of the column. Adequate horizontal support at the offset bends shall be treated as a matter of design, and shall be provided by metal ties, spirals, or parts of the floor construction. Metal ties or spirals so designed shall be placed near (not more than eight-bar diameters from) the point of bend. The horizontal thrust to be resisted shall be assumed as one and half times the horizontal components of the nominal stress in the inclined portion of the bar. Offset bars shall be bent before they are placed in the forms. Where column faces are offset 75 mm or more, splices of vertical bars adjacent to the offset face shall be made by separate dowels overlapped as specified in 26.2.5.1.



23A Cold Worked Deformed Bar



23B Steel Bar with Definite Yield Point

FIG. 23 REPRESENTATIVE STRESS-STRAIN CURVES FOR REINFORCEMENT

NOTE — The limiting values of the depth of neutral axis for different grades of steel based on the assumptions in 38.1 are as follows:

f_y	$x_{u,max}/d$
250	0.53
415	0.48
500	0.46

The expression for obtaining the moments of resistance for rectangular and T-Sections, based on the assumptions of 38.1, are given in Annex G.

39 LIMIT STATE OF COLLAPSE : COMPRESSION

39.1 Assumptions

In addition to the assumptions given in 38.1 (a) to 38.1 (c) for flexure, the following shall be assumed:

a) The maximum compressive strain in concrete in axial compression is taken as 0.002.

b) The maximum compressive strain at the highly compressed extreme fibre in concrete subjected to axial compression and bending and when there is no tension on the section shall be 0.0035 minus 0.75 times the strain at the least compressed extreme fibre.

39.2 Minimum Eccentricity

All members in compression shall be designed for the minimum eccentricity in accordance with 25.4. Where

calculated eccentricity is larger, the minimum eccentricity should be ignored.

39.3 Short Axially Loaded Members in Compression

The member shall be designed by considering the assumptions given in 39.1 and the minimum eccentricity. When the minimum eccentricity as per 25.4 does not exceed 0.05 times the lateral dimension, the members may be designed by the following equation:

$$P_u = 0.4 f_{ck} . A_c + 0.67 f_y . A_{sc}$$

where

P_u = axial load on the member,

f_{ck} = characteristic compressive strength of the concrete,

A_c = Area of concrete,

f_y = characteristic strength of the compression reinforcement, and

A_{sc} = area of longitudinal reinforcement for columns.

39.4 Compression Members with Helical Reinforcement

The strength of compression members with helical reinforcement satisfying the requirements of 39.4.1 shall be taken as 1.05 times the strength of similar member with lateral ties.

39.4.1 The ratio of the volume of helical reinforcement to the volume of the core shall not be less than $0.36 (A_g/A_c - 1) f_{ck}/f_y$

where

A_g = gross area of the section,

A_c = area of the core of the helically reinforced column measured to the outside diameter of the helix,

f_{ck} = characteristic compressive strength of the concrete, and

f_y = characteristic strength of the helical reinforcement but not exceeding 415 N/mm².

39.5 Members Subjected to Combined Axial Load and Uniaxial Bending

A member subjected to axial force and uniaxial bending shall be designed on the basis of 39.1 and 39.2.

NOTE — The design of member subject to combined axial load and uniaxial bending will involve lengthy calculation by trial and error. In order to overcome these difficulties interaction diagrams may be used. These have been prepared and published by BIS in 'SP : 16 Design aids for reinforced concrete to IS 456'.

39.6 Members Subjected to Combined Axial Load and Biaxial Bending

The resistance of a member subjected to axial force and biaxial bending shall be obtained on the basis of assumptions given in 39.1 and 39.2 with neutral axis so chosen as to satisfy the equilibrium of load and moments about two axes. Alternatively such members may be designed by the following equation:

$$\left[\frac{M_{ux}}{M_{ux1}}\right]^{\alpha_n} + \left[\frac{M_{uy}}{M_{uy1}}\right]^{\alpha_n} \leq 1.0$$

where

M_{ux}, M_{uy} = moments about x and y axes due to design loads,

M_{ux1}, M_{uy1} = maximum uniaxial moment capacity for an axial load of P_u, bending about x and y axes respectively, and

α_n is related to P_u/P_{uz}

where $P_{uz} = 0.45 f_{ck} . A_c + 0.75 f_y . A_{sc}$

For values of $P_u/P_{uz} = 0.2$ to 0.8, the values of α_n vary linearly from 1.0 to 2.0. For values less than 0.2, α_n is 1.0; for values greater than 0.8, α_n is 2.0.

39.7 Slender Compression Members

The design of slender compression members (*see* 25.1.1) shall be based on the forces and the moments determined from an analysis of the structure, including the effect of deflections on moments and forces. When the effect of deflections are not taken into account in the analysis, additional moment given in 39.7.1 shall be taken into account in the appropriate direction.

39.7.1 The additional moments M_{ax} and M_{ay} shall be calculated by the following formulae:

$$M_{ax} = \frac{P_u D}{2\,000}\left\{\frac{l_{ex}}{D}\right\}^2$$

$$M_{ay} = \frac{P_u b}{2\,000}\left\{\frac{l_{ey}}{b}\right\}^2$$

where

P_u = axial load on the member,

l_{ex} = effective length in respect of the major axis,

l_{ey} = effective length in respect of the minor axis,

D = depth of the cross-section at right angles to the major axis, and

b = width of the member.

For design of section, 39.5 or 39.6 as appropriate shall apply.

ANNEX G
(*Clause* 38.1)

MOMENTS OF RESISTANCE FOR RECTANGULAR AND T-SECTIONS

G-0 The moments of resistance of rectangular and T-sections based on the assumptions of 38.1 are given in this annex.

G-1 RECTANGULAR SECTIONS

G-1.1 Sections Without Compression Reinforcement

The moment of resistance of rectangular sections without compression reinforcement should be obtained as follows :

a) Determine the depth of netutral axis from the following equation :

$$\frac{x_u}{d} = \frac{0.87 f_y A_{st}}{0.36 f_{ck} b.d}$$

b) If the value of x_u/d is less than the limiting value (*see* Note below 38.1), calculate the moment of resistance by the following expression :

$$M_u = 0.87 f_y A_{st} d\left(1 - \frac{A_{st} f_y}{bd f_{ck}}\right)$$

c) If the value of x_u/d is equal to the limiting value, the moment of resistance of the section is given by the following expression :

$$M_{u,lim} = 0.36 \frac{x_{u,max}}{d}\left(1 - 0.42 \frac{x_{u,max}}{d}\right) bd^2 f_{ck}$$

d) If x_u / d is greater than the limiting value, the section should be redesigned.

In the above equations,

x_u = depth of neutral axis,
d = effective depth,
f_y = characteristic strength of reinforcement,
A_{st} = area of tension reinforcement,
f_{ck} = characteristic compressive strength of concrete,
b = width of the compression face,
$M_{u,lim}$ = limiting moment of resistance of a section without compression reinforcement, and
$x_{u,max}$ = limiting value of x_u from 39.1.

G-1.2 Section with Compression Reinforcement

Where the ultimate moment of resistance of section exceeds the limiting value, $M_{u,lim}$ compression reinforcement may be obtained from the following equation :

$$M_u - M_{u,lim} = f_{sc} A_{sc} (d - d')$$

where

$M_u, M_{u,lim}, d$ are same as in G-1.1,

f_{sc} = design stress in compression reinforcement corresponding to a strain of

$$0.003\,5 \frac{(x_{u,max} - d')}{x_{u,max}}$$

where

$x_{u,max}$ = the limiting value of x_u from 38.1,
A_{sc} = area of compression reinforcement, and
d' = depth of compression reinforcement from compression face.

The total area of tension reinforcement shall be obtained from the following equation :

$$A_{st} = A_{st1} + A_{st2}$$

where

A_{st} = area of the total tensile reinforcement,
A_{st1} = area of the tensile reinforcement for a singly reinforced section for $M_{u,lim}$, and
$A_{st2} = A_{sc} f_{sc} / 0.87 f_y$.

G-2 FLANGED SECTION

G-2.1 For $x_u < D_f$, the moment of resistance may be calculated from the equation given in G-1.1.

G-2.2 The limiting value of the moment of resistance of the section may be obtained by the following equation when the ratio D_f / d does not exceed 0.2 :

$$M_u = 0.36 \frac{x_{u,max}}{d}\left(1 - 0.42 \frac{x_{u,max}}{d}\right) f_{ck} b_w d^2 + 0.45 f_{ck} (b_f - b_w) D_f \left(d - \frac{D_f}{2}\right)$$

where

$M_u, x_{u,max}, d$ and f_{ck} are same as in G-1.1,
b_f = breadth of the compression face/flange,
b_w = breadth of the web, and
D_f = thickness of the flange.

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FIFTH/SEVENTH SEMESTER B.Tech

END TERM EXAMINATION NOV/DEC-2024

EN301 Wastewater Engineering: Design and Applications

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

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

Q.1 (a) The sewage is flowing @5.5 million litres per day from a primary clarifier to a standard rate trickling filter. The 5-Day BOD of the influent is 160 mg/l. The value of the adopted organic loading is to be 160 gm/m^3/day and surface loading 2000 l/m^2/day. Determine the volume of the filter and its depth. Also calculate the efficiency of this filter unit. [5][CO5][L3]

(b) Classify the different stages of the sludge digestion process in a digester tank.

OR

(b) Describe the factors affecting sludge digestion and their control. [3][CO4][L1]

Q.2 (a) Summarize the design and construction principles of a grit chamber, using a sketch for illustration. [4][CO2][L4]

(b) Design a circular settling tank units for a primary treatment of sewage 20 Million Litres/day. Assume a suitable value of detention period (presuming that trickling filters are to follow sedimentation tank) and surface loading. [4][CO1,2][L6]

Q.3 (a) Build a comparison of septic tanks and Imhoff tanks, analysing their scope, function, and overall performance in the context of wastewater treatment. [4][CO4][L5]

(b) Design the septic tank for a small colony having the following data :

No. of People = 250
Sewage/head/day = 110 litres
Length : width = 3 : 1
Depth of tank = 1.5 m
De sludge period = 1 year
Detention period = 24 hrs [4][CO4][L3]

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Q.4 (a) Explain Upflow anaerobic sludge blanket. [3][CO5][L2]

(b) An Average operating Data for conventional Activated Sludge treatment plant is as follows:

1) Wastewater flow=30000 Cubic Metre/day
2) Volume of aeration tank =10000 Cubic metre
3) Influent BOD=250 mg/l
4) Effluent BOD=30 mg/l
5) Mixed Liquor Suspended Solids(MLSS)=2500 mg/l
6) Effluent suspended solids=30 mg/l
7) Waste sludge suspended solids=9800 mg/l
8) Quantity of waste sludge= 220 m^3/day

Based on data above, determine.

(a)Aeration Period(hrs)
(b)Food to micro-organisms (F/M) (kg BOD per day/kg MLSS)
(c)Percentage efficiency of BOD removal
(d)Sludge age (days).

OR

(b) Design a digestion tank for the primary sludge with the help of following data:

(i) Average flow=300 Mld ;
(ii) Total Suspended Solids in raw sewage =310 mg/l;
(iii) Moisture Content of digested sludge=85%
(iv) Solid removed in primary tank = 60%
(v) Moisture content of fresh sludge = 95% [5][CO5][L6]

Q.5 (a) Summarize the construction and maintenance of sewers, highlighting the key features such as materials, shapes, and gradients typically adopted. [3][CO6][L2]

(b) A 200 mm diameter sewer is to flow at 0.6 depth on a grade ensuring a degree of self-cleansing equivalent to that obtained at full depth at a velocity of 0.90 m/sec. Find the required grade and associated velocity and rate of discharge at this depth. Assume Manning's rugosity coefficient n as 0.015. The variations of n with depth may be neglected. At d/D = 0.6, a/A = 0.626, r/R = 1.11, q/Q = 0.671 [5][CO6][L4]

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FIFTH SEMESTER
END SEMETER EXAMINATION

B.TECH. (ENE)
NOV. – 2024

EN-305 SOIL POLLUTION AND REMEDIATION

Time: 03 Hours *Max. Marks: 40*

Note: Attempt any five questions; All the questions carry equal marks; Assume suitable missing data if any

1	a)	Describe pedogenesis with special reference of weathering.	CO2	K2
	b)	What are the important physical properties of soil that determine migration of a pollutant?	CO3	K3
2	a)	Discuss the criteria for selection of a suitable site for landfill.	CO1	K2
	b)	What is a liner? Discuss the characteristics of a good liner material; and its configuration being used in landfills.	CO4	K4
3	a)	Estimate the landfill area required to handle five year's MSW for a town of 100000 people. The per capita waste generation is 0:65Kg/day; landfill density is 500Kg/m^3, with a three-metre lift. Assume that 20% of the cell volume is soil used for cover.	CO5	K5
	b)	Discuss the details of top cover of a landfill. What are the major functions of a top cover? Explain.	CO3	K3
4	a)	Discuss the details of various types of barrier systems used to contain the subsurface contaminants.	CO4	K5
	b)	Discuss the effect of organic pollutants on geotechnical properties of soil	CO3	K3
5	a)	A confined aquifer 20.0 meters thick has two monitoring wells placed 1 kilometer apart along the direction of groundwater flow. The difference in water levels of the wells is 1.0 meter. The hydraulic conductivity is 20 meters/day. Estimate the rate of flow per meter of distance perpendicular to the flow.	CO5	K5
	b)	Briefly discuss the methodology for waste characterisation.	CO3	K3
6		a) Effective Porosity	CO1	K2
		b) Retardation		
7	a)	Describe the treatment scheme for landfill leachate.	CO3	K3
	b)	Discuss the changes in landfill gas composition during decomposition process.	CO3	K3

(b) Government of India has set up a net zero target by 2070. Briefly explain what "Net Zero" means and what measures are being taken by the Government to meet this target. [5][CO3]

Q. 3. (a) Do aerosols impact climate? Why or why not? [5][CO2]

(b) Calculate the amount of carbon sequestered by trees in forest spread over an area of 6.5 km^2 and having 15-year-old Albizzia lebbek (tree species), 30 feet tall with a 12-inch trunk. The average area occupied by one tree is ~10m x 10m. [5][CO5]

Q.4. (a) Enumerate the different scopes under which GHG emissions are reported as per globally recognized protocols. [5][CO2]

(b) Explain the term "Carbon Sequestration" and the different satges/proccesses involved therein. [5][CO4]

Q.5. (a) Ozone is a known GHG and also it protects us from UV rays. So, is it not a dilemma with policy makers on how to handle it? Discucss. [5][CO5]

(b) Owing to the population increase in India, there is an increasing demand on the production of food grains. Also, the climate changes is posing a threat to the food security. What measures have been taken or should be taken by the Indian Government to tackle this problem? [5][CO2]

Q.6. (a) Summarize the salient features of ongoing global protocol in response to Climate Change. [5][CO2]

(b) Explain the term Carbon Credit. List different category of project which can help an Organizations earn these. [5][CO5]

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Fifth Semester

B.Tech.

END TERM EXAMINATION

Nov 2024

EN-317 Environmental Management

Time: 3:00 Hours

Maximum Marks: 50

Note: Attempt any five questions.

Assume suitable missing data, if any.

1.	Justify with an example that the precautionary principle does not conflict with technological innovation and promotes cleaner technologies' development.	[M 10]	[CO#2]	[BTL#5]
2.	Discuss the controversial issue of 'scientific uncertainty' in the context of the Precautionary Principle.	[M 10]	[CO#1]	[BTL#2]
3.	Highlight the features of the Cradle-to-Cradle design approach. How is it different from the LCA approach?	[M 10]	[CO#1,2]	[BTL#1,2]
4.	If you are an environmental auditor and you got a chance to visit a metro construction site in Delhi during the winter season. Discuss and analyse all the steps that you will follow to complete the environmental auditing.	[M 10]	[CO#2,3]	[BTL#4]
5.	Explain the salient features of ISO 14000 and also compare the performance of an ISO 14000-certified company before and after certification.	[M 10]	[CO#2]	[BTL#2]

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6. From the policy mix of India, give details of some pollution control instruments that are based on PPP. [M 10] [CO#3] [BTL

7. Write short notes on the following [M 10] [CO#1] [BTL
   a. Relationship between uncertainty, indeterminacy and ignorance
   b. First, second and third-party audits

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Seventh Semester

B.Tech.

END TERM EXAMINATION **Nov-2024**

EN – 407 Vibration Analysis & Control of Noise Pollution

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

Note: Attempt any five questions.
Question no. 7 is compulsory.
Assume suitable missing data, if any.

1. Considering the FHWA application on a transport corridor in Delhi, estimate the distance adjustment if the height of the line is less than 3 meters and the view of the highway is interrupted by isolated buildings along with clumps of bushes and scattered trees and the perpendicular distance from the observer to the centreline of the nearest and farthest lane is 30 and 60 meters respectively? If the average vehicle speed is 30 km/hour in Delhi, calculate the reference energy mean emission level of Motorcycle, Jeep, Minibus and Truck. **[M 10] [CO#2,3] [BTL#3, 4]**
2. Due to fast motorization in Delhi, just consider two categories of vehicles (two-wheelers and four-wheelers) running in Delhi with a percentage share of 60 and 40%, respectively. To study the impact of noise due to the movement of such a large number of vehicles on

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different road transport corridors, design the procedural framework as per FHWA for noise impact estimation. **[M 10] [CO#3] [BTL# 6]**

3. How is the traffic volume in front of the DTU gate closely associated with the traffic noise? Justify your statement with some data. Design a proforma to collect traffic volume for one hour at DTU Gate. Describe the various technical factors along with the equation that need to be considered in muffler performance. **[M 10] [CO#3, 5] [BTL# 5]**
4. Write the basic equation for the calculation of hourly equivalent sound level in the FHWA model and explain in detail the various corrections considered in this particular model. **[M 10] [CO#1, 2] [BTL# 1,2]**
5. What are the various acoustic materials that can be used for the absorbance of sound or vibrations? Calculate finite segment adjustment for the hard site, if the total angle subtended by the segment as seen by the observer is 60 degrees. **[M 10] [CO#1, 2] [BTL# 1,3]**
6. **(a)** A certain jet flying overhead a residential area at a height of 200 m has a SPL of 100 dB. Find the total SPL of twelve such jets flying overhead at that height. **[M 5] [CO#4] [BTL#3]**

   (b) The sound level specification you are given is 75 dB for the compressor package at 50 meters away. You have a residence 800 meters away from the facility. What would be the sound pressure level at your residence? **[M 5] [CO#3] [BTL#3]**
7. Write short notes on the following: **[M 10] [CO#1] [BTL#1, 2]**

   (a) Acoustic louvers & Acoustic lagging

   (b) Basic equation to calculate noise level as per CORTN model

   (c) Edinburgh model

   (d) Noise standards by WHO

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7th SEMESTER

B.Tech.

END TERM EXAMINATION

Nov-2024

EN409: INDUSTRIAL WASTE MANAGEMENT

Time: 03:00 Hours

Max. Marks: 40

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

Q.1 (a) Outline the basis on which CPCB has classified the industries into red, orange and green category. Associate the classification with examples in each of these categories. [5][CO1][L2, L4]

(b) Illustrate the cases in which combined treatment of industrial and municipal wastewater is advised to be carried out? [5][CO3][L3]

Q.2 (a) Discuss the advantages of incineration method of disposal. State which industrial waste should be treated by incineration. [5][CO3][L2]

(b) Illustrate the origin, characteristics and treatment of tannery industrial wastewater. [5][CO2, CO3][L3]

Q.3 (a) Explain the method of disposal of hazardous industrial waste as per the Government of India guidelines. [5][CO1, CO2][L2]

(b) Select and Illustrate the different techniques for removing the suspended and dissolved organic solids from wastewater. [5][CO3][L3]

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B.Tech. EP (Third Semester)

END SEMESTER EXAMINATION **(November *2024*)**

EP-205: Classical and Quantum Mechanics

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

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

1. Answer any **Five** questions from the following. [CO1, CO4, CO3](5x5)

(a). Write the Lagrangian, thus obtain the Hamiltonian for a simple pendulum.

(b). Obtain the Hamiltonian for an harmonic oscillator, whose Lagrangian is given by $\mathbf{L}(x, \dot{x}) = \frac{1}{2}x^2 - \frac{1}{2}\omega^2 x^2 - ax^3$

(c). What is the physical significance of Hamiltonian H? Enumerate the advantages of using Hamiltonian approach over Lagrangian approach.

(d). What is a central force show that the motion of a particle under central force is always confined to a single plane?

(e). A particle of mass m is constrained to move under the gravity in inner surface of a cone of half angle alpha (α). Deduce the Lagrangian of the system in suitable coordinate system.

(f). A particle of mass, m, is constrained to move on the surface of a cylinder. The particle is subjected to a force directed towards the origin and proportional to the distance of the particle from the origin. Construct the Hamiltonian and Hamilton's equation of motion.

2. The Schrodinger equation of a particle confined to the positive x axis is $\frac{-\hbar^2}{2m}\frac{d^2\psi}{dx^2} + mgx\psi = E\psi$ with $\psi(0) = 0$, $\psi(x) \to 0$ as $x \to \infty$ and E is the energy eigenvalue. Use the trial function x exp (-αx) and obtain the best value of parameter α. [CO2, CO5] (5)

3. Using the time independent perturbation theory, calculate the first order energy shift in the ground state by a perturbing potential ax^4 in the Hamiltonian of a linear harmonic oscillator ($V = 1/2kx^2$). [CO3] (5)

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4. A stream of particles of mass 'm' and energy 'E' moves towards the potential step V(x) = 0 for x<0 V(x) = V_0 for x>0. If the energy of the particles E>V_0, show that the sum of fluxes of the transmitted and reflected particles is equal to the flux of incident particles. [CO 2] (5)

5. If $\psi(x) = Ae^{-x^4}$ is the eigenfunction of the one-dimensional Hamiltonian with eigenvalue E=0. Then, calculate the potential V(x) in units of $\hbar = 2m = 1$. [CO 1, CO 4] (5)

6. If the kinetic energy and potential energy is given by $T= x = \frac{1}{2}m\,(\dot{x} + \dot{y})$ and $V= -mgy$, respectively. Then deduce the equation of the motion using the Lagrangian and identify the generalized coordinate and cyclic coordinates. [CO 2, CO 5] (5)

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

THIRD SEMESTER **B.Tech. (EP)**

END TERM EXAMINATION ***Nov-2024***

EP 205: Classical Mechanics

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

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

Q.1 The Force on a particle of mass m and charge e, moving with a velocity v in an Electric Field E and magnetic field B is given by

$F = e\,(E + v \times B)$

Obtain the form of Lagrangian and hence model the form of Hamiltonian for charged particle. **[7][CO3][BTL3]**

Q.2 a) What is Inverse square law force? Derive the equation of orbit in polar coordinates under a central attractive Inverse square law force. Examine the conditions under which the orbit will be an ellipse, parabola or hyperbola depending upon the Energy and hence of eccentricity. **[5][CO4][BTL6]**

b) A particle moves along an orbit $r = A\cos\theta$ under the influence of Central force $F(r)$. find the r – dependence of the force.

[4][CO5][BTL3]

Q.3 a) Considering Earth to be a rotating frame of reference, discuss the effect of centrifugal force due to rotation on the value of g. Show that the effect is maximum at the equator and minimum at the poles.

[4] [CO5][BTL1]

b) A 200 kg projectile is fired due east with an initial elevation of 30° and initial speed of 500 m/s. If the latitude of the place is 60°N, calculate the magnitude of the total initial Coriolis force and analyse with the help of vector diagram also. **[4][CO4][BTL4]**

Q.4 a) If H be the Hamiltonian and f be any function dependent on position momenta and time then show that

$$\frac{df}{dt} = \frac{\partial f}{\partial t} - [H, f]$$ **[4][CO2][BTL1]**

b) Show that the transformation $p = m\omega q \cot Q$ and $P = \frac{m\omega q^2}{2\sin^2 Q}$ is Canonical, and evaluate the generating function of the transformation. **[4][CO1][BTL5]**

Q.5 a) Discuss and solve the Jacobi's identity for Poisson's brackets for any three dynamical variables F_1, F_2 AND F_3, that is,

$[F_1, [F_2, F_3]] + [F_2, [F_3, F_1]] + [F_3, [F_1, F_2]] = 0$ **[4][CO4][BTL2]**

b) Discuss the 1-D motion of a particle under an Inverse Square force and is (i) Repulsive and (ii) Attractive, with total energy E given by $E = \frac{1}{2}m\dot{r}^2 + V_e(r)$. **[5][CO5][BTL2]**

Q.6 a) Explain Hamilton's principle. Obtain, by Calculus of Variation, the Euler- Lagranges equation of motion for a system of particles.

[5][CO3][BTL2]

b) Show that $[L_x, L_y] = L_z$ using the definition of Poisson Brackets.

[4][CO4][BTL1]

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THIRD SEMESTER

B.Tech. (EP)

END SEMESTER EXAMINATION *November-2024*

EP207: Digital Electronics (Engineering Analysis and Design)

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

Note: Attempt Any 4 Questions in all. All questions carry equal marks. Assume suitable missing data, if any.

Q.1. (a) Design a memory expansion interconnection of 16 x 4 static RAMs to construct a 16 x 8 memory. Each RAM has an active low- chip select line and common data-in pins. [5][L3][CO3]

(b) Write a VHDL Code for a 4 x 1 Line Multiplexer using DataFlow Modeling. [5][L3][CO2][CO4]

Q.2. (a) A count recorded by a counter at its output is 1010. What is the time delay required for the next count change? Given: Turn On Delay = 30 ns and Turn Off Delay = 10 ns. Give truth tables of D, T and JK Flip-Flops. [5][L2][L5][CO2]

(b)Perform the BCD Addition and XS-3 Addition of the following two numbers:

2050 and 1068. [5][L2][CO1]

Q.3. (a) Explain the refreshing circuitry mechanism in DRAMs with diagram and distinguish between Static RAM and Dynamic RAM. [5][L2][CO5]

(b) Given a two input MUX, write down its truth table. Use it to implement a AND gate. [5][L4][CO3]

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Q.4. (a) Design and explain the operation of a 3-bit PISO and SISO S
Registers. [5][L3][C

(b) Design a non-sequential counter such that it generates the sequenc
mentioned states (2,6,4,3) using D Flip-flops. Also check for the b
condition. [5][L4][C

Q.5. (a) Reduce the following Boolean expressions:

(i.) A[B+C(AB+AC)]

(ii) (A+B+C).(A+B+C).(A+B+C).(A+B+C)

[5][L2][CO

(b) Convert D flip-flop to T flip-flop and obtain the conversion table,
corresponding logic diagram and the equations relating the input
outputs of the 2 flip-flops.

[5][L3][CO

********END**********

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THIRD SEMESTER

B.Tech. (EP)

END SEMESTER EXAMINATION *November-2024*

EP207n: Digital and Analog Electronics (Engineering Analysis and Design)

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

Note: **Attempt Any 4 Questions in all. All questions carry equal marks.** Assume suitable missing data, if any.

Q.1. (a) A count recorded by an up-counter at its output is 0111. What is the time delay required for the next count change? Given: Turn On Delay = 20 ns and Turn Off Delay = 40 ns. Give one application each of photodiode, tunnel diode and zener diode.

[5][L4][CO1][CO5]

(b) Design the circuit of a positive clamper with positive bias and discuss the effect of diode circuit on the clamper.

[5][L4][CO2]

Q.2. (a) Design a memory expansion interconnection of 16 x 4 static RAMs to construct a 64 x 4 memory. Each RAM has an active low- chip select line and common data-in pins. **[5][L4][CO4]**

(b) Depletion region decreases during Forward Bias and increases during Reverse Bias in the case of a p-n junction diode. Justify

[5][L5][CO1]

Q.3. (a) Analyze the operation of CE amplifier and summarize the input and output characteristics. **[5][L4][CO2][CO3]**

(b) Explain the conversion of 11.4V analog input to its corresponding digital output using a 4-bit Successive Approximation Analog to Digital Converter. Define Monotonicity with reference to ADC.

[5][L4][CO4]

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Q.4. (a) Obtain SOP and POS forms of the given following expression using a K-Map:

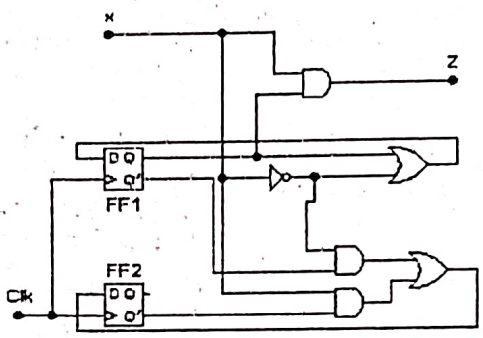
$$F = \sum_m(0, 1, 2, 3, 7, 9, 11, 12, 13, 15, 18, 20, 21, 22, 23, 26, 31)$$

Also state which form of expression is better and why? **[5][L3][CO2]**

(b) Write a VHDL Code for an octal to binary Encoder using DataFlow Modeling **[5][L4][CO3]**

Q.5. (a) Compare 5 general characteristics of TTL, ECL and CMOS logic families. **[5][L3][CO5]**

(b) For the circuit given below, write its state table, state equation and draw the state diagram. **[5][L5][CO3]**



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THIRD SEMESTER

B.Tech. (EP)

END SEMESTER EXAMINATION

November 2024

EP209: QUANTUM MECHANICS

Time: 3 Hours *Max. Marks: 50*

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

Q1. (a) Drive the Schrodinger time-independent equation and explain the concept of probability density and probability current density. [5] [CO1]

(b) (i) A spherical wave is travelling outward from a point is given by $\psi(r) = \frac{A}{r}\exp(ikr)$.
Evaluate the probability current density? [2.5] [CO1]

(ii) If $A|\varphi_n> = n^2 a_o|\varphi_n>$ for all n = 1, 2, 3, ...
and $|\Psi> = (3+4i)|\varphi_2> -3|\varphi_3> +3i|\varphi_6>$.
If A is measured on the $|\Psi>$, what will be the measurements with what probability? [2.5] [CO2]

Q2. (a) Show that the commutator $[x,[x,H]] = -\hbar^2/m$, where H is the Hamiltonian operator of free particle. [5] [CO3]

(b) Consider a system described by the Hamiltonian

$\mathcal{H} = \begin{pmatrix} 3 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 7 \end{pmatrix}$, which at $t = 0$ is in the state

$|\psi(0)> = \frac{1}{\sqrt{14}}\begin{pmatrix} 1 \\ 3 \\ 2 \end{pmatrix}$. Calculate the expectation value $<\mathcal{H}>$. [5][CO3]

Q3. (a) Consider a spinless particle of mass m confined in a rectangular box of sides a, b, and c with potential

$$V(x,y,z) = \begin{cases} 0, & 0 < x < a, 0 < y < b, 0 < z < c, \\ \infty, & \text{elsewhere,} \end{cases}$$

Calculate the energy eigenvalue and eigenfunctions of the particle and drive all the possible energy states of a level of degeneracy six. Also, reduce these results for a cubic confinement a = b = c. [5] [CO2]

(b) Write the Schrödinger equation for the hydrogen atom. Separate the angular equation into azimuthal and polar angle equations, and then solve the azimuthal angle equation. [5] [CO2]

Q4. (a) The Hamiltonian matrix of a system is [5] [CO5]

$$H = \begin{pmatrix} 1 & \varepsilon & 0 \\ \varepsilon & 1 & 0 \\ 0 & 0 & 2 \end{pmatrix}, \quad \varepsilon \ll 1$$

Find the energy eigenvalues corrected to first order in the perturbation. Also, find the eigenstates if the unperturbed eigenstates are $|\phi_1\rangle$, $|\phi_2\rangle$ and $|\phi_3\rangle$.

(b) Drive the bound states for potential well with one rigid wall using WKB method? [5] [CO1]

Q5. (a) Consider a system which is in the initial state [5] [CO4]

$$\psi(\theta,\varphi) = \frac{1}{\sqrt{5}} Y_{1,-1}(\theta,\varphi) + \sqrt{\frac{3}{5}} Y_{10}(\theta,\varphi) + \frac{1}{\sqrt{5}} Y_{11}(\theta,\varphi)$$

(i) Find $\langle\psi|\hat{L}_+|\psi\rangle$.

(ii) If $\hat{L}_z$ were measured what values one will obtain and with what probabilities?

(b) Establish a relation between the infinitesimal rotation and angular momentum operator. [5] [CO4]

Q.6 (a) Elaborate the principle underlying *Variational* method. [4] [CO5]

(b) Use the *Variational* method to evaluate ground state energy for the one-dimensional harmonic oscillator:

$$H = -\frac{\hbar^2}{2m}\frac{d^2}{dx^2} + \frac{1}{2}m\omega^2 x^2.$$ [6] [CO5]

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B.Tech.

FIFTH SEMESTER

ENDTERM EXAMINATION

Nov-2024

EP301 SEMICONDUCTOR DEVICES

Time: 03:00 Hours

Max.Marks:50

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

Q.1(a) Derive the effective density of state function and find the ratio of the effective density of states in the conduction band at $E_c + kT$ to the effective density of states in the valence band at $E_v - kT$.(m^*_e = 1.08 m_0, m^*_p = 0.56 m_0) [3M][CO 1]

(b) Discuss direct band gap and indirect band gap semiconductors? [2M][CO 1,2]

(c) A germanium p^+n diode at T=300K has the following parameters: of $N_A = 10^{18}/cm^3$, $N_D = 10^{16}/cm^3$, D_p = 49 cm^2/s, D_n = 100 cm^2/s, $\tau_{po} = \tau_{no}$=5μs, and A =$10^{-4}cm^2$. Determine the diode current for (a) a forward-bias voltage of 0.2 V and (b) a reverse-bias voltage of 0.2 V. [3M][CO 2]

(d) Describe the avalanche breakdown mechanism in a p-n junction. [2M][CO 2]

Q.2(a) Describe the concept of excess generation and recombination. [2.5M][CO 2,3]

(b) The carrier effective masses in a semiconductor are $m_n^* = 0.62m_0$ and $m_p^* = 1.4\ m_0$. Determine the position of the intrinsic Fermi level with respect to the center of the band gap at T = 300 K. (b) Repeat part (a) $m_n^* = 1.10\ m_0$ and $m_p^* = 0.25\ m_0$. [2.5M][CO 2]

Q.3(a) Find the terminal currents I_E, I_C, and I_B of n-p-n bipolar junction transistor (BJT); (b) calculate emitter efficiency, base transport factor, common-base current gain, and common-emitter current gain, and (c) comment on how the emitter efficiency and base transport factor can be improved. [5M][CO 3]

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(b) Describe input and output characteristics of the common em
(CE) p-n-p transistor. Indicate active, saturation and cut off regi
[5M][CC

Q.4(a) Define and derive threshold voltage (V_T) of ideal Metal o
semiconductor (MOS) capacitor. [2.5M][CO
(b) Plot the band diagram of an ideal MOS capacitor with p-t
substrate at $V_G = V_T$. Plot the band diagram of an n^+ poly silicon-g
MOS capacitor with p-type substrate at $V_G = 0$. [2.5M][CO 3

(c) Sketch the energy band diagrams in an MOS capacitor with an n-t
substrate in accumulation, depletion and inversion mode. [5M][CO 3

Q.5(a) How does the MOSFET behave (a) for small values of V_{DS} and
for larger values of V_{DS}? [2.5M][CO

(b) Define the transconductance (g_m), drain resistance (r_d) paramete
small signal equivalent circuit of MOSFET. [2.5M][CO

(c) Consider an ideal n-channel MOSFET with parameters $L = 1.25$
$\mu_p = 650 cm^2/V\text{-}s$, $C_{ox} = 6.9 \times 10^{-8}$ F/cm² and $V_T = 0.65$ V. Design
channel width W such that $I_D(sat) = 4$ mA for $V_{GS} = 5$ V. [2.5M][CO

(d) Explain fabrication steps of metal oxide semiconductor field ef
transistor (MOSFET). [2.5M][CO 4

Q.6 Sketch the geometry of JFET and draw current-volt
characteristics of n channel depletion type JFET. [5M][CO

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Vth SEMESTER

B.Tech. (Engineering Physics)

November 2024

END TERM EXAMINATION

COURSE CODE: EP – 303 **COURSE TITLE:** ELECTROMAGNETIC THEORY, ANTENNAS AND PROPAGATION

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

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

1. (a)Using Maxwell's equations derive the electric and magnetic wave equations. (4) [CO #1]
   (b)What do you understand by the terms- cutoff frequency, dominant mode, guide wavelength, phase velocity, group velocity and wave impedance for rectangular waveguides. (4) [CO#1]
2. (a)An air-filled rectangular waveguide of inside dimensions 6x3 cm operates in the dominant TE_{10} mode. (4) [CO#1]
   (i) Find the cutoff frequency (ii) Determine the phase velocity of the wave in the guide at a frequency of 4.0GHz (iii) Determine the guide wavelength at the same frequency.
   (b) Using the method of distributed circuit theory, obtains the one-dimensional transmission line Equations for a lossless line i.e. R=G=0. (4) [CO #2]

3(a) Explain with schematic diagram (4)[CO#2]
(i) Reflection Coefficient (ii) Transmission Coefficient (iii) Standing wave pattern.
(b) What are the characteristics of Smith Chart? (4) [CO#2]

4 (a) Explain the following terms with respect to Antenna (i) Radiation resistance (ii) Directivity (iii) Effective Area (iv) Half-Power Beam Width. (4) [CO#3]
(b)The radiation resistance of an antenna is 72 ohm and loss resistance is 8 ohm. What is the directivity, if the power gain is 16. (4) [CO#4]

5. (a) What is an antenna arrays? Show that the normalized array factor is a function of the geometry of the array and the excitation phase. (4) [CO#3]
   (b) An Antenna has a field pattern given by $E(\Theta) = \text{Cos}\Theta\ \text{Cos}2\Theta$ for $0 \leq \Theta \geq 90^0$. Find (i) the half-power beam width (ii) beam width between first nulls. (4) [CO#3]

6 (a) What do you mean by (i)ground waves, (ii) space waves, and (iii) sky waves (4) [CO#5]
(b) Calculate the skip distance for flat earth with MUF of 10 MHz if the wave is reflected from a height of 300 km, where the maximum value of refractive index n is 0.9. (4) [CO#5]

7. Derive the relation for the refractive index of the ionospheric layer in terms of its frequency, i.e., $n = \left(1 - \frac{81N}{f^2}\right)^{1/2}$. (8) [CO#5]

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Total Number of Pages 2
Vth SEMESTER
END SEMESTER EXAMINATION

Roll. No.....
B.TECH (EP)
Nov-Dec 2024

EP-305: Atomic and Molecular Physics

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

Note: Answer any Five questions from Part A and Part B. Assume suitable missing data, if any.

Part A (Atomic Physics)

Q1. (a) Derive an expression for the interaction energy for hyperfine splitting in the presence of weak magnetic field (Zeeman effect in hyperfine structure). Also show the hyperfine splitting in the transition $7\,^2P_{3/2} \rightarrow 7\,^2S_{1/2}$ (doubly ionised thallium, I =1/2) in the presence of weak magnetic field. [5][CO#2,3]

(b) If the K-, L-, M-energy levels of platinum involved in the emission of the K-series of X-rays of this element are 78000, 12000, and 3000 eV respectively, calculate the wavelengths of the K_α and K_β lines of platinum. [5][CO#1,2]

Q2. (a) What is Paschen-Back effect? Derive an expression for the interaction energy and wave number shift in Paschen-Back effect. Explain the Paschen-Back effect in transition $^2P \rightarrow {}^2S$. [5][CO#2,3]

(b) Outline the essential features of alkaline earth spectra. Write down the normal and first few excited configurations of Ca (Z=20) and obtain the corresponding spectroscopic terms. Also, draw the allowed transitions and their series. [5][CO#1,2]

Q3. (a) A mixture of ordinary hydrogen and tritium (a hydrogen isotope whose nucleus is approximately three times more massive than ordinary hydrogen) is excited and its spectrum studied. Calculate the shift in wavelength for the H_α lines of two kinds of hydrogen isotopes. ($m_p = 1.67 \times 10^{-24}$ g). [5][CO#1]

(b) Determine the parity and spectroscopic terms of the ground state of Nitrogen and Oxygen. [5][CO#1]

Part B (Molecular Physics)

Q4. (a) What is the average period of rotation of HCl molecule if it is in the J=1 state? The internuclear distance of HCl is 0.1274 nm. Given that the mass of hydrogen and chlorine atoms is 1.673×10^{-27} kg and 58.06×10^{-27} kg, respectively. [5][CO#4,5]

(b) Discuss the factors affecting the intensities of rotational spectral lines and the role of isotopic substitution. [5][CO#4,5]

Q5. (a) Drive the energy expression of a diatomic vibrating rotator and obtain the expression for three initial transitions between the rotational-vibrational energy levels, i.e., the vibration-rotation spectra. [5][CO#4,5]

(b) The equilibrium vibration frequency of the iodine molecule is 215 cm^{-1} and the anharmonicity constant is $x_e = 0.003$. What is the intensity of the hot band $v=1 \rightarrow v=2$ relative to that of the fundamental $v=0 \rightarrow v=1$, if the temperature is 300 K? [5][CO#4,5]

Q6. Describe the following [10][CO#3-5]

(a) Spectrophotometer with diagram
(b) Fortrat diagram
(c) Predissocaiation with diagram

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5th & 7th SEMESTER **B.Tech.**

END TERM EXAMINATION **November-2024**

EP-307: BIOPHYSICS

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

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

Q.1 (i) Calculate the membrane potential (V_m) for a neuron using the Hodgkin-Goldman Katz equation, with ion concentrations and ion permeabilities are given below:

Ion concentrations	Outside (mM)	Inside (mM)	Relative Permeability (P)
K^+	5	145	60
Na^+	140	10	1
Cl^-	500	50	0.5

[5][CO#1]

(ii) What is Excitation-Contraction coupling in the cardiac muscle? Explain the mechanism of excitation coupling with well labeled diagram?

[5][CO#1]

Q.2 (i) What is the role of GPCR in cell signaling? Explain the mechanism with well labeled diagram? [5][CO#2]

(ii) Which protein structure has the most enzymes? Explain it with well labeled diagram? [5][CO#2]

Q.3 (i) What is the difference between synapsis and synapse? Where is the synapse found? How do neurons communicate at the synapse?

[5][CO#3]

(ii) What are the different types of models in modeling and simulation? Describe any one model with all possible stages? [5][CO# 3]

Q.4 (i) What is gap junction? How do gap junctions play a role in cell to cell conduction? [5][CO#4]

(ii) What are the assumptions of Hodgkin-Huxley Model? Derive a mathematical expression for the generation of action potential during the activation and inactivation process for Sodium current and inactivation of Potassium current with an equivalent circuit diagram [5][CO#4]

Q.5 (i) Give five differences between active and passive transport? Mention two examples of active and passive transport. What is the importance of active and passive transport? [5][CO#1]

(ii) What are the three gating states of the voltage gated Na^+ channel? [5][CO#2]

OR

(i) What kind of model is best used to describe disease transmission. Explain it with the diagram. [5][CO#3]

(ii) Write down the parallel conductance equation for the resting potential as a function of equilibrium potentials and conductances. Calculate the resting potential V_r of Hodgkin-Huxley Model where the equilibrium potentials are $E_K = -72.1$; $E_{Na} = 52.4$; $E_{Cl} = -57.2$ and the conductances are $g_K = 0.07$; $g_{Na} = 0.026$ $g_{Cl} = 0.1$ [5][CO#4]

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Total No. of Pages: 2
5th SEMESTER
END SEMESTER EXAMINATION

Roll No.....
B. Tech.
Nov.-Dec. 2024

EP309: Quantum Information and Computing

Time: 3.00 Hours

Max. Marks: 50

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

1. (a) Define Turing Machine. What are its major components and tuples? [4] [CO1]

   (b) Obtain the Asymptotic notations for the given functions:

   (i) $f(n) = n \log n^3$

   (ii) $f(n) = 2^{2n}$ [6] [CO1]

2. (a) Design a Turing Machine [6] [CO5]

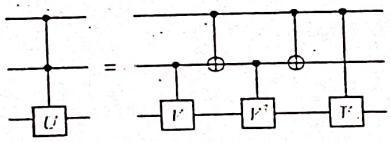
   (i) To recognize all strings consisting of an odd number of 1's.

   (ii) To computes the function $f(x) = \begin{cases} 1, & x = even \\ 0, & x = odd \end{cases}$

   (b) Explain the concept of local realism with the help of famous EPR paradox. [4] [CO2]

3. (a) Calculate the matrix representation of the tensor products of the Pauli operators (a) X and Z; (b) I and X; (c) X and I. Is the tensor product commutative? [5] [CO2]

   (b) Show that the two quantum circuits shown below are equivalent. Where $U = V^2$. [5] [CO3]



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4. (a) Suppose Alice wants to send *two classical bits of information* to Bo using *Dense Coding*. Design a quantum circuit for the same and discu the underlying protocol in detail [6] [CO5]

(b) A two-qubit state is given as $|\psi\rangle = \frac{|00\rangle + |11\rangle}{\sqrt{2}}$. Show that it is a *entangled* state. [4] [CO3]

5. In reference to Grover's search algorithm, define the '*search problen* and using all the possible *Oracles* show (both mathematically as well a geometrically) that effective number of Grover's iterations (r) are of th order of $\sqrt{n}$. [10] [CO4]

OR

6. Let $f:\{0,1\} \rightarrow \{0,1\}$ be a binary funtion such that:

if $f(0)=0$ or $f(1)=1$ or $f(0)=1$ or $f(1)=0$, it is a Balanced function an

if $f(0)=f(1)=0$ or $f(0)=f(1)=1$, it is a Constant function. Show that, using *Deutsch's algorithm*, that it takes only one query to tell whethe it is a Balanced or Constat function. [10] [CO4]

**********END**********

Total No. of Pages: 2

Roll No. 346

FIFTH SEMESTER B.Tech. [EP]

END-SEMESTER EXAMINATION (DEC.-2024)

EP—317--Advanced Semiconductor Device Physics

Time: 3 Hours Max. Marks: 50

Note: Attempt all the questions. Choices are given in some questions.
All questions carry equal Marks, 10 for each question. Assume suitable missing data, if any. Symbols denote usual standard meaning.
Write relevant answers only

Qus. 1 (a) Draw (222), (012), and (030) planes. Which plane orientation of semiconductor is preferred to make ICs? (4M) [CO: 2,4]

1 (b) What is Hall effect? Derive an expression for Hall Voltage and Hall resistance. Write down some applications of the Hall effect. (3M) [CO: 2, 4]

1 (c) What are generation and recombination currents inside a semiconductor? Draw suitable diagrams for both processes inside p-n junction. Write down the differences between Zener and Avalanche breakdown mechanisms (3M) [CO: 1, 4]

Qus. 2 (a) What do you understand by the transition and diffusion capacitances of a p-n junction. Derive an expression for transition capacitance of p-n junction. (5M) [CO: 1,2]

2 (b) What is contact potential and what is its significance? Draw the energy-band diagrams showing variation of charge density, variation of potential inside space-charge region, and variation of barrier potential inside uniformly doped p-n junction at equilibrium, without any external bias. (3M) [CO: 2]

2(c) Prove that the net charge carrier current inside p- and n- regions at equilibrium is zero. (2M) [CO: 2]

Qus. 3 (a) What do you understand by Ohmic, and Schottky contacts? Draw typical I-V characteristics of Ohmic and Schottky diodes. (4M) [CO: 1, 3]

Qus. 3(b) Write down advantages along with the applications of Ohmic, and Schottky diodes. (3M) [CO:1, 2]

Qus. 3(c) Define the working of Ohmic and Schottky contacts using proper energy level diagrams for both p-and n-type semiconductor. (3M) [CO:1, 2]

OR

Qus. 3(c) Define the terms Vacuum level, work-function, and electron-affinity in context of metal/semiconductors (or both), and their significance for Ohmic/Schottky contacts energy band diagrams. (3M) [CO:1, 2]

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Qus. 4 (a) Draw standard MOS device structure? Define accumulation, depletion, and inversion of MOS devices under external bias, also draw the band-diagram, and block-charge diagram for n-type MOS devices under bias for each case. (4M) [CO: 2, 3]

4 (b) What type of semiconductor is used for substrate of N-EMOS, P-EMOS, N-DMOS and P-DMOS? (2M) [CO: 3, 4]

4(c) An N-EMOS with V_{TN} of 2V, they measure its terminals with following potentials (assume reference to be at ground potential): V_G=5V, V_S=1V, and V_D=3V. What is operating mode of this MOSFET? (triode, cut-off, saturation) (2M) [CO: 2, 3]

4(d) Calculate the Source to Drain voltage to bias p-MOS in the saturation region. K_p=0.2 mA/V^2, I_D=0.5 mA, and V_{TP}=-0.5V (2M) [CO: 1, 3]

OR

4(d) An N-EMOS operates as voltage-controlled resistor, if $(W/L)_{new}=2(W/L)_{old}$ and $V_{GS,\,new}=4\,V_{GS,\,old}=5V_{TN}$, then what is $R_{DS,\,new}/R_{DS,\,old}$? (2M) [CO: 1, 3]

Qus. 5 (a) Draw standard diagram of MOSFET device. What is the difference in different parameters in n-type and p-type MOSFETs in OFF and ON state. (3M) [CO: 1, 3]

5 (b) Draw the output and transfer characteristics (ONLY) of n-type and p-type MOSFETs in both ON and OFF region. (3M) [CO: 2, 3]

5 (c) Determine the region of operation of M1 (V_{TN}=0.4V) in each circuit. (2M) [CO:3]

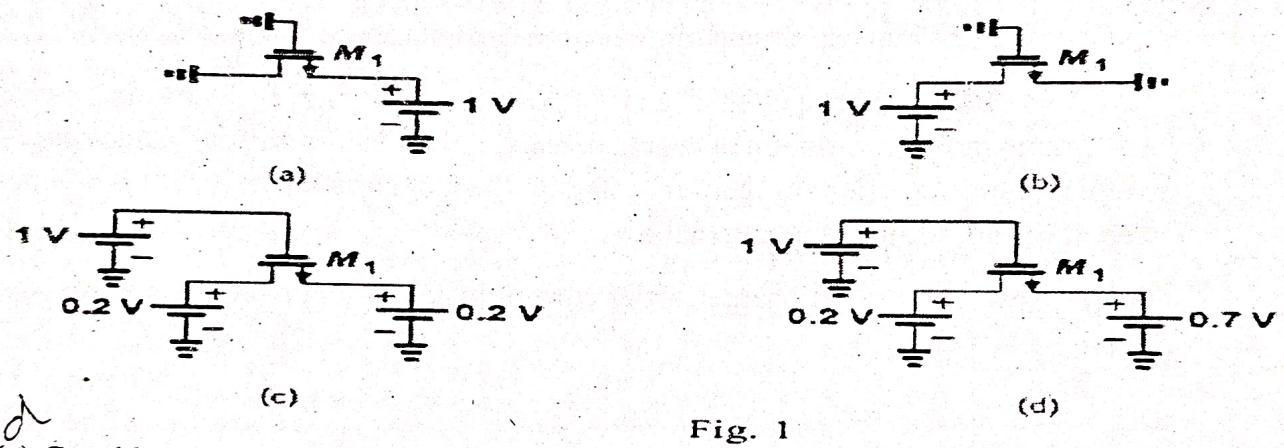


Fig. 1

5 (e) Consider a long channel MOSFET with a channel length 1 μm and width 10 μm. The device parameters are: Acceptor concentration $N_A=5X10^{16}$ cm^{-3}; electron mobility μ_n=800 cm^2/(V-s), oxide capacitance per unit area $C_{ox}=3.45X10^{-7}$ F/cm^2, threshold voltage V_T=0.7 V, Calculate the drain saturation current (I_{Dsat}) for a gate voltage of 5 V.

[Given $\varepsilon_0=8.854X10^{-4}$ F/cm, ε_{Si}=11.9] (2M) [CO: 2]

END OF QUESTION PAPER

Total No. of Pages 3 *Roll No. .....*

FIFTH SEMESTER **B.Tech (EP)**

END SEMESTER EXAMINATION ***(December.-2024)***

EP-321 Advance Wafer Processing

Time: 3.0Hours *Max. Marks: 50*

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

1. **(a)** What is oxidation process in silicon wafer fabrication? Prove the relation oxidation thickness ($x_0(t)$) and time in parabolic regime. **[5][CO-1,4]**

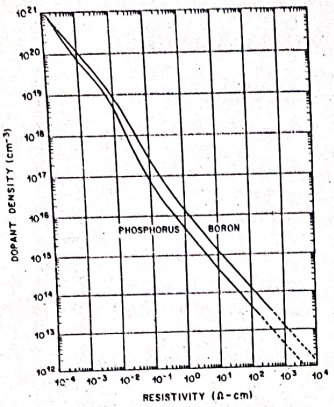
   (b) Prove the normal freezing relation. **[5][CO-3]**

2. **(a)** Explain, how the clean room class identified? Also state the all parameters of clean room design criteria. **[5][CO-2,4]**

   (b) An electron beam lithography system operates with an electron wavelength of 0.005 nm and has an effective numerical aperture of 0.02. Calculate the spot size of the electron beam. Describe the method for estimating the dose. If resist sensitivity requires a minimum dose of 10 $\mu C/cm^2$, estimate the beam current necessary to expose a 1 μm^2 area in 1 second. **[5][CO-2,4]**

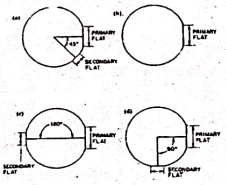
3. **(a)** Describe every step involved in converting silicon from metallurgical grade to electronic grade. **[5][CO-1,2,3,4]**

   (b) A boron-doped crystal is measured at its seed end with a four-point probe of spacing 1 mm. The (V/I) reading is 10 ohms. What is the seed end doping and the expected reading at 0.95 fraction solidified? Where, segregation coefficients for boron impurities in silicon (k_0) is 0.8. **[5][CO-1,3]**



4. **(a)** Draw the schematic cross-section of typical molecular beam epitaxy growth chamber. Compare the advantage and disadvantage of existing epitaxial technologies. . **[5][CO-1,2,3]**

(b) Identify the silicon wafer type and orientation from the following images. **[5][CO-1,3,4]**



5. **(a)** Distinguish between electron beam and Ion beam lithography. Why is the resolution of electron beam lithography so high? **[5][CO-1,2,34]**

(b) What differentiates shadow printing and projection printing state in term of line resolution? Which has higher resolution. **[5][CO-1,3,5]**

6. **(a)** State, the Fick's first law of diffusion. Differentiates between bulk, surface, and sub-surface diffusion. **[5][CO-2,3]**

(b) List all factors to be taken into account when selecting resist and etchants. Also describe all the factors that have an impact on the etch quality and etchant's selectivity. **[5][CO-2,3,5]**

7. (a) Explain, how the clean room class identified? Also state the all-important design consideration for HVAC (heating, ventilation, and air conditioning) system. **[5][CO-1,2,3]**

(b) Draw the schematic diagram and explain all the steps involved in the semiconductor fabrication Processes of ICs. **[5][CO-1,2,3]**

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

Seventh SEMESTER **B.Tech. (EP)**

END SEMESTER EXAMINATION *(December-2024)*

EP-415 Nanoscience & Technology

Time: 3 Hours *Max. Marks: 50*

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

1. (a) Prove the relation for density of states, for one and zero dimensional system. [5][CO-1,3, L_6]

   (b) In a finite 2-DEG system of length L (along x-direction) and width W (along y-direction), calculate the degeneracy of each Landau levels, and prove the relation for two dimensional electron density and sheet carrier concentration. [5][CO-2,3, L_6]

2. (a) Prove the relation for the population of conduction band, valance band and Fermi level for 3-DEG system. [5][CO-1,3,5, L_6]

   (b) If electron in a 2-DEG nanomaterials subjected to a transverse magnetic field then prove, it executes the motion in closed orbits and relation for Landau Energy Levels [5][CO-2,3,4 L_6]

3 (a) Explain, response (I_{SD}-V_G response curve) of CNTFET device with a single semiconducting SWCNT as the conduction channel to NH_3 and NO_2 gas. [5][CO-4,5,L_2]

(b) Draw the diagram and explain the mechanism of protein detection by using carbon nanotubes. [5][CO-4,5, L_2]

4. (a) Define, briefly, Characteristic lengths and their importance in nanoelectronics. [5][CO-1,2,3, L_2]

(b) Briefly explain Shubnikov-deHass Oscillation and prove the relation between period of oscillation and sheet concentration. Explain why these oscillations observed in strong magnetic field.

[5][CO-1,2,3, L2]

5. Explain single electron tunneling phenomenon and draw a schematic diagram of the energy levels of a quantum dot coupled to the source and drain. Also prove the relation for the energy required for single electron charging of the quantum dot and explain the charging energy model and capacitive coupling constant. [10][CO-1,2,3, L2]

6. (a) Copper has face-centered cubic (FCC) structure with a lattice constant a =3.597 Å. Each unit cell contains 4 Cu atoms, and the unit cell volume is a^3. Given that the atomic mass of Cu is 63.55 u, (where 1 u = 1.66×10^{-27} kg) and its density is 8.96 g/cm^3. Determine the number density (n) of free electrons, assuming one free electron per Cu atom, Fermi energy (E_F), Fermi velocity (v_F) and Fermi temperature T_F. [5][CO-2,3,L6]

(b) Prove that in ideal 2-DEG system Hall resistance is quantized. [5][CO-2,3, L6]

7. Answer any two parts:

(a) Field emission characteristics of nanomaterial [5][CO-2,3, L6]

(b) Assesses the Size effect on optical properties of nanomaterial [5][CO-2,3, L5]

(c) Analyze the working of ZnO based oxygen sensor [5][CO-2,3, L4]

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

Seventh Semester

B.Tech [E.P]

END SEMESTER EXAMINATION (NOV/DEC 2024)

EP-423 Space & Atmospheric Science-I

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

Note: Answer all the Five Questions
Assume suitable missing data, if any

1. What is meant by a boundary layer and what factors makes the boundary layer to form. Explain with reasons how its height can be influenced by various factors. Also describe how boundary layer height can be measured experimentally. (10 M)(CO2)

2. Explain with reasons why it is significant to measure upper air observations? What are the different instrumentation useful to measure upper air meteorological parameters? Explain clearly any one technique useful for upper air observations. (10 M)(CO1)

3. What is Automatic Weather Station (AWS). Write the advantages and disadvantages of AWS. Explain how different meteorological parameters that can be measured using AWS. (10 M) (C 3)

4. What are T-phigrams? Explain how they can be constructed along with the advantages of T-phigrams. (10 M) (C 2)

5. Mention different space borne techniques that are available for the measurement of meteorological parameters? Describe the advantages of such techniques when compared with ground based equipment's. (10 M) (C 4)

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Total No. of Pages:01 353 Roll No. .....

SEVENTH SEMESTER B.Tech. [EP]/M.Sc. [Physics]

END TERM EXAMINATION Nov/Dec.-2024

EP 427: Advanced Materials for Photonic Devices

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

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

1. Write short notes on the following: [4+2+2+2=10][CO1& 4&5]
   (a) Seven basic Crystal Systems and their lattice parameters
   (b) Long-persistence phosphors (c) Hypersensitive transitions
   (d) Up and Down Conversion phosphors

2. (a) Derive the expression for inter-planar spacing between two consecutive parallel planes of Miller indices *(h k l)*. [5][CO1]
   (b) Discuss the significance of Judd-Ofelt's theory for rare earth doped materials along with a flow chart. [5][CO4]

3. (a) Derive spectroscopic terms for f^2 configuration by Breit's Scheme. [5] [CO4]
   (b) Describe the commercial approach for pc-WLEDs. How rare earth doped materials are useful in solid state lighting technology? [5][CO5]

4. (a) Draw the following planes and directions in a tetragonal unit cell: (001), (200), (113), [110], [201], [111]. [3] [CO2]
   (b) Discuss all steps and procedure followed for material synthesis using solid-state route. [3] [CO2]
   (c) What is the structure factor? Assuming the proper atomic positions in a simple cubic (SC) unit cell, estimate the structure factor for both the mixed and unmixed states. [4] [CO3]

5. (a) Write down the characteristic information deduced from the scanning electron microscope (SEM) technique for materials. How SEM is different from optical microscopy? [3] [CO3]
   (b) How back scattered electrons (BSEs) and secondary electrons (SEs) in SEM? Discuss the working principle of SEM with suitable diagram. Write two applications of SEM. [7] [CO3]

6. **(a)** Explain thermogravimetric analysis (TGA). Explain the impact of the heating rate on the transition temperature range with an example.

[3] [CO3]

(b) What is the Differential Thermal Analysis (DTA) technique? Discuss the working principle of DTA for material characterization. Write applications of DTA.

[7] [CO3]

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Total No. of Pages – 2 | Roll No. .....

Vth & VIIth Semester | B.Tech.

End Term Examination | Nov. 2024

EV301: Fundamentals of Electric Vehicles

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

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

1. (a) Using a suitable diagram explain the *aerodynamic drag acting on a vehicle* and summarize the design considerations to minimize its effect. (4) [CO1] {L2}

   (b) If a vehicle has a mass of 650kg and frontal area of $1.6m^2$, calculate the tractive force required to overcome the aerodynamic drag to reach a speed of 25km/hr. (Assume that the rolling resistance coefficient, $\mu = 0.013$, aerodynamic drag coefficient, $c_d = 0.44$ and air density, $\rho = 1.2\ kg/m^3$) (4) [CO1] {L3}

2. (a) Construct a block diagram of a Series Hybrid Electric Vehicle (Internal Combustion Engine + Battery), clearly indicating the major component; also summarize the working of each bock and its functions within the overall system. (4) [CO2] {L3}

   (b) A 1kW, 48V BLDC motor having rated speed 3000 rpm is used in an e-rickshaw designed for short distance urban travel. If the radius of the e-rickshaw's wheel is 0.27m and the desired speed of the e-rickshaw is 40km/hr, solve for the required gear ratio. (4) [CO2] {L6}

3. (a) Summarize the importance challenges ahead for EV before its faster adoption? (4) [CO2] {L2}

   (b) Analyse the suitability of permanent magnet motors for electric vehicle application, clearly categorizing the pros and cons. (4) [CO3] {L4}

4. (a) Induction motors are used as propulsion drive in many E-vehicles. Summarize their features for these applications, illustrate your answer with torque speed characteristic for both constant torque and constant power region. (4) [CO3] {L2}

   (b) A three phase, 50 Hz, 4 pole induction motor has rated output of 10kW at 1425 rpm; the maximum torque of the induction motor is developed at 1200 rpm. Neglecting the stator resistance and rotational losses, determine the starting torque. (4) [CO3] {L5}

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5. (a) Analyse the demagnetization characteristics of at least four magnetic materials used for permanent magnets of PM motors. (4) [C

(b) A shunt connected DC machine driven by a diesel engine supplies a current of 25 A to a 110V battery. The armature and field resistance are 0.5Ω and 110Ω respectively. The friction, windage and other mechanical losses are 220W. Calculate the generated *emf* and efficiency of the generator. (4) [C

6. (a) Explain the speed control of BLDC motor through a block diagram (4) [C

(b) Identify three important batteries used in EV, also summarize the characteristics which make them suitable for EV application. (4) [C

7. (a) If the motor of an Electric Vehicle has dimensional data as given below: - (4) [C

i) Motor Diameter: 150 mm *ii)* Motor Length: 250 mm
iii) Motor Efficiency: 90% *iv)* Voltage (nominal): 400 V
v) Max RPM of Motor: 6000 *vi)* Gearbox ratio is 1:10

Additional Parameters:
vii) Vehicle Frontal Area (A) is 2.5 m^2
viii) Air Density (ρ) is 1.225 kg/m^3
ix) Wheel Radius is 0.3 m

Using the assumptions that the efficiency of the motor and the drivetrain is constant during operation. Rolling resistance and aerodynamic drag are the primary resistive forces. Determine the motor's required power rating for an application that requires the motor to achieve a target speed of 100 km/h in 15 seconds on a flat road with a total vehicle weight of 1500 kg, a rolling resistance coefficient of 0.01, and an aerodynamic drag coefficient of 0.3

(b) If an electric vehicle draws 60 kW power from a battery of 15kWh, what is the C rate of battery? Also find the time required to charge the battery at 0.1 C rate. (4) [C

Total No. of Pages 02

Roll No. .....

V / VII SEMESTER

B.Tech. [EE]

MID-SEM EXAMINATION

DEC-2024

EV-351 E-Mobility

Time: 3 Hours

Max. Marks: 50

Note: Attempt any Five questions.

Q.1[a] World over various governments are promoting E-Mobility. Enlist the main reasons for the same. [5] CO1 L2

[b] Explain the types of electric vehicles with suitable block diagram showing the components and power flow. [5] CO1 L3

Q.2[a] Describe the E-mobility / EV ecosystem with the help of a neat diagram. [5] CO2 L2

[b] Discuss the drivers of E-Mobility. [5] CO2 L3

Q.3[a] Recently Delhi was in the news for the increased air pollution to the tune of "Health Emergency". What are the various factors contributing to the increased AQI. What is the % contribution of transport in the air pollution. How can e-mobility help us? [5] CO1 L3

[b] Enlist and discuss the four important factors for assessing the impact of an EV. [5] CO2 L3

Q.4[a] Explain the concept of drive cycle analysis and its importance in vehicle design and performance evaluation. Discuss how driving patterns of different vehicles (such as passenger cars, heavy commercial vehicles, and two-wheelers) influence emissions, fuel consumption, and energy requirements. [5] CO5 L2 L3

[b] Describe the techniques used for collecting drive cycle data, such as on-road testing, GPS systems, and chassis dynamometers. Explain how advanced data analysis methods are used to extract insights from this data to improve vehicle design and operational efficiency. [5] CO5 L2 L3

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Q.5[a] What do you understand by a thermal management system in a battery. Discuss the air cooling and liquid cooling related to the EV battery. [5] CO2 L2 L3

[b] What is a BMS? Enlist the various functions performed by the BMS. [5] CO2 L3

Q.6 [a] With the help of a detailed diagram, explain the torque vs. speed characteristics of internal combustion engines (ICEs) and their relationship with the torque-speed requirements of vehicle wheels. Discuss how these relationships dictate the need for a gearbox in vehicles. [5] CO3 L2 L3

[b] Critically evaluate the impact of emerging technologies, such as electric powertrains and autonomous systems, on drive cycle development and drivetrain design. Discuss the potential evolution of drive cycles and transmission systems to optimize energy efficiency and reduce emissions. [5] CO4 L2 L3

Q.7 [a] What do you understand by the term "well to wheel" emission. Compare the well to wheel efficiency of conventional ICE vehicle to the BEV. [5] CO2 L1, L2, L3

[b] Compare and tabulate the powertrain efficiency and well to wheel efficiency of Petrol, Diesel, EV, Parallel HEV and FCEV. Share your observations on the same. [5] CO2 L3

Q.8 Write short notes on any two: [2 x 5 = 10] ALL CO's L2

(i) Deciding the series and parallel combination of cells in a Li-ion battery

(ii) Rolling resistance and aerodynamic drag with examples

(iii) BOL and EOL Range of a EV battery

(iv) Basic issues to be addressed in charging system selection (any 5 points)

Total no. of Pages: 02

Roll no:_____

V / VII SEMESTER B.Tech.

END TERM EXAMINATION **Nov-2024**

EV-355: CHARGERS AND CHARGING INFRASTRUCTURE

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

Note: Question 1 is compulsory; Answer any four questions from the remaining.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Explain the following: **[2×5=10][CO1-CO5][BTL1-BTL2]**

(a). Advantages of Combined Charging System (CCS) for EV charging over other charging protocols
(b). Differences between Level 1, Level 2, and Level 3 charging systems
(c). Role of battery management systems (BMS)
(d). Impact of regenerative braking on storage system
(e). Advantages of PFC in EV chargers for both the grid and the vehicle

Q.2 A hybrid electric vehicle uses a 30 kW bidirectional converter to generate a 650 V dc link voltage from the 288 V NiMH battery. The bidirectional converter has an inductance of 245 μH and switching frequency is 10 kHz. The vehicle is operating in generating mode, and the bidirectional converter is required to act as a buck at full power. **[2×5=10][CO4][BTL5-6]**

(a). Calculate the rms currents in the low-voltage capacitor and in the inductor.
(b). Calculate the maximum and minimum currents in the IGBT and diode.
(c). Calculate the rms and average currents in the IGBT and diode.
(d). Calculate the rms current in the high-voltage capacitor.
(e). Determine the low-voltage and high-voltage capacitor values if the peak-to-peak voltage ripple is 0.5%.

(Ignore component losses.)

Q.3 (a) Explain PFC boost converter topology for level 2 chargers in detail.

(b) Determine the total energy and time required to charge an EV from 20% to 80% of its capacity. If EV battery capacity is 60 kWh, charging power from the charger is 22 kW, efficiency of the charging process is 90% (to account for losses in the system). **[5×2=10][CO3][BTL3, 4]**

Q.4 The specifications of ultracapacitor module are g

Parameters	Value	Unit
Rated Capacitance	83	F
Maximum ESRDC	10	mΩ
Rated Voltage	48	V
Absolute Maximum Voltage	51	V
Maximum Continuous Current at 40°C	100	A
Maximum pek current for 1S, nonrepetitive	1150	A
Mass	10.3	Kg

[2×5=10][CO2][BTL4-

Calculate,

(a). stored energy of the module in Wh.

(b). maximum specific power and energy of the module.

(c). the usable specific energy of the module (the discharge ratio is 50%

(d). module is discharging at 100A in constant current discharge mode, ho long does it take to discharge the supercapacitor from 48 V to 28 V

(e). how long does the module take to discharge the supercapacitor from V to 28 V at a constant power discharge rate of 1000 W?

Q.5 (a) What are the Charging Protocols? Why they are important in E charging? [5×2=10][CO5][BTL3,

(b) Determine the battery capacity to achieve the following driving ran and performance of EV: energy consumption is 180 Wh/km (avera energy consumption including losses), desired range is 300 km (on full charge), depth of discharge (DoD) is 90%, safety margin is 10%.

Q.6 (a) Discuss the following with respect to battery:[5×2=10][CO5][BTL

(i) charge/discharge voltage
(ii) charge/discharge ratio
(iii) round trip energy efficiency
(iv) trickle charge
(v) memory effect

(b) In a conventional PFC boost converter operating in CCM, consider components to be ideal. Let V_{in} be 85–265 V, V_o = 400 V (regulated) = 1650 W, and f_s = 70 kHz. Calculate L_{min}, low-frequency and h frequency ripple current in the output capacitors, and the capacita value if the desired low-frequency voltage ripple at the output is assu to be 10% of nominal output voltage.

7 b A contract has been awarded the contract to construct a 6-mile long tunnel in the mountain. During the five years construction period, the contractor will need water from a nearby stream. He will construct a pipeline to carry the water to the main construction yard. An analysis of costs for various pipe sizes is as follows: [5][CO# 4]

	Pipe size (cm)			
	6	8	10	15
Installed cost of pipeline and pump(in ₹)	22,000	23,000	25,000	30,000
Cost/hour for pumping (in ₹)	1.20	0.65	0.50	0.40

At the end of 5 years, the pipe and pump will have a salvage value equal to the cost of removing them. The pump will operate 2000 hours per year. The lowest interest rate at which the contractor is willing to invest money is 7%. (The minimum required interest rate for invested money is called the minimum attractive rate of return(MARR)). Select the alternative with the least present worth of cost

Total no. of Pages : 04

Roll no.....

SEMESTER-V

B.Tech

END TERM EXAMINATION *Nov/Dec-2024*

HU-301 Engineering Economics

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

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

1 a Define Sustainable Development. What is the role of an Engineer in promoting Sustainable Development? Discuss. [2+3=5] [CO# 1+3]

1 b Mr. A furnishes the following data relating to the manufacturing of a Standard product during the month of January 2024. [2+3=5] [CO# 4]

You are required to prepare

1) Cost Sheet

2) A Statement showing Profit for the Period.

Particular	Price/ Cost /Time
Raw material purchased	₹ 15000
Opening Stock of Raw Materials	₹ 4000
Closing Stock of Raw Materials	₹ 5000
Direct Labour Cost	₹ 9000
Machine Hours Worked	900 Hrs
Machine Hours Rate	₹ 5/ Hour
Carriage Inwards	₹ 1000
Administrative Overheads	20% Of Work Cost
Selling Overheads	₹0.50 Per Unit Sold
Units produced	17100 Units
Opening stock of finished goods	2000 Units @ ₹ 4.50 Per Unit
Units Sold	16000 Units
Seliing Price per Unit	₹ 14

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2 a Differentiate between Microeconomics and Macroeconomics with suitable examples [5][CO# 2]

2 b Summit has ₹90 with him. He intends to purchase goods X and Y with his money. The market price of X and Y per unit is ₹10. The marginal utility schedule of goods X and Y is given below. Find out how many units of X and Y should summit purchase so that he gets maximum satisfaction. [5] [CO# 2]

Units of Commodity	1	2	3	4	5	6	7	8	9	10
MUx	80	72	64	56	48	40	32	24	16	8
MUy	40	32	24	20	16	12	8	4	0	0

3 a What do you mean by Monopolistic Competition? How it is different from Perfect Competition? Discuss with suitable examples. [2+3=5] [CO# 1&3]

b A firm is borrowing 100 lakhs/ year for three years for technological upgradation. The loan will be repaid two years later@ 15%/ year. Calculate how much will be repaid. [5][CO# 2]

4 a What do you mean by an Opportunity Cost? How is it different from the Actual cost? Discuss with suitable examples . [2+3=5] [CO# 1&3]

b Calculate Total Fixed Cost (TFC), Total Variable Cost (TVC), Average Total Cost (ATC), Average Fixed Cost (AFC) and Marginal Cost (MC) from the following: 5 [CO# 2]

Output (in units)	0	1	2	3	4	5	6
TC (₹)	40	100	120	130	150	190	240

5 a What do you mean by Monetary Policy? How monetary policy may be used for controlling Inflation? Discuss [2+3=5] [CO# 1&3]

b A man owns a corner plot. He must decide which of the two alternatives to select in trying to obtain a desirable return on his investment. After much study and calculation, he decides that there are two best alternatives. Bank interest rate is 12% compounded annually. Details are given below: [5][CO# 2]

	Build Gas station	Build Ice-cream stand
Initial Investment (in ₹)	20,00,000	36,00,000
Annual Property Tax (in ₹)	80,000	1,50,000
Annual Income (in ₹)	8,00,000	9,80,000
Life of Building (in Years)	20	20
Salvage Value (value which owner may receive after completing life) (in ₹)	0	0

Evaluate the alternative based on the future worth method.

6 a What do you mean by Fiscal Policy? Suggest a fiscal policy to control air pollution in Delhi. [2+3=5] [CO# 1&3]

b A company invests in one of the two mutually exclusive alternatives. The life of both alternatives is estimated to be 5years with the following initial investments, annual return and salvage value (money received after selling the machine at the end of its operational life) [5][CO# 2]

	Alternative A	Alternative B
Initial Investment (in ₹)	1,50,000	1,75,000
Annual Equal Return (in ₹)	60,000	70,000
Salvage value (in ₹)	15000	35000

Determine the best alternative based on the annual equivalent method when rate of interest is 25%.

7 a You are CEO of an electronic company. Now, you want to expand your business in a foreign country. What are the factors you will consider while deciding foreign location for your company? [5][CO# 4]

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

____SEMESTERB.Tech./B.Des./BBA/BAE/M.Sc./M.Des./M.Tech. /MBA/Ph.D/ B.Tech. (Eve)

END TERM EXAMINATION *November-2024*

COURSE CODE ___HU-305.__ COURSE TITLE__MacroEconomics_____-

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

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

Q.1 Explain Circular Flow of Income in case of three sector Economy Model. Discuss the injections and leakages of the Model. [10][CO#1]

Q.2 Explain the Expenditure Method in estimation of National Income. Calculate the National Income of the following:

C=600
I=200
G=150
Net Export= -50 [10][CO#1]

Q.3 Distinguish between the Classical and Keynesian model of output and income determination with the help of suitable diagrams. [10][CO#2]

Q.4 Discuss how the IS-LM model can be used to analyze the effects of fiscal and monetary policies on output and interest rates. [10][CO#2]

Q.5 a) Explain the Quantity Theory of Money and its assumptions.
b) what is Inflation? Explain its consequences on the Economy. [10][CO#3]

Q.6 Explain the Phillips Curve and the trade-off between Inflation and Unemployment with the help of a suitable diagram. [10][CO#3]

Q.7 How does Fiscal Policy with perfect capital mobility affect an open economy with fixed as well as floating exchange rate with the help of suitable diagrams. [10][CO#4]

Total no. of Pages : 03 *Roll no.....*

SEMESTER-V & VII

B.Tech

END TERM EXAMINATION ***Nov/Dec-2024***

HU-307 Basic Econometrics

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

Note : Attempt any five questions.
All questions carry equal marks.
Assume suitable missing data, if any.
T-test table, F-test table and Chai square table allowed

1.a What do you mean by Econometrics? Discuss the relevance of Econometrics for engineering students. [CO# 1+3] [6]

1.b Two random samples drawn from two normal population areas are given below. Obtain estimation of the variances of population and test whether the two populations have the same variance [CO# 2][4]

Sample 1	20	16	26	27	23	22	18	24	25	19
Sample 2	17	23	32	25	22	24	28	18	31	33	20	27

2.a What should be the size of a sample? Difference between confidence level and confidence interval. Discuss [CO# 1+3] [6]

2.b Based on the following distribution, state True or False for the following statements (I and ii) with reasons. [CO# 2] [4]

	Distribution A	Distribution B
Mean	100	90
Median	90	80
Standard Distribution	10	10

i. Distribution A has the same degree of variation as distribution B.

ii. Both distributions have the same degree of skewness

3.a The OLS method relies on several assumptions to be valid. Discuss those assumptions. [CO# 3][6]

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3.b The following table gives frequencies of occurrence of a variate x between certain limits. The distribution is normal. Find mean and standard deviation. [CO# 2][4]

Variate (X)	f
Less than 40	30
40 or more but less than 50	33
50 and more	37
	100

4.a How to detect and correct Serial Correlation? Discuss [CO# 4][6]

4.b A stockist has 20 items in a lot. Out of which, 12 are non-defective and 8 defective. A customer selects 3 items from the lot. [CO# 2][4]

i. What is the probability that all three items are non-defective?

ii. What is the probability that out of these three items, two are non-defective and one is defective?

5.a What do you mean by Heteroscedasticity? Differentiate between Pure heteroscedasticity and Impure heteroscedasticity with examples. [CO# 4][6]

5.b A breeder claims that his variety of cotton contains, at the most, 40 per cent lint in seed cotton. Eighteen samples of 100 grams each were taken, and the following quantity of lint was found in each sample. [CO# 2][4]

Sample	1	2	3	4	5	6	7	8	
Lint/100gm	36.3	37.0	36.6	37.5	37.5	37.9	37.8	36.9	
Sample	10	11	12	13	14	15	16	17	
Lint/100gm	38.5	37.9	38.8	37.5	37.1	37.0	36.3	36.7	

To check the breeder's claim, a t-test is performed

H0: $\mu = 40$

H1: $\mu < 40$ at $\alpha = 0.01$.

6.a What do you mean by Multicollinearity? Discuss its different types with examples. [CO# 4][6]

6.b Obtain a straight-line trend equation and tabulate against each year after estimation of the trend and short-term fluctuations: [CO# 2][4]

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023
Sales	380	400	650	720	690	620	670	950	1040

7.a What do you mean by Omitted Variable Bias? Why is it a problem? Discuss. [CO# 4][6]

7.b Mendel conducted a classic experiment on peas to know the genetic effect of colour and shape in the first generation after taking four crosses, namely, Round and yellow (RY), Round and green (RG), Wrinkled and yellow (WY) and Wrinkled and green (WG). He found the frequencies in these four classes as follows: [CO# 2]4

Classes	RY	RG	WY	WG	Total
Observed Frequencies	315	108	101	32	556

As per his theory, H_0 =9:3:3:1.

H_1 =H_0 is not True

Determine whether Mendel's theoretical ratio is accepted or not at $\alpha = 0.05$.

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

V/VII SEMESTER **B.Tech.**

END TERM EXAMINATION *Nov/Dec-2024*

HU 309 : Indian Economy-Contemporary issues in Indian Economy

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 Briefly discuss the idea of 'Viksit Bharat@2047'. What policy measures do you suggest to make India 'Viksit' by 2047? [10] [CO-1]

Q.2 Briefly discuss the policies and reforms needed for enhancing farm income, inclusiveness and sustainability in Indian agriculture. [10] [CO-2]

Q.3 What are objectives of 'Make in India' campaign? Discuss the important measures that needs to be formulated and implemented for making this campaign successful. [10] [CO-3]

Q.4 Discuss the role and importance of MSME sector for Indian economy? Discuss the policy measures taken by the government of India during last decade for further development of MSME sector in India? [10] [CO-3]

Q.5 Discuss the role played by the service sector in enabling India's participation in the global manufacturing value chain. Briefly highlight the challenges faced by the service sector in India. [10] [CO-4]

PTO

Q.6 Briefly outline the important labour laws applicable for organised sector in India. Discuss the recent labour market reforms undertaken in India. [10] [CO-4]

Q.7 'Both India and China have experienced massive growth but they have to face several challenges in the future path of their economic growth.' Discuss this statement and give your suggestions from Indian perspective. [10] [CO-5]

Total no. of Pages: 03 Roll no.....

V/VII SEMESTER

B.Tech.

END TERM EXAMINATION ***Nov-2024***

HU317: Basic Communication Skills

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

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

Q1. Spot the errors in the given statements and write the correct answer (rewrite the statement if required): 10 [CO1,2]

i) "Can you bring the reports to the managers office by noon?" she asked.

ii) Its important to proofread documents before submission to avoid minor errors.

iii) He could decide whether to attend the meeting or not, he was feeling unwell.

iv) The inspector asked Rahul to report to the police station as soon as he comes from office.

v) Its important to proofread documents before submission to avoid minor errors.

vi) Don't cry over spilt ____ (soup/milk/water), said the manager to his team members.

vii) In that difficult situation, he simply decided to take the bull by the---------- rope/horns/lake.

viii) The city is rapidly becoming the ---------- de facto/modus operandi centre of the financial world.

ix) The celebrity made an even bigger blunder while trying to recover from his "fau pa".

x) They were disappointed as their colleague received a _____ (carte blanche/carpe diem) to execute the project, while their ideas were overlooked.

Q2. Write an Extemporaneous speech on "Artificial Intelligence in Education" 10 [CO 2,3]

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Q3. i) Explain the differences between Descriptive and Explanatory compositions with examples. (5) [CO2]

ii)Provide arguments in the favour of/against the topic "Work from Home in the 21st C". (5) [CO 3,4]

Q4. Write an abstract (30 to 50 words) on the following passage: 10 [CO3,4]

Disruptive technology refers to innovations that significantly alter or displace established industries, markets, or practices, often by introducing solutions that are more efficient, affordable, or accessible. These technologies challenge the status quo, forcing businesses and individuals to adapt or risk obsolescence. A classic example is the rise of digital streaming platforms like Netflix, which disrupted traditional cable television and physical media rental businesses. Similarly, advancements in artificial intelligence, blockchain, and renewable energy are reshaping industries by redefining processes, enhancing efficiency, and creating new possibilities. For instance, artificial intelligence is transforming healthcare through predictive diagnostics and personalized treatment plans, while blockchain technology is revolutionizing finance by enabling secure, decentralized transactions.

The impact of disruptive technologies is two-fold: they bring significant opportunities but also present challenges. On one hand, they foster innovation, create new business models, and empower consumers with better choices. For instance, ride-sharing apps like Uber have revolutionized urban transportation by making it more convenient and cost-effective. On the other hand, these technologies can lead to job displacement, increased market competition, and ethical dilemmas. For example, automation powered by artificial intelligence and robotics has improved productivity but also raised concerns about the future of work and the displacement of human labor.

To thrive amidst such disruptions, businesses and societies must embrace adaptability, invest in education and upskilling, and establish frameworks to address ethical and regulatory concerns. Policymakers and organizations need to balance innovation with responsibility, ensuring that these technologies are harnessed for the collective good. As disruptive technologies continue to evolve, their influence on the economy, environment, and social systems will deepen, underscoring the need for a proactive and inclusive approach to managing their transformative impact.

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Q5.i) Express the given paragraph with the help of a visual representation technique of your choice (eg. flowchart/graph/fishbone diagram etc.).

ii) Write two conclusions that can be drawn from the paragraph. 10 [CO 4,5]

Employee wellbeing in the modern workplace is influenced by multiple factors that can impact productivity, morale, and overall job satisfaction. Workload pressure often leads to stress and burnout, reducing employee engagement. Poor work-life balance, driven by excessive hours or lack of flexibility, can cause fatigue and dissatisfaction. Inadequate leadership support and lack of clear communication can result in employees feeling undervalued or disconnected from organizational goals. A negative work environment, including poor interpersonal relationships or toxic culture, can harm mental health. Insufficient compensation and benefits may lead to financial stress and reduced motivation. On the other hand, when organizations prioritize wellbeing through mental health initiatives, flexible work policies, and a supportive culture, employees are more likely to thrive, demonstrating higher productivity, loyalty, and job satisfaction.

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V SEMESTER

B.Tech.

End-Semester Exam **November-2024**

HU325 Creative Writing Skills

Time: 3 Hrs Max. Marks: 50

Answer **any five** questions.

1. Write short notes on **any two** of the following with examples. (CO 1) (BTL 1) (10)

   a. Elegy b. Sonnet c.Ballad d. Prosody

2. Assess differences in writing for Advertisements, Films and Web series. (CO 5) (BTL 5) (10)

   OR

   Explain why the language of film scripts is often different from that of novels. (CO 2) (BTL 5) (10)

3. Explain major types of figures of speech with examples.(CO1) (BTL 2)(10)

4. Analyze the role of ideological influences on the development of characters and plot in a literary work of your choice. (CO 4) (BTL 4)(10)

   OR

   How is writing for the radio different from writing for the television ? Write the first scene of a radio play keeping in mind the following key words – Journey, Twist, Growth, Unfamiliar, Identity, Station (CO 1)(BTL 4) (10)

5. Write a short story of approximately 250-300 words incorporating a subplot that enriches the central theme. Provide a title that justifies the theme. (CO6) (BTL 6) (10)

6. Write a news article on the surge of pollution in Delhi NCR during the winter months. (CO 5) (BTL 4) (10)

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V/VII SEMESTER

B.Tech.

END TERM EXAMINATION Nov-2024

HU 327: Non-Verbal Communication

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

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

Q1. Analyse the concept of time as a non-verbal indicator.

10 [CO 1, 2,3]

Q2. Non-verbal communication is universal but context dependent. Evaluate the validity of this statement in the light of multiple interpretations that are possible when there are differences in cultural values, workplace ethics and rules of proximity in different countries.

10 [CO 3,4]

Q3. Analyze the impact of paralanguage in virtual communication settings, such as video conferencing or voice-only interactions. Develop three strategies that you would adopt for effective use of paralanguage to compensate for the lack of in-person cues during your digital/online communications. 10 [CO4,5]

Q4. Examine how spatial arrangements in professional settings (such as office layouts or seating arrangements in meetings) communicate power, hierarchy, and collaboration. Give three points to illustrate that understanding spatial dynamics can improve workplace communication, collaboration and productivity? 10 [CO4,5]

Q5. Assume that you are the team leader of a start-up company. You have been given the role of preparing your team for meeting delegates from two countries (pick any two countries of your choice). Now, create a set of non-verbal communication guidelines with explanation and examples to help your team members for effective handling of interpersonal and professional communication with the delegates.

10 [CO5]

Total no. of Pages: 1 372 Roll no .....

SEMESTER-V & VII

B.Tech.

END TERM EXAMINATION Nov-2024

HU403/HU405 ECONOMIC GROWTH

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 How is Solow growth model an improvement over Harrod-Domar Model? [10] [CO 3 & 4]

Q.2 (i) Explain steady state of growth as given by Harrod model.

(ii) Explain the role of technical progress in Swan model. [5+5] [CO 5 & 4]

Q.3 Define development planning along with its significance. [10] [CO 3]

Q.4 Critically examine Malthusian theory of population.

[10] [CO1]

Q5. Explain Solow's approach to Growth Accounting. [10] [CO3]

Q6. Write short notes on: [5+5] [CO 2]

(i) Ginni Coefficient

(ii)Convergenc

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V/VII SEMESTER B.Tech.

END TERM EXAMINATION Nov/Dec-2024

HU 407: Wealth and Poverty of Nations-Indian Economic Development

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 Distinguish between the concept of economic growth and economic development. Discuss briefly the measures taken by the government of India to promote inclusive growth. [10] [CO-1]

Q.2 Distinguish between demographic deposit, demographic dividend and demographic debt. Briefly discuss the issues related to demographic dividend and demographic debt in India. [10] [CO-2]

Q.3 Discuss the theory of demographic transition with respect to India. [10] [CO-2)

Q.4 Briefly discuss the Rangarajan committee report on poverty in India. How this report differs from Tendulkar committee report? [10] [CO-3]

Q.5 What do you mean by poverty trap? Briefly discuss the causes, effects and solutions to poverty trap. [10] [CO-3]

Q.6 What do you mean by sustainable development? Discuss the 17 SDGs as adopted by the UNO in the year 2015. [10] [CO-4]

Q.7 Discuss the history of global climate change. [10] [CO-4]

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VII Semester

B.Tech.

END SEMESTER EXAMINATION November- 2024

HU 413: Advanced Spoken Skills

Max. Marks: 50 Max. Time: 3.00 hrs

Note: Attempt all the questions.

1. Write short notes on the following: (CO1,2) (BTL1) (10)
   a. Handshake strategies
   b. Importance of non-verbal communication.
2. Express your views as a part of a Group Discussion on the topic: (CO2) (BTL 5) (10)

   The future of Artificial intelligence
3. What are the characteristics of effective presentation? Describe. (CO1,3) (BTL4) (10)
4. Differentiate between debate and discussion. (CO1,4) (BTL4) (10)
5. Transcribe the following: (CO1,3) (BTL6) (10)

   Price, name, coat, tap, calm

   Or

   Explain why acceptable pronunciation is significant in a professional set-up. (CO1,3) (BTL5) (10)

Total no. of Pages: 01

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V/VII SEMESTER

B.Tech.

END TERM EXAMINATION *Nov-2024*

HU425: Soft Skills Development

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

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

1. Define "protocols of communication". Analyse the impact of protocols of communication on formal, online environments. 10[CO 1, 3]

2. Write short notes on i) Gesture ii) Communication across hierarchies. 10[CO 1, 2]

3. Discuss any five key principles of delivering constructive feedback in a professional/ interpersonal context? 10[CO 3]

4. Analyze the importance of conflict management in the workplace. Discuss the role of active listening and collaborative problem-solving as effective strategies to promote better solutions in situations of professional conflict. 10 [CO 4,5]

5. As the team lead of the Soft-skills training Department in a Company XYZ, you have been given the task to train the new employees of the company to help them in coping up with the challenges of the new workplace environment. Identify any three key areas to train them and explain the importance of each in the context of multinational corporate workplace. 10 [CO 2,5]

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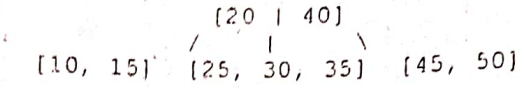
b) What are B-trees and how are they different from m-way trees? State the properties of a B-Tree? Consider the following B Tree with an order of 4 (i.e., each internal node can have a maximum of 4 children).
(5) [CO 4] [BTL2,3,5]



i) **Insert the key 22** into the tree and show the updated B Tree structure
ii) **Delete the key 25** from the updated tree and show the resulting structure.

3)

a) What is a Minimum Spanning Tree? Describe a real-world scenario where MST algorithms may be used. Evaluate does the chosen algorithm influence the outcome? (5) [CO 4] [BTL2, 5]

OR

a) Compare Prim's algorithm and Kruskal's algorithm for finding an MST. Analyse is one more efficient than the other? (5) [CO 4] [BTL2,4]

b) Discuss the representation of Graph data structure? Evaluate the pros and cons of each representation. (5) [CO 3] [BTL2,5]

4)

a) Implement a binary search algorithm and test it on a sorted array. Modify the binary search algorithm to return the index of the element along with the number of comparisons made. And test the classic binary search algo on a sorted array. (5) [CO 2] [BTL 6]

b) Given the keys {329, 410, 333, 970, 280, 159, 865, 593, 621, 564} and the mid square hash function, create and show the contents of the hash table of size 10 which resolves collision using quadratic probing.
(5) [CO 2] [BTL1,6]

Total no. of Pages: 03

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3rd SEMESTER

B.Tech

END TERM EXAMINATION

Nov-2024

IT201n: Digital Systems and Microcontroller

Time: 03:00 Hours

Max. Marks: 40

Note : All questions carry equal marks.
Assume suitable missing data, if any.
Questions 1 is compulsory. Total 5 Questions need to be attempted

Q1.

a. Subtract −24 from −14 using 2's complement. [1M][CO1][L2]

b. Write the excess 3 code for decimal 54. [1M][CO1][L2]

c. Write the Hamming (7, 4) code for data 0000 using even parity system. [1M][CO1][L3]

d. Let F = Σ (5, 6, 13) and F1 = Σ (0, 1, 2, 3, 5, 6, 8, 9, 10, 11, 13) find F2 such that F = F1.F2'. Is F2 unique? justify your answer. [2M][CO1][L4]

e. What are the special purpose registers in ARM and explain their purpose [2M][CO4][L2]

f. Write down the CPSR register for ARM microcontroller. [1M][CO4][L2]

Q2.

a. For the function F(A, B, C, D) = Σ m(2, 3, 7, 9, 11, 13) + Σ d(1, 10, 15), minimize this using QM method. [4M][CO2][L4]

b. The circuit below has a 2-to-4 decoder with active high outputs connected to a 4-to-1MUX with an active low output

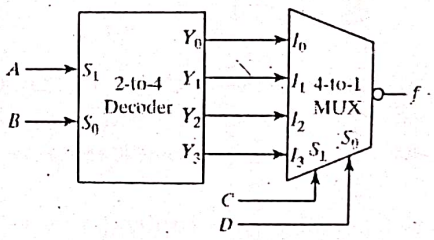
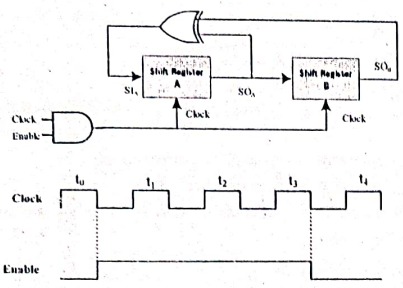


Figure 1

Derive a minimum SOP or a minimum POS expression for the output, f(A, B, C, D). [4M][CO2][L3]

Q3.

a. Consider the figure where both shift register A and B are 4 bit serial in serial out with initial value as 1010 and 0000 respectively. Find the values in both registers after t_3. Assume the shift registers to be positive edge triggered.



[4M][CO3][L3]

b. Consider an L-M flip-flop works as follows:
If LM = 00, the next state of the flip-flop is 1. If LM = 01, the next state of the flip-flop is the same as the present state. If LM = 10, the next state of the flip-flop is the complement of the present state. If LM = 11, the next state of the flip-flop is 0.
Design a counter with sequence ABC=000, 100, 101, 111, 011, 001, 000, . . . using LM flip flop [4M][CO3][L6]

Q4.

a. Design a one input one output sequence detector using mealy machine which will produce the output 1 whenever either of the sequence 1010 or 0101 is detected. Consider the detection with overlapping sequence. [4M][CO3][L6]

b. Design a bit-serial odd parity checker using Moore FSM: It counts the number of 1's in a bit serial input stream and asserts its output when the input stream contains an odd number of 1's. use T flip flop to implement the circuit. [4M][CO3][L6]

Q5.

a. Use merger graph/table to determine the set of compatible for the given below state machine. Also, draw the compatibility graph and hence find the closed covering and obtain the minimal form of the state machine

	NS, z	
PS	I_1	I_2
A	$E, 0$	$B, 0$
B	$F, 0$	$A, 0$
C	$E, -$	$C, 0$
D	$F, 1$	$D, 0$
E	$C, 1$	$C, 0$
F	$D, -$	$B, 0$

[4][CO3][L3]

b. Determine the equivalence of machine M1 and M2

State Table		
PS	NS	
	X=0	X=1
A	E,0	C,0
B	C,0	A,0
C	B,0	G,0
D	G,0	A,0
E	F,1	B,0
F	E,0	D,0
G	D,0	G,0

Machine M1

State Table		
PS	NS	
	X=0	X=1
S0	S3,0	S2,0
S1	S2,0	S0,0
S2	S1,0	S2,0
S3	S4,1	S1,0
S4	S3,0	S1,0

Machine M2

[4][CO3][L3]

Q6.

a. Explain the different modes of operation in ARM. [4][CO4][L2]

b. Compare the RISC and CISC instruction. What are the enhancements incorporated in basic RISC architecture of ARM microcontroller? [4][CO4][L2]

Total no. of Pages: 02 380 Roll no.....

III SEMESTER

B.Tech

END TERM EXAMINATION Nov-2024

COURSE CODE IT203(Old) COURSE TITLE Object Oriented Programming

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

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

Q.1 (a) Difference between structures in C and C++? Support your answer with help of examples. [3][CO1][BL2]

OR

(a) Explain the features of object-oriented programming with suitable code and examples. [3][CO1][BTL2]

(b) Discuss the importance of constructors and destructors as well as their use. Demonstrate with the help of code, how a constructor and destructor can be created for a class named Testing? Which constructor is created in a class automatically if we do not provide any constructor for a given class? [4][CO2][BTL3]

(c) Explain how base class member function can be invoked in a derived class if the derived class also has a same-named member function. Support your answer with proper code. [3][CO3][BTL2]

Q.2 (a) Can the working of an operator be modified in C++? What is this concept called? Modify the working of binary + operator to add two complex numbers of class Complex. [5][CO3][BTL6]

(b) Justify how generic programming supports code reusability? How does inheritance also help in code reusability? Show with the help of C++ code. [5][CO4][BTL5]

Q.3 (a)What is typecasting and its types? With the help of an example, show typecasting of a class to basic type. [5][CO5][BTL3]

3.84

(b) Explain why Java is said to be secure and platform independen
What is bytecode? Explain the widening and narrowing of data type
in Java? [5][CO5][BTL2

Q.5 (a) Classify polymorphism into various types. Show run-tim
polymorphism in C++ with the help of code. Explain the need
virtual keyword in this scenario. [5][CO6][BTL 3,4

(b) What is an exception? How is it different from an error? Write
C++ program to demonstrate the concept of rethrowing an exceptio
in C++. [5][CO6][BTL2,3

Total No. of Pages 02

Roll No. .....

THIRD/FIFTH SEMESTER

B.Tech. (IT)

END SEMESTER EXAMINATION ***DEC-2024***

IT203n DATA STRUCTURES

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

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

1)

a) A logistics company uses a software application to calculate the cost of delivering a package based on the following formula: (5) [CO 1] [BTL1,6]

Cost= (Base Rate+(Weight×Rate per kg))×(1−Discount Percentage)

i) Represent this formula in **infix notation.**

ii) Convert the formula into a **notation** so it can be processed by their software system.

iii) Evaluate the expression from part (ii) to calculate the cost of delivery for a package with the following details:

Base Rate: ₹50, Weight: 10 kg, Rate per kg: ₹20

Discount Percentage: 0.1 (10%)

b) How does a priority queue work differently from a regular queue? Explain how elements are enqueued and dequeued in a priority queue compared to a regular queue. (5) [CO 3] [BTL1, 2]

OR

b) Describe the state when the stack size exceeds its capacity in a static array implementation? How can this be mitigated? Modify the implementation to prevent stack overflow by adding a mechanism to detect and handle it. (5) [CO 3] [BTL2,6]

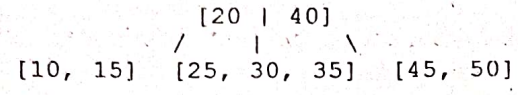
2)

a) Explain how self-balancing trees maintain their balance during insertions and deletions.? Give real-world scenarios where they are used. Create an AVL tree by inserting the following keys one by one and on each key insertion make sure tree is AVL. (5) [CO 4] [BTL2,6]

{15, 20, 24, 10, 13, 7, 30, 36, 25, 42, 29}

b) What are B-trees and how are they different from m-way trees? State the properties of a B-Tree? Consider the following B Tree with an order of 4 (i.e., each internal node can have a maximum of 4 children).

(5) [CO 4] [BTL2,3,5]



i) **Insert the key 22** into the tree and show the updated B Tree structure

ii) **Delete the key 25** from the updated tree and show the resulting structure.

3)

a) What is a Minimum Spanning Tree? Describe a real-world scenario where MST algorithms may be used. Evaluate does the chosen algorithm influence the outcome? (5) [CO 4] [BTL2, 5]

OR

a) Compare Prim's algorithm and Kruskal's algorithm for finding an MST. Analyse is one more efficient than the other? (5) [CO 4] [BTL2,4]

b) Discuss the representation of Graph data structure? Evaluate the pros and cons of each representation. (5) [CO 3] [BTL2,5]

4)

a) Implement a binary search algorithm and test it on a sorted array. Modify the binary search algorithm to return the index of the element along with the number of comparisons made. And test the classic binary search algo on a sorted array. (5) [CO 2] [BTL 6]

b) Given the keys {329, 410, 333, 970, 280, 159, 865, 593, 621, 564} and the mid square hash function, create and show the contents of the hash table of size 10 which resolves collision using quadratic probing.

(5) [CO 2] [BTL1,6]

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Total No. of Pages _02__ Roll No. .....

_Third__ SEMESTER **B.Tech [IT]**

END SEMESTER EXAM *Nov-2024*

IT-205n DATA SCIENCE AND VISUALIZATION

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

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

Q.1 a) For the following data in the format features × samples, compute the outliers using IQR method.

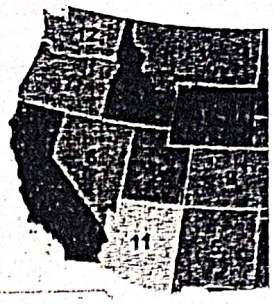
F1	11	12	-11	20	80	-3	3	2	-3
F2	8	6	-3	6	15	4	5	4	5

[7][CO4]

b) Define the Central Limit Theorem and discuss its uses in practical real-life scenarios. [3][CO5]

Q.2 Describe and compare different data visualization techniques, as many as possible, using graphs, codes and description of use. [10][CO3]

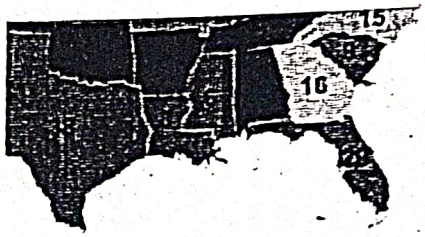
Q.3 Construct and sketch the overall Normal Distribution (N.D.) curve for the results of the U.S. presidential elections shown for some western states in Fig. 1. [10][CO1]



(Source: Wikipedia)

Fig. 1: Election results of some states in western part of USA.

Q.4 Conduct the t-test for the two distributions pertaining to Fig. 1 and Fig. 2 which show the results for the western and southern states of USA, respectively. Analyze the outcome of the t-test. [10][CO1]



(Source: Wikipedia)

Fig. 2: Election results of some states in southern part of USA.

Q.5 Describe the modern-day applications of data science and visualization using examples from real-life scenarios.

[10][CO5]

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

3rd SEMESTER

B.Tech. (IT)

END TERM EXAMINATION Nov-2024

IT207 Data Communications

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) Discuss time domain and frequency domain concept of a signal. Draw the frequency domain plot of a periodic signal.	[3] [CO1]
	(b) Differentiate between Synchronous TDM and Statistical TDM. Why is a statistical time division multiplexer more efficient than a synchronous time division multiplexer?	[7] [CO1]
Q.2	(a) A telephone line is known to have a loss of 20dB.The input signal power is measured as 0.5W, and the output noise level is measured as 4.5μW. Using this information, calculate the output signal to noise ratio in dB.	[5] [CO2]
	(b) If the spectrum of a channel is between 3MHz and 4 MHz and SNRdB = 24 dB. Then calculate the Shannon Channel capacity? Also find out the number of levels required to achieve the above capacity, by using Nyquist's formula?	[5] [CO2]
Q3.	(a) With the help of suitable diagrams, differentiate multi-mode and single-mode optical fibres. How are the rays propagated in step-index and graded-index multi-mode fibres?	[5] [CO3]
	(b) What are the advantages of using multiplexing in data communication? How does a synchronised time division multiplexer stay synchronized with de-multiplexer on receiving end?	[5] [CO3]

Q4.	(a) For the bit stream 11000110010, sketch the wave form for each of the Line code of NRZ-I, NRZ-L, Bipolar-AMI, Pseudoternary, Manchester, Differential Manchester. Also write the Python/C++/Go/Java code to plot these wave forms.	[8] [CO4]
	OR	
	(a) Encode the bit stream 10101010101010 into the following line coding schemes assuming that the last signal level has been negative: i. NRZ-I ii. NRZ-L iii. Manchester iv. Differential Manchester v. Bipolar AMI (Most recent preceding 1 bit has negative voltage) vi. Pseudoternary (Most recent preceding 1 bit has negative voltage) Also write the Python/C++/Go/Java code to plot these wave forms.	
	(b) How cross talk does occurs in twisted pair cables? Give the purpose of CAT5e, CAT6, CAT7 twisted pair cables.	[2] [CO4]
Q5.	(a) How does spread spectrum eliminates narrow band interferences? Explain Direct Sequence Spread Spectrum (DSSS) technique.	[5] [CO5]
	OR	
	(a) Give any two reasons why baseband signal cannot be directly transmitted in a wireless system? How Frequency Hopping Spread Spectrum (FHSS) spread the baseband signal for transmission.	[5] [CO5]
	(b) Explain the datagram approach for packet switching network. What is the significance of packet size in packet switching network?	

End

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

III SEMESTER

B.Tech. (IT)

END TERM EXAMINATION *Nov-2024*

IT 209 Principles of Computing

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

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

Q.1 a) Define ambiguous grammar.Show that the following grammar is ambiguous S->aSbS|bSaS|Ɛ [5][CO3][BTL2]

b) Convert the following grammar into an equivalent one with no unit productions and no useless symbols S⟶ABA, A⟶aAA|aBC|bB B⟶ A|bB|Cb C⟶CC|Cc [5][CO3][BTL3]

Q.2 a) State Pumping lemma for CFL and Prove $L = \{ 0^n 1^n 0^n | n \geq 1\}$ is not context Free Language. [5][CO4][BTL1]

b) What is GNF for of CFG? Reduce the following grammar to Greibach normal form: S→AB, A→BSB, A→BB, B→aAb, B→a, A→b [5][CO4][BTL1]

Q.3 a) Design a PDA which accepts strings of the form $1^*0^n1^n$ [5][CO5][BTL2]

b) Construct a TM that accepts $L = \{0^{2n} | n \geq 0\}$ [5][CO5][BTL4]

Q.4 a) Consider the following Null NFA. Where F is the final state.

	Ɛ	a	b	C
→ p	{q , r}	ϕ	{q}	{F}
q	ϕ	{p}	{F}	{p,q}
F	ϕ	ϕ	ϕ	ϕ

(1) Compute ε closure of each state.

(2) Give the set of all strings of length 3 or less accepted by the automaton.

(3) Convert the automaton to a DFA [5][CO1][BTL6]

b) Define pumping lemma for regular languages. Apply the lemma on the following language to prove it as irregular language.

$L = \{ 0^n 1^{2n} \mid n \geq 1 \}$ [5][CO1][BTL6]

Q.5 Write short notes on: [2.5X4][CO6][BTL5]

a) PCP problem

b) Universal TM

c) Halting Problem

d) Variants of Turing Machine

Total no of Pages: 03 Roll no.....

Vth SEMESTER **B.Tech**

END TERM EXAMINATION ***Nov-2024***

IT301: Theory of Computation

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

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

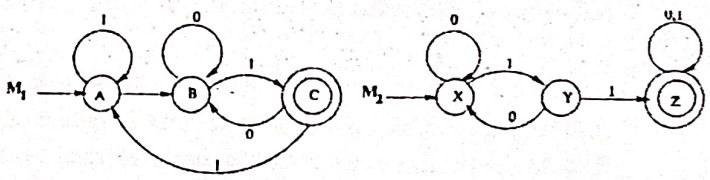
Q1. a) For the context-free language (CFL) **L= {$a^n b^m a^n$|m, n>=1}** do the following:

i) Design the context-free grammar (CFG): **G= (V, T, S, P)** for this language. [2] [CO2] [BTL3]

ii) Convert the CFG to the Chomsky Normal Form. [3] [CO3] [BTL3]

iii) Construct the Push Down Automata (PDA) for the language and show the instantaneous description of PDA with one example. [3] [CO3] [BTL4]

b) The following figure shows two DFAs, M_1 and M_2, which accept the languages L_1 and L_2 respectively. Determine a DFA that recognizes the union of these two languages, $L_1 \cup L_2$. [2] [CO1] [BTL2]



Q2. a) Define the ambiguous grammar and check following grammar is ambiguous or not? [4] [CO2][BTL5]

S→aB|bA
A→aS|bAA|a
B→bS|aBB|b

b) Convert the following grammar into the GNF form.

S→ XA|BB

B→ b|SB

X→ b

A→ a [4] [CO2][BTL1]

c) Explain the decision properties of context-free languages (CFLs) for emptiness, finiteness, and membership. [2][CO3][BTL2]

Q3. (a) What is halting problem. Construct a Turing Machine over the alphabet {0, 1}, that contains set of string of 0's and 1's except those containing the substring 001. Show the transition function and transition diagram with tape explanation. Show the acceptance and rejection by Turing Machine with example. [6][CO5] [BTL4]

OR

a) Explain decidability and undecidability. Construct a Turing Machine over the alphabet {0,1}, that outputs 0 or 1 depending upon whether number of 1's in the sequence is even or odd respectively. Show the transition function and transition diagram with tape explanation. Show the output 0 or 1 by Turing Machine with appropriate example. [6][CO5] [BTL4]

b) Write difference between NFA and DFA. Construct a finite automaton for the regular expression $10+(0+11)0^*1$ [4][CO1][BTL3]

OR

(b) Find deterministic Finite Automata of the following language on $\Sigma=\{a,b\}$, $L=\{w: n_a(w) \bmod 5>0\}$ and show that string "aaaa" is accepted by the finite automata. [4][CO1][BTL3]

Q4. (a) Differentiate between recursive enumerable and recursive language. Explain with examples. [2][CO6][BTL2]

b) Explain the concept of post correspondence problem with the help of an example. Let A = {1, 10111, 10} and B = {111, 10, 0} on alphabet $\Sigma = \{0,1\}$. Does this Post correspondence problem have a solution if yes what will be the sequence? [3][CO6][BTL2]

c) Design a Turing Machine over {0,1} to accept the language L = {x | x contains equal number of 0's and 1's in any order and contains at least one 0 and one 1}. Show the transition function and transition diagram with tape explanation. [5][CO5][BTL4]

Q5. a) State Pumping Lemma for Context Free Language. Prove that the language $L = \{ a^i b^j c^k \mid i<j<k \}$ is not CFL. [4][CO3][BTL5]

b) Design 2-stack Push Down Automata accepting the language $L= \{a^n b^n c^n d^n \mid n>=1\}$ by empty stack. Clearly write transition function and diagram. Also trace the string w= aabbccdd. [6][CO3][BTL3]

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

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

FIFTH/SEVENTH SEMESTER **B.Tech. (IT/ALL)**

END TERM EXAMINATION *Nov-2024*

IT303 COMPUTER NETWORKS

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

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

Q.1

a) Compare & contrast Datagram and Virtual Circuit Switching. **[2][CO2][BTL2,5]**

b) Draw the IPv4 and IPv6 headers and justify, by explaining the modifications in the various field, how IPv6 is an improvement? **[6][CO4][BTL2,5]**

Q.2

a) Support the argument that TCP is suitable and not UDP as transport layer protocol for FTP at application layer. **[2][CO5][BTL5]**

b) Describe the mechanism of sending and receiving e-mails (with attachments) by explaining the working of the associated protocols SMTP, POP and IMAP. **[6][CO5][BTL1,2]**

Q.3

a) What is the significance of pseudo header and concept of "Port" at the transport layer? **[2][CO4][BTL1]**

b) Explain in detail how sliding window protocol is used for transport layer flow, how does it differ from flow control at layer 2 ? **[6][CO4][BTL2]**

Q.4

a) With help of an example explain the working of Distance Vector Routing **[5][CO3][BTL3]**

OR

b) With help of an example explain the working of Link State Routing

c)	The WWW has a unique combination of flexibility, portability, and user-friendly features that are a result of Client-server architecture, Justify	[3][CO3][BTL5
	OR	
d)	Write short notes on Domain Name system.	
Q.5		
a)	Calculate the Network ID, subnet mask , broadcast address, First Usable IP and Last Usable IP on the subnet that a node 173.91.43.43/25 belongs to? If the given block was to be divided among four subnets determine the First and Last Usable IP of each subnet.	[5][CO3][BTL3
b)	Solve the above network as example of Classful addressing.	[3][C3,4][BTL3
	OR	
c)	Draw the TCP header explaining the significance of each field.	

****END****

Total no. of Pages:3 *Roll no.....*

B.Tech. (V^{th} / VIIth SEMESTER)

END TERM EXAMINATION ***Nov/Dec-2024***

COURSE CODE IT307 COURSE TITLE Pattern recognition

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

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

Q.1

a) What are different types of feature detection techniques? How it's helpful in pattern recognition?

b) Find the probability density function (pdf) of a random variable $Y = (x - a)^2$ in terms of pdf of X. [5+5] [CO#1]

Q.2

a) A dataset of 2D points and their corresponding labels (either "Red" or "Blue"). Classify a new point (4,4) based on the labels of its nearest neighbours. Assume K =3.

Point (x, y)	Label
(1, 2)	Red
(2, 3)	Red
(3, 3)	Blue
(6, 5)	Blue
(7, 8)	Blue
(8, 8)	Red

b) A man is known to speak truth 3 out of 4 time. He throws a dice and reports that it is a six. Find the probability that it is actually a six.

[5 +5] [CO#2]

Q.3

a) What do you mean by clustering? How it's different from Classification and Regression? What are different common similarity and dissimilarity measures are used for clustering?

OR

a) We have six products, each with two features: Price (in dollars) and Customer Rating (on a scale from 1 to 10). Let's apply K-means clustering with k= 2 clusters "High-Price, High-Rating" products and "Low-Price, Low-Rating" products. Let's initial Centroid considered is product 'A' and product 'E' and update new centroid after 1st iteration.

Product	Price ($)	Customer Rating
A	10	4
B	15	6
C	24	5
D	30	8
E	85	9
F	90	10

b) Given the points A (3, 7), B (4, 6), C (5, 5), D (6, 4), E (7, 3), F (6, 2), G (7, 2) and H (8, 4), Find the core points and outliers using DBSCAN. Take Eps = 2.5 and MinPts = 3. [5+ 5] [CO#3]

Q.4

a) What do you mean by feature selection? What's the need of feature selection? How it's is different from feature extraction?

b) What is sequential forward selection method? Explain with the help of a diagram. Write algorithm for SFS? What are advantages and disadvantages of SFS? [5+ 5] [CO#4]

Q.5

a) Suppose we have three fruits, each with two features: Sweetness (on a scale of 1-10) and Crunchiness (on a scale of 1-10). We want to classify these fruits into two clusters, such as "Sweet Fruits" and "Crunchy Fruits," allowing for partial membership. Assume: c=2 (one for sweet fruits, another for crunchy fruits), Fuzziness parameter is 2

Fruit	Sweetness	Crunchiness
Apple	7	8
Banana	9	4
Pear	6	7

OR

a) Let's consider a simple binary classification problem. Suppose you have the following dataset with two features (x1, x2) and two classes (labels 1 and -1): (2, 2) and (1, 1) both belongs to class +1 and (2, 0), (0, 0) belongs to class -1. Find a linear classifier separates these two classes with the maximum margin using a Linear SVM

b) Suppose we have a dataset representing three customers, each with three features: Annual Income, Spending Score, and Age. We want to reduce this dataset to two dimensions to better understand customer segmentation.

Customer No.	Annual Income	Spending Score	Age
1	50	80	25
2	60	70	30
3	55	75	28

[5+5] [CO#5]

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_____SEMESTER B.Tech. Roll No._____

END TERM EXAMINATION *Nov-2024*

IT321: MALWARE ANALYSIS

Time: 3 Hours *Max. Marks: 40*

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

Q.1 Answer the following in brief: [2x4][CO1,CO2,CO4,CO5][L1]

i. What is UPX?

ii. What is Windows Registry?

iii. Explain the uses of Wireshark.

iv. What are Software Breakpoints?

Q.2 a. Develop a procedure to find strings in the Unicode binary file.

b. Design a procedure to publish binary files using the hashing technique on the internet. [4x2][CO1,CO2][L5]

Q.3 a. What is Jump2self technique? Design procedure to find CPU instructions, stack contents, and CPU registers values of binary executable file.

b. What is Sandboxing? Explain different Virtualization approaches and 3 Common uses of Virtualization.

[4x2][CO2,CO3][L3,L2]

Q.4 a. Design a procedure to identify the Most Recently Used (MRU) files on a suspect computer system using Windows Registry.

b. Design a procedure to analyse suspicious main memory areas of a computer system. [4x2][CO4][L4,L5]

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Q.5 a. Discuss salient features of the TaintDroid system. Why is there need for studying mobile security separately?

b. Design a procedure to capture network packets using Wiresha and extract packet's source and destination addresses along wi MAC address.

OR

b. Develop a procedure to analyse the pager & walkie-talki explosions in Lebanon that occurred in September 2024

[4x2][CO6][L2,L6]

Total No. of Pages:03 *Roll No.*_____

FIFTH SEMESTER **B.Tech. (IT/ALL)**

END SEMESTER EXAMINATION ***November-2024***

IT-323 MACHINE LEARNING

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

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

1. a) A sentiment analysis model is tested on 2,500 customer reviews. Out of these, 1,000 are classified as positive sentiments and 1,500 as negative. The model correctly identifies 850 positive reviews and 1,300 negative ones. Formulate the confusion matrix, compute the balanced accuracy, and F1-Score. [4][CO1][BTL3]

b) Differentiate:

i) Classification and Clustering. [2][CO3][BTL2]

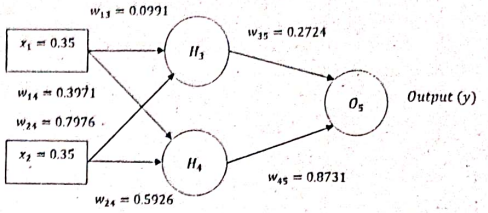
ii) Inductive and Deductive learning. [2][CO1][BTL2]

iii) Value and Policy based Reinforcement Learning [2][CO5][BTL1]

2. a) A spam detection model is trained using Stochastic Gradient Descent algorithm to classify whether an email is spam or not, based on two features: x_1 –number of spam keywords in the email, x_2 –length of the email. The model's prediction score is given by: $\hat{Y} = w_1.x_1 + w_2.x_2 + b$, where w_1, w_2, are the weights for x_1, x_2 respectively and b is the bias. Use mean absolute error as loss function. The model is trained on the following three labeled emails: Email 1: $(x_{11} = 2,\ x_{12} = 50;\ y_1 = 1\ (spam))$, Email 2: $(x_{21} = 1, x_{22} = 20, y_2 = 0\ (Not\ Spam))$, Email 3: $(x_{31} = 3, x_{32} = 80, y_3 = 1\ (Spam))$. Initial parameters are $w_1 = 0.1, w_1 = 0.05, b = 0.5$, Learning Rate α=0.01. Provide the updated values of $w_1, w_2, and\ b$ after processing all three emails. [Hint: Also determine gradient of bias]. [5][CO1][BTL7]

b) How to evaluate the quality of clusters? Explain types of clustering. [2+3][CO3][BTL5]

3. a) Assume that the neurons in the network use a sigmoid activation function. Perform a forward pass and a backward pass on the given network. The actual output of y is 0.5, and the learning rate is 0.01. After completing the backward pass and updating the weights, perform another forward pass to calculate the updated output. [5][CO2][BTL3]



b) A healthcare company wants to predict whether a patient's hospital visit will require an emergency admission or not, based on historical data. The table below shows data for 10 visits: [1+1+3][CO2][BTL3]

Visit	Age (years)	No. of visits	Average Bill (Rs.)	Class (Emergency/Non-Emergency)
V1	65	3	5000	Emergency
V2	45	1	1500	Non-Emergency
V3	72	4	7000	Emergency
V4	50	2	2500	Non-Emergency
V5	80	5	10000	Emergency
V6	38	1	2000	Non-Emergency
V7	58	3	3000	Non-Emergency
V8	70	4	8000	Emergency
V9	40	2	1800	Non-Emergency
V10	75	6	12000	Emergency

(i) What distance metric (e.g., Euclidean, Manhattan) would you use, in this example and why?

(ii) Using the KNN algorithm (k=3), classify a new patient visit with the following features: Age = 60 years, Number of Visits = 3, Average Bill = 4000.

(iii) If k is increased to 5, how would the classification for the above patient change? If k is decreased to 1, what would the classification be? Discuss how the values of k affect the performance of the KNN model (e.g., overfitting or under fitting).

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4. a) Given the following data points in a 2D space: A(1,2), B(2,4), C(5,7), D(6,9). [2+3][CO5][BTL3]

(i) Calculate the distance matrix between these points using Euclidean distance.

(ii) Perform hierarchical clustering using single linkage (nearest neighbor) and construct the dendrogram step-by-step.

b) Write the mathematical expressions for the Hard Margin SVM and Soft Margin SVM used to define this hyperplane. Explain when to prefer which one with a suitable example. [5][CO2][BTL4]

5. Consider the following dataset about whether a student passes or fails based on three attributes: Study Time (High, Medium, Low), Sleep Hours (Sufficient, Insufficient), and Assignments Completed (Yes, No). The goal is to predict the Pass outcome. [2+2+3+3][CO5][BTL6]

Study Time	Sleep Hours	Assignments Completed	Pass
High	Sufficient	Yes	Yes
High	Insufficient	No	Yes
Medium	Sufficient	Yes	Yes
Medium	Insufficient	No	No
Low	Sufficient	Yes	Yes
Low	Sufficient	No	No
Low	Insufficient	Yes	No
Medium	Insufficient	Yes	Yes

a) Calculate the entropy for the target variable (Pass).

b) Calculate the information gain for each attribute: Study Time, Sleep Hours, and Assignments Completed.

c) Determine the root node for the decision tree using the ID3 algorithm.

d) Construct the first split in the decision tree based on the chosen attribute.

[CO#]:- Course Outcome

[BTL#]:- Bloom's Taxonomy

Total No. of Pages:03 *Roll No.*_____

FIFTH/SEVENTH SEMESTER **B.Tech. (IT/ALL)**

END SEMESTER EXAMINATION ***November-2024***

IT-351 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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

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

1[a] Consider the data given in Table 1. Consider the sample (brightness = 20, sharpness = 35). What will be the class of this sample when k is taken as 3 in KNN and distance calculated using Euclidean distance method. [5] [CO#4][BTL#4]

Table 1

Brightness	Sharpness	Class
40	20	Red
50	50	Blue
60	90	Blue
10	25	Red
70	70	Blue

[b] You have 2 jugs of water with capacity 8 litres and 5 litres respectively. There is a tap to get any amount of water from it. There is no measuring scale on the jugs. You have to measure 1 litre water using these two jugs. How will you solve this problem with the help of state space representation?

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

2[a] Calculate the regression coefficients and Prediction equation for the following points: (2,3), (4,7), (6,5), (8,10). Also, predict the output for Xi = 7 and calculate the coefficient of correlation r.

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

[b] What is the difference between K-fold cross validation and LOOCV? Calculate precision, recall and accuracy for the data given in Table 2:-

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

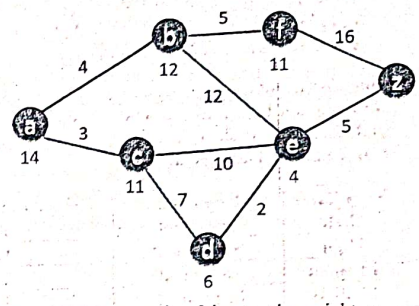
Table 2

	Actual Yes	Actual No
Predicted Yes	7	1
Predicted No	2	10

3[a] Find the best route from the start node a to the goal node z in the graph given in figure 1, using A* search algorithm.

[5][CO#2][BTL#3]

Figure 1



[b] Consider an artificial neuron has 2 inputs, the weights corresponding to these inputs is (2, -3), the bias is 0 and the activation function is a step function. Determine the output for the input values given in the Table 3:- [5][CO#4][BTL#3]

Table 3

Pattern	X1	X2
P1	0	1
P2	1	0
P3	1	1
P4	0	0

4[a] Consider six points P1 = (4,5), P2 = (2,4), P3= (3,3), P4= (3,2), P5= (1,4) and P6= (5,3). Cluster these points using agglomerative methods. Calculate using Euclidean distance. Find the final single link distance matrix and draw the hierarchical tree diagram.

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

[b] What do you mean by a Tautology, Contradiction and Contingency? Convert the following sentences into predicate logic: -

[i] John feeds dogs.

[ii] All herbivores eat grass.

[5][CO#3][BTL#2]

5[a] Consider the dataset for two species (M & H) given in the Table 4:-

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Table 4

S. No	Color	Legs	Height	Smelly	Species
1.	White	3	Short	Yes	M
2.	Green	2	Tall	No	M
3.	Green	3	Short	Yes	M
4.	White	3	Short	Yes	M
5.	Green	2	Short	No	H
6.	White	2	Tall	No	H
7.	White	2	Tall	No	H
8.	White	2	Short	Yes	H

Using this data, identify the species of the entity having the attributes: X = (Color = Green, Legs =2, Height =Tall, Smelly=No) using naive bayesian classifier. [5][CO#4][BTL#4]

[b] What is the difference between a generic node and an instance node in semantic nets? Express the following information using frames: -

[i] Alex fixed a puncture of a scooter

[ii] There is a bed, almirah, table and chair in a Bedroom

[5][CO#3][BTL#2]

6[a] Consider the data given in Table 5. Construct a decision tree on this dataset using Hunt's algorithm. Also calculate Information Gain on income attribute. [5][CO#4][BTL#3]

Table 5

Income	Is Student?	Credit Rating	Buys Computer?
High	No	Fair	Yes
High	No	Excellent	Yes
High	No	Fair	Yes
Medium	No	Fair	No
Low	Yes	Fair	Yes
Low	No	Excellent	No
Low	Yes	Excellent	Yes
Medium	No	Fair	No
Low	Yes	Fair	Yes
Medium	Yes	Fair	Yes
Medium	Yes	Excellent	Yes
Medium	No	Excellent	Yes
High	Yes	Fair	Yes
Medium	No	Excellent	Yes

[b] What is the curse of dimensionality? Explain feature selection techniques in detail. [5][CO#5][BTL#2]

[CO#]:- Course Outcome

[BTL#]:- Bloom's Taxonomy

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

V, VII SEMESTER B.Tech

END TERM EXAMINATION ***Nov-2024***

IT407 : Information and Network Security

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

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

Q1.(a) Using Play fair technique encrypt the following message "send more money" using the key "tarun". [5][CO1][L3]

(b) Discuss the terms, active attacks, passive attacks cryptography and cryptanalysis. [5][CO1][L4]

Q2.(a) Draw the block diagram of DES algorithm. Also explain its functionality. [5][CO2][L2]

(b) Using Row transposition technique and given key is "2 5 4 1 3" generate the cipher text for following plain text " a convenient way to express the transposition". [5][CO2][L3]

Q3.(a) Alice and Bob want to establish a secret key using Diffie-Helllman key exchange protocol. Assuming the values as n=11, g=5, x=2, and y=3 find out the values of A and B and the secret key. [5][CO3][L3]

(b) Describe the different variants of permutation boxes used in modern ciphers. [5][CO3][L2]

Q4.(a) Differentiate between hashing and encryption. Compare MD5 and SHA1 algorithms. [5][CO4][L2]

(b) What is PKI? What are the components of PKI? Explain Authority in detail. [5][CO4][L3]

Q5.(a) Explain Kerberos in detail describing format and content of each message. [5][CO5][L2]

(b) Why is the SSL layer positioned between the application layer and the transport layer? [5][CO6][L3]

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

V/VII SEMESTER **B.Tech**

END TERM EXAMINATION *Nov-2024*

IT409 Enterprise Java Programming

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

Note : Attempt all 5 questions in a sequence.
Internal choices have been given. They may be clearly specified.
Support your answers with proper codes and example.

Q.1 Differentiate between: [10][CO1,2,4][BTL2]
(a) Runnable interface and thread class
(b) JDBC and ODBC
(c) Driver type 1 and Driver type 2
(d) Transient and synchronized

Q.2 (a) What is the difference between Collection and Collections framework. Explain the hierarchy of the framework with a diagram. Highlight the factors like duplicates, ordering, null value storage and synchronization in HashSet and HashMap. [4][CO1][BTL2]
(b) Show how are service(), destroy() and init() are related? Explain with a code and diagram. [4][CO4][BTL2,3]
(c) What are the bound and constrained properties of a Java Bean? [2][CO5][BTL2]

OR

(c) What is the role of the Serializable interface? [2][CO5][BTL2]

Q.3 (a) Write a complete JAVA code for the following problem – An organization wants to collect the data of its employees for calculating their Diwali bonus. For this they want their employees to fill a form which contains a Salary, Experience, Name, EmpId fields. The code at the backend will calculate bonus as either 20000, 30000 or 50000 depending on the checks set by the organization (assume this check on your own). It should then display the result on the screen with a "Congratulations message". Also, **justify** the use of the Java API feature you chose to write this code and **discuss** possible option to attempt this code with any other method. [4][CO4][BTL2,5]

(b) Explain following: [6][CO1,2,5,6][BTL2]
i) Connection ii) Cookie
iii) PreparedStatement iv)ResultSet
v) HttpSession vi)InetAddress

Q.4 (a) What is the advantage of using an Entity bean for datab
operations, over directly using JDBC API to do database operatio
Assess the need to use one over the other? [4][CO3,6][BTL2
(b) Explain the types of an Enterprise Java bean. Examine the rol
of the states of an EJB. [4][CO6][BTL2
(c) Why do we need web.xml? [2][CO4][BTL

Q.5 (a) Create a remote, stateless Enterprise Java bean for the follow
scenario- There is a bank which lets customer apply for different l
(Car, home, education, personal etc.) using a form in which he
select the type of loan, amount required, tenure of the loan wit
fixed rate of interest set by the bank (Choose rate of interest on y
own). EMI calculator will calculate the amount per month to be p
by the customer. Use different files and explain the purpose of e
with proper comments and explanation. [4][CO3,4,6][BTL2,

(b) Use socket and network program to use client ser
communication using UDP. Write the complete code involv
classes and interfaces required to create this session. How will
messages be exchanged? Which fragment of the code is responsi
for the same. Justify and explain with respect to the classes a
interface used. [4][CO2,5][BTL2,5

OR

(b) Create a session between 2 clients and one server, reserving t
different ports for the communication to take place. The messa
exchanged are as follows:

client 1: Hi Server I am client one
Server: Hi Client 1, received your Hello.
Client 2: Hi Server I am client two
Server: Hi Client 2, received your Hello.
..
..

Create separate codes for client and server side and comment
needed showing the purpose of every class/interface or functi
used. [4][CO2,5][BTL2,5]

(c) What is CGI? Explain the purpose of CGI along with pros a
cons. [2][CO3][BTL2]

Total no. of Pages:2 404 Roll no.....

VII SEMESTER B.Tech.

END TERM EXAMINATION *Nov-2024*

IT-411: Digital Image Processing

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

Note: All questions carry equal marks.
Assume suitable missing data, if any.
Internal choices, if any, are indicated using OR

Q.1 (a) Evaluate the need of sampling and quantization in Digital Image Processing. [2][CO1][BTL5]

(b) Justify which type of spatial filter can be used for removing salt noise, pepper noise, and salt & pepper noise? [3][CO2][BTL5]

(c) Calculate 4-point DFT of a sample 4x4 image given below using kernel. [5][CO3][BTL3]

1	2	3	4
1	1	1	3
2	2	2	2
2	2	2	2

OR

(c) What is image sharpening? Show that subtracting the Laplacian from an image is proportional to unsharp masking. [5][CO3][BTL3]

Q.2 (a) Explain different types of noise models in digital image processing. [5][CO4][BTL2]

(b) Let p and q be the pixels at coordinates (10,12) and (15,20) respectively. Determine which distance measure produce minimum distance between them. [3][CO1][BTL3]

(c) What is a membership function in fuzzy logic? Describe its key properties. [2][CO2][BTL1,2]

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Q.3 (a) Explain RGB color model. Solve the given R,G,B=(100,150,20 intensities to map them into HSI color model. [5][CO4][BTL2,3

(b) Consider the following binary image segment fig (a) a structuring element fig (b).

1	0	1	0	1	0
0	1	1	1	0	1
1	1	0	1	1	0
0	0	1	1	1	1
1	0	1	0	0	1

(a)

1	1	1
1	1	1
1	1	1

(b)

Apply dilation and erosion operation on the binary image using given structuring element. Evaluate the effect of dilation and eros on the image. [5][CO5][BTL3,4

Q.4 (a) Determine the need of multiple thresholding in ima segmentation. How is it different from basic thresholding. Prov an example where multiple thresholding would be preferred a briefly discuss limitations of thresholding methods.

[5][CO6][BTL2,3

OR

(a) Explain Sobel Filters? Compute the gradient magnitude a direction of an image using Sobel operators. [5][CO6][BTL 2,

Image Matrix	Sobel Kernel	Sobel Kernel:
100, 105, 110	-1, 0, 1	-1, -2, -1
120, 125, 130	-2, 0, 2	0, 0, 0
140, 145, 150	-1, 0, 1	1, 2, 1

(b) What is morphological watershed? Evaluate how it helps segmentation? Explain in detail. [5][CO6][BTL 2,5]

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Total no. of Pages 02 406 Roll no.....

5th SEMESTER

B.Tech. (ALL)

END TERM EXAMINATION **Nov-2024**

IT-417 High Performance Computing

Time: 3:00 Hours Max.Marks:50

Note:All questions are compulsory. Kindly check the paper code before start your exam.
All questions carry equal marks.
Assume suitable missing data, if any.
[M]: Marks allocated to the question.
[CO#]: Course Outcome number.

Q.No	Question Description	[M][CO#][BTL]
Q.1	(a) Define pseudo-random numbers and explain how they differ from true random numbers.	[2][CO4][BTL1]
	(b) What are Sobol sequences, and why are they considered low-discrepancy sequences?	[2][CO4][BTL1]
	(c) In the context of Monte Carlo methods, why is the choice of a random number generation method important?	[2][CO4][BTL1]
	(d) Explain the scenarios where binary search is applicable. Discuss its advantages.	[2][CO4][BTL2]
	(e) Discuss the "Decrease and Conquer" approach, and how is it used in algorithms like Merge Sort or Quick Sort?	[2][CO4][BTL2]
Q.2	(a) Why is parallel processing crucial for scientific and engineering applications, assess the difficulties do non-computer scientists encounter in developing parallel programs, and how does MATLAB address these challenges to make parallel programming more accessible?	[5][CO5][BTL5]
	(b) Compare and contrast the Shared-variable model and the Message-passing model of parallel programming. Discuss the key features of each model, their advantages, and provide examples of their typical use cases in parallel computing.	[5][CO1][BTL5]

Q3. (a) What is throughput in the context of a hybrid memory system, and how does it affect the performance of computational tasks? Discuss how throughput is measured and its significance in evaluating memory system efficiency. [4+2][CO6][BTL2]

(b) Explain the difference between symmetric and asymmetric system designs. How do these designs affect performance and scalability in parallel computing? [2] [CO6][BTL2]

(c) Explain Amdahl's Law and discuss its key features. How does it predict the impact on the performance of a system? [2] [CO6][BTL2]

Q4. (a) Given the following assumptions: A small core takes an area budget of 1 and has a performance of 1. A large core takes an area budget of 4 and has a performance of 2. If a system consists of 4 small cores and 1 large core, calculate the total area budget and the overall performance of the system. How does this configuration impact the system's performance in terms of parallelism and scalability? [5][CO6][BTL3]

(b) Explain the differences between the Data-Parallel Model and the Task Graph Model of parallel programming. Include the key features of each model, an example of their application, and how they handle task and data partitioning in parallel computation. [5][CO4][BTL2]

Q5 (a) Explain the concepts of Time Complexity, Space Complexity, and Auxiliary Space in algorithm analysis. How do these measures help in evaluating the efficiency of an algorithm? Provide examples of each with respect to a given problem. [5][CO2][BTL2]

(b) Explain the architecture of a multi-core processor and discuss its advantages and disadvantages. How does a multi-core processor enhance performance, reliability, and multitasking, and what challenges can arise in terms of application speed and analysis? [5][CO3][BTL2]

****END****

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_Seventh__ SEMESTER B.Tech [IT]

END SEMESTER EXAM Nov-2024

IT-425 NATURAL LANGUAGE PROCESSING

Time: 3:00 Hours Max. Marks : 50

Note : Q.1 is mandatory. Answer any three questions among the remaining Q.2 to Q.5.
Assume suitable missing data, if any.

Q.1 a) Design a suitable grammar and lexicon for the successful parse of the test sentence "she nursed the patients in the hospital". [CO2][3]

b) Construct the top-down parsing table for the given test sentence and the grammar designed in (a). [CO2][5]

c) Sketch the parse tree for the test sentence. Justify how the tree can be constructed from the top-down parsing table. [CO2][2]

d) Construct the Augmented Transition Network (ATN) for the grammar. [CO5][5]

e) Conduct top-down parsing using the constructed ATN for the given test sentence. [CO5][5]

Q.2 a) Design a single Finite State Transducer (FST) that performs the following input-to-output mappings:

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(i) nurse→nurse (ii) nursing→nurse+ing (iii) nursed→nurse+ed (iv) nurses→nurse+s [CO1][5]

b) Identify the parts-of-speech (POS) tags for each word in the following sentence: "she has been nursing the patients in the hospital over the past year" [CO2][5]

Q.3 a) Describe the different Word Embeddings used for machine/deep learning in NLP. [CO6][4]

a) Distinguish between Word Embeddings and bag-of-words. [CO3][2]

c) Examine the advantages of using PCFG over CFG using an example. [CO4][4]

Q.4 a) Define the Perplexity measure and its use in statistical language modelling. Explain the constituents of the formula and how they are determined in a practical scenario. [CO4][5]

b) In how many different ways can Auxiliary Verbs be used? Justify with suitable examples for each case. [CO5][5]

Q.5 Explain different machine learning and deep learning models used for NLP in contemporary times, describing their working, briefly. Also do a comparison between the models. [CO6][10]

Total No. of Pages-02 Roll No. .....

5TH & 7TH SEMESTER 410 B.Tech. [IT]

END SEMESTER EXAMINATION NOV-2024

IT427: INTRUSION DETECTION AND INFORMATION WARFARE

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

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

1)

a) Define intrusion and its different types. Give in detail the Classification of an IDS and its various components. Differentiate between Host-based IDS (HIDS) and Network-based IDS (NIDS) in terms of their working mechanisms, advantages, and limitations.

[5] [CO1] [BTL4]

b) Taking SNORT as an example IDS justify its location. Which layers of the protocol framework does it interact with?

[5] [CO1] [BTL3]

2)

a) Explain what a password is and why it is considered a common authentication method. [5] [CO2] [BTL2]

b) What are some common techniques used to protect music video, and software from unauthorized distribution? [5] [CO2] [BTL1]

3)

a) Compare and discuss some common sandboxing techniques with respect to features, design and applications. [5] [CO3] [BTL4]

b) What does PGP stand for, and what is its primary purpose in email security? [5] [CO3] [BTL2]

OR

b) What is buffer overflow, and how does it impact memory security? [5] [CO3] [BTL2]

4) 411

a) Discuss the role of Machine Learning (ML) in enhancing the accuracy of modern IDS. Provide an example of a commonly used ML algorithm in this context and briefly describe how it is applied. [5] [CO4] [BTL4]

b) Explain with the help of suitable diagram a defensive model of Information Warfare. Compare the defensive model with offensive model of Information Warfare. [5] [CO 4] [BTL3]

5)

a) Explain the various intrusion detection techniques. Consider a scenario where an anomaly-based IDS triggers multiple false positives. As a security analyst, outline three steps you would take to address this issue while maintaining system security. [5] [CO5] [BTL3,4]

b) What are side channel attacks, explain some common side channel attacks. Why are they such a major concern? [5] [CO5] [BTL4]

OR

b) What are the ways to attack router using BGP? How to detect and prevent the same. [5] [CO5] [BTL4]

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

_____SEMESTER 4|2 **B.Tech.** Roll No.....

END TERM EXAMINATION ***Nov-2024***

IT429: Cyber-Laws

Time: 3 Hours *Max. Marks: 50*

Note: Q.1 is compulsory; attempt any *four* from remaining questions.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 Answer the following in brief:

i. Evaluate the role of autarchy in cybersecurity and assess its feasibility in a globally interconnected system. [2]

ii. Describe the challenges in enforcing electronic contracts across jurisdictions with different legal standards. [2]

iii. What is Sandbox Monitor? [2]

iv. What are Hardware Breakpoints? [2]

[CO1,CO2,CO4][L1]

Q.2 a. Develop a comprehensive strategy combining redundancy, diversity, and autarchy to address a specific cyber threat scenario. [CO1,L1][4]

b. Assess how the lack of uniform jurisdiction affects international collaboration in tackling cyber threats [CO1,L5][4]

Q.3 a. Design a legal framework to balance technological advancements with the protection of privacy rights. [CO2,L6][4]

b. Analyse the implications of internet piracy on small-scale content creators and compare it to the impact on large corporations. [CO2,L4] [4]

Q.4 a. Develop a set of ethical guidelines for businesses handling sensitive customer information, considering existing cyber laws and duty of care principles. [CO3,L6][4]

b. Evaluate the effectiveness of current procedural frameworks in addressing evidence-related issues in cybercrime cases.[CO3,L5][4]

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Q.5 a. Analyse the ethical dilemmas posed by the late 1990s and 2000s developments in cyber law, such as mass surveillance and data collection. [CO4,L4][4]

b. Compare and contrast the applicability of general laws versus cyber laws in addressing digital crimes in developing countries. [CO4,L5][4]

Total no. of Pages: 02 414 Roll no.....

VVII SEMESTER B.Tech

END TERM EXAMINATION Nov-2024

IT433: Multimodal Data Processing

Time: 03:00 Hours Max. Marks: 50

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

Q.1 a) List the historical view of multimodal. [3][CO1][BTL1]

b) A linear regression model is trained using Stochastic Gradient Descent (SGD) to predict the target variable y based on two features, x1 and x2. The model's prediction is given by the function: $\hat{Y} = w_1 \cdot x_1 + w_2 \cdot x_2 + b$. Where w_1 and w_2 are the weights for features x_1 and x_2, respectively, and b is the bias. Given that, *Data Point 1*: ($x_{1,1}=1$,$x_{1,2}=2$; Target $y_1= 5$), *Data Point 2*: ($x_{2,1}=3$,$x_{2,2}=1$, Target $y_2=8$), *Data Point 3*: ($x_{3,1}=4$,$x_{3,2}=3$; Target $y_3=10$) . Initial weights: $w_1=0.5$, $w_2=1.0$, Initial bias: $b=0.5$ Learning rate $\alpha=0.01$. Derive the updated values of w_1, w_2, and b after applying one SGD step for each data point. Consider Mean Squared Error (MSE) loss function for each data point [Hint: Also determine gradient of bias]:

$$\text{Loss} = \frac{1}{n}(\hat{y}- y)^2$$ [7][CO2][BTL6]

Q.2 a) Explain Non-Matrix Factorization with its mathematical formulation. Illustrate with a real life problem how Multiview clustering and Non Matrix Factorization can be used in combination to solve the problem. [3+2][CO4][BTL4]

b) Explain the working of Multimodal deep Boltzmann machine with suitable diagram. Identify a real life scenario where it is suitable to use and mention. [3+2][CO3][BTL2]

OR

b) Explain the need of regularization. What are various the regularization techniques? [2+3][CO3][BTL2]

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Q.3 a) You are given two time series A and B, of equal length: A=[1,3,4], B=[2,2,3]. Use Dynamic Time Warping (DTW) to calculate the minimum DTW distance between A and B. Construct a DTW cost matrix based on the Euclidean distance between elements of A and B . Calculate the cumulative minimum distance for each cell, starting from the top-left and ending at the bottom-right of the matrix. [5][CO5][BTL3]

b) Explain the need of Optimization. Briefly explain various optimization techniques. [2+3][CO2][BTL2]

Q.4 a) Illustrate the working of LSTM with suitable diagram. Briefly explain how it can be used in Multimodal system. [3+2][CO5][BTL2]

b) Differentiate between multimodal Implicit and explicit signal alignment. Describe how dynamic time wrapping and canonical time wrapping are related to it. [3+2][CO5][BTL2]

OR

b) Explain the need of following: self-attention, co-attention, hard attention, multi-headed attention, BERT pre-training. [5][CO6][BTL2]

Q.5 a) For the given inputs : [1, 0,1,0]; [0,2,0,2]; [1,1,1,1] and weights of Key W_k, querry W_q, value W_v respectively:

$W_k =$

0	0	1
1	1	0
0	1	1
1	1	1

$W_q =$

1	0	1
1	1	0
0	0	1
0	1	1

$W_v =$

0	2	0
3	0	0
1	0	3
1	1	0

Derive key representation, calculate attention score, softmax attention score and sum weighted output for each. [5][CO6][BTL6]

b) Interpret the limitation of sequence to sequence model. Explain in detail the transformer architecture with suitable diagram.

OR [5][CO6][BTL3]

b) Explain the use of auto encoder and briefly explain its all types with suitable diagram. [5][CO3][BTL3]

Total No. of Pages 2 M16 Roll No. .....

FIRST SEMESTER B. Tech

END SEMESTER EXAMINATION [Nov/Dec 2014]

ME101 BASIC MECHANICAL ENGG.

(OLD SCHEME)

Time: 3.00 Hrs Max. Marks:50

Note: Answer Part A and Part B *separately* in the same answer sheet. Answer any 5 questions from each Part. Assume suitable missing data, if any.

PART A

[1] Derive SFEE for heat exchanger and state assumptions made. In a gas turbine the gas enters at the rate of 6 kg/s with a velocity of 60 m/s and enthalpy of 950 kJ/kg and leaves the turbine at the velocity of 160 m/s and enthalpy of 420 kJ/kg. The loss of heat from the gases to the surrounding is 25kJ/kg. Determine the power output of the turbine. (2,3)

[2] Give schematic diagram with labelling, working principle and advantages and disadvantages of (a) Thermal Power Plant (b) Hydro Electric Power Plant. (5)

3[a] State Kelvin-Planck and Clausius statements of second law of thermodynamics and prove their equivalence of statements.

[b] A reversible heat Engine operates between two reservoirs at temperature of 873 K and 313 K. The heat transfer to the heat engine is 2000 kJ. Find the heat rejected to the sink, the work done by the engine and the Thermal Efficiency of the Carnot's Engine. (2.5, 2.5)

4[a] Draw the P-V and T-S diagram of the Diesel cycle and derive its efficiency in terms of Compression ratio.

[b] Draw the P-V and T-S diagram of the Otto cycle and Dual cycle with all notations. (3.5,1.5)

PTO

M17

5[a] State Newton's law of viscosity with units of measurement.

[b] An oil film of thickness 1.5 mm is used for lubrication between a square plate of size 0.9 m x0.9 m and an inclined plane having an angle of inclination 20 degree. The weight of the square is 392.4 N and it slides down the plate with a uniform velocity of 0.2 m/s. Find the dynamic viscosity of the oil. (1,4)

6[a] State and Prove Pascal's Law

[b] Derive an expression for the Pressure variation in a fluid at rest.

[c] Give Statement of Bernoulli's Theorem with their units. (2,2,1)

[7] The water is flowing through a pipe having diameters 20 cm and 15 cm at sections 1 and 2. The rate of flow through pipe is 40 litres per second. The section 1 is 6 m above datum line and section 2 is 3 m above datum line. If the pressure at section 1 is 29.43 N per square cm. Find the intensity of pressure at section 2. (5)

PART B

[1] Differentiate the following terms briefly

(a) Strength and hardness (b) Plain carbon steel and alloy steel (c) Runner and riser (d) Straight and reverse polarity (e) Line and end standards 5

[2] Define pattern. Discuss following patterns with neat sketches.

(a) Loose piece pattern (b) Match plate pattern 5

[3] Explain the principle of Resistance Seam welding with a neat sketch. Also discuss its advantages, disadvantages and applications. 5

[4] With a neat sketch of a column and knee type horizontal milling machine, discuss its important parts, working and applications. 5

[5] With the help of neat sketches discuss the following operations.

(a) Knurling (b) Facing (c) Gang milling (d) Tapping (e) Vertical shaping 5

[6] With neat sketches discuss the construction, working and applications of the following.

(a) Mechanical comparator (b) Vernier height gauge 5

[7] Write short notes on the following. (*ANY TWO*)

(a) Super alloys (b) SMAW (c) Sheet metal operations 5

END

Total no. of pages: 2 418 Roll. No. ----------

B.Tech. (1st SEMESTER)

ME101a: Computer Aided Engineering Graphics-I

END TERM EXAMINATION **November 2024**

Time: 03:00 Hours Max. Marks: 40

Note: Answer any five questions.
All questions carry equal marks.
Assume suitable missing data.

Q.1 A line AB is 75 mm long and it is 30° and 40° inclined to HP and VP respectively. End A is 12 mm above HP and 10 mm in front of VP. Draw the projections.

[8 Marks] [CO-1]

Q.2 A regular pentagonal prism of 25 mm long edges and axis 70 mm long rests on HP on one of its corner of the base. The slant edge passing through corner makes 45° with HP and the side opposite to the same corner makes 30° with VP. Draw its projections.

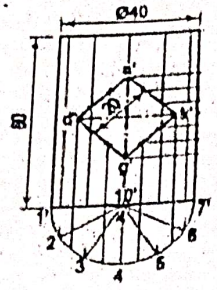
[8 Marks] [CO-3]

Q.3 A cone, 40 mm base diameter and 60 mm axis is standing on its base on horizontal plane (HP). It is cut by a section plane 45° inclined to horizontal plane (HP) through base end of end generator. Draw Front view (FV), sectional top.

[8 Marks] [CO-3]

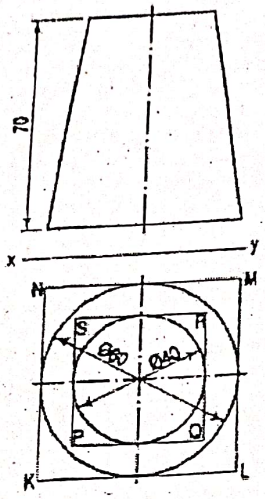
Q.4 Draw the development of the lateral surface of the cylinder having a square hole in it as shown in figure.

[8 Marks] [CO-3]



Q.5 Draw ISOMETRIC view of the frustum of the cone given below.

[8 Marks] [CO-4]



Q.6 Write steps in solving problem given in Q1 with the help of AutoCad.

[8 Marks] [CO-5, 6]

Q.7 Write steps in solving problem given in Q2 with the help of AutoCad.

[8 Marks] [CO-5, 6]

Total no. of pages: 02 420 Roll. No. ----------

B.Tech. (1st SEMESTER)
ME105 Computer Aided Engineering Graphics-II

END TERM EXAMINATION **November 2024**
Time: 03:00 Hours Max. Marks: 40

Note: Answer any five questions.
All questions carry equal marks.
Assume suitable missing data.

Q.1 A regular pentagon of 30 mm sides is resting on HP on one of its sides while its opposite vertex (corner) is 30 mm above HP. Draw projections when side in HP is 30° inclined to VP.
[8 Marks] [CO-2]

Q.2 A regular hexagonal prism of 30 mm sides and axis 80 mm long is resting on HP on one of its corners of the base. The axis makes 30° with HP and plan of the axis makes 45° with the VP. Draw its projections.
[8 Marks] [CO-3]

Q.3 A cylinder of 40 mm diameter, 60 mm height and having its axis vertical, is cut by a section plane, perpendicular to the VP, inclined at 45° to the HP and intersecting the axis 32 mm above the base. Draw its front view, sectional top view, sectional side view and true shape of the section.
[8 Marks] [CO-3]

Q.4 Draw the development of the lateral surface of the part P of the pentagonal pyramid shown in figure.

[8 Marks] [CO-3, 4]

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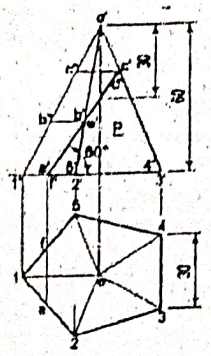
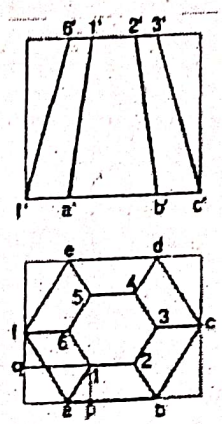


Q.5 Draw the isometric view of the frustum of the hexagonal pyramid shown in figure.

[8 Marks] [CO-4]



Q.6 Write steps in solving problem given in Q1 with the help of AutoCad.

[8 Marks] [CO-5, 6]

Q.7 Write steps in solving problem given in Q2 with the help of AutoCad.

[8 Marks] [CO-5, 6]

Roll No.....

Total No. Pages: 1 **B.Tech. (CE)**

FIRST SEMESTER **November 2024**

END SEMESTER EXAMINATION

ME 107: BASIC MECHANICAL ENGINEERING

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

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

1(a) Work and heat exchange during a non flow process are given by Q = 80dT J/K and W = 60dT J/K, where T is in K. Calculate the change in the energy of the system during a process in which temperature rises from 60^0C to 120^0C.

(b) State the SFEE in the differential form and show that the work done by the steam turbine is equal to the enthalpy difference of steam entering and leaving the turbine. (4,4) [CO1]

2(a) State and prove Clausius Inequality

(b) Two reversible heat engines A and B are arranged in series. Engine A rejects heat directly to B. Engine A receive 225 kJ at a temperature of 425^0C from the heat source while engine B is engine in communication with a cold sink at a temperature of 2^0C.If the work output of engine A is twice that of B. Determine:
(i) Intermediate temperature between A & B, (ii) efficiency of each engine, (iii) Heat rejected to the sink. (3,5) [CO2]

3(a) Define the following terms used in an air standard cycle of an I.C Engine.
(i) Compression ratio r (ii) Cut off ratio r_c, (iii) Pressure ratio r_p.

(b) In an air standard Otto cycle with a compression ratio of 10, initial volume of 400 cm^3 and temperature after the compression is 700 K with a maximum temperature of 2000 K. Determine the clearance volume, heat added, heat rejected, work done and thermal efficiency. (3,5) [CO3]

4(a) List the fundamental parts of Hydro Power Plant, and its advantages and disadvantages over thermal power plant.

(b) Name the different types of Nuclear reactor, explain anyone with a neat line diagram.- (4,4) [CO3]

5(a) Explain the term dynamic viscosity and derive its units. Distinguish between ideal and real fluid.

(b) A pipe of diameter 300mm carries water at a velocity of 30m/sec. The pressure at point A and B are given as 295k Pa and140Pa.respectively while the datum head at A and B are 30m and 42m. Determine loss of head between A and B. (4,4) [CO4]

6(a) Name the alloying elements used in steel and discuss in brief the effects of these alloying elements on steel. What is the composition of stainless steel and high carbon steel?

(b) Name the different types of cast iron, their compositions properties and uses. (4,4) [CO5]

7(a) What is brass and, what is bronze? Describe their composition and uses. How does lead and nickel affects the properties of copper base alloys?

(b) What is Super alloy, how are they classified. Give composition of a typical super alloy in each category. (4,4) [CO6]

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Total No. of Pages 02

THIRD SEMESTER

B.Tech. (ME)

END TERM EXAMINATION

November-2024

Paper Code : ME201n

Engineering Material and Metallurgy

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)	Draw Iron – carbon (Fe-C) diagram and mark all the phases and explain the reactions?	(6) (CO 4
Q.1(b)	Derive the equation for Gibb's phase rule.	(2) (CO 4
Q.2(a)	Explain the Griffith theory on brittle fracture and deduce an expression for the critical stress required to propagate a crack simultaneously in a brittle material?	(6) (CO 2
Q.2(b)	A material with a fracture toughness (σf) of 80 MPa$\sqrt{m}$ has a critical crack length of 0.05 mm. Calculate the surface energy (γ) of the material. Take E=120GPa.	(2) (CO 2
Q.3(a)	Write down any three methods for powder production in powder metallurgy. Write step involved in the production of cemented carbide tools.	(5) (CO 6
Q.3(b)	Discuss the processes of annealing and normalizing in terms of their effects on the microstructure of metallic materials.	(3) (CO 5
Q.4(a)	Discuss the three stages of a creep curve in detail. Draw a diagram and explain the mechanisms operating in each stage.	(4) (CO 1

Q.4(b) Draw Time temperature transformation diagram for eutectoid steel. Label the regions and products formed on this diagram. (4) (C

Q.5(a) Write down the procedure to calculate miller indices in cubic crystals and HCP crystal. Give examples of each? (5) (C

Q.5(b) Calculate the number of vacancies in copper at room temperature of 200C. Assume Boltzman constant, $K=8.62x10^{-5}$ ev/atom-k, Ed=0.9Ev/atom at room temperature, density of copper is 8.94g/cc at 200C and atomic weight of copper is 63.55g/mol. (3) (C

Q.6(a) Discuss the reinforcement materials commonly used in polymer matrix composites and explain how their properties contribute to the overall performance of the composite. (6) (C

Q.6(b) Write down the composition, properties and applications of Duralumin and Brass alloy. (2) (C

Total No. of Pages 1
THIRD SEMESTER
END SEM EXAMINATION

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Roll No. ....
B.Tech.(ME).
Nov 2024

ME-201 MECHANICS OF SOLIDS

Max Marks : 40

Time: 3 hrs

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

1(a) For the bar shown in Fig. 1, find the change in length when E = 210 G Pa. Find the strain energy stored in the bar. 4 [1#] [2#]

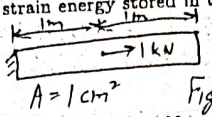


Fig.1

Cross-sectional area of each wire = 5 cm²

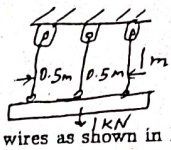
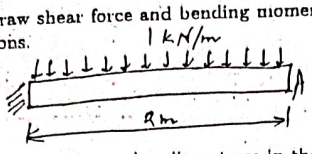


Fig.2

(b) If a load of 1 kN is applied to a rigid bar suspended by three wires as shown in Fig. 2, what force will be resisted by each wire? The outside wires are aluminum (E=70 GPa). The inside wire is steel (E=210 GPa). Initially there is no slack in the wire. The rigid bar stays horizontal. What is the downward displacement of the bar? 4 [#1] [2#]

2(a)Draw shear force and bending moment diagrams for the beam shown in Fig.3. Find reactions. 4 [2#] [1#]



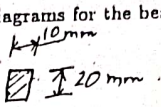


Fig. 3

2(b) Find maximum bending stress in the beam in Q 2(a). Find equation of deflection curve of the beam. What is rotation and diflection at end A ? 4 [4#] [2#]

3(a) Derive expression for bulk modulus in terms of Young's modulus and Poisson's ratio. 4 [1#] [1#]

3(b) A plane element is subjected to the stresses σ_{xx}=5 MPa, σ_{yy}=10 MPa, σ_{xy}=5 MPa. Find principal stresses and maximum shear stress existing in the element and show the planes on which they act. 4 [3#] [3#]

4(a) Find maximum shear stress and twist per unit length for a torque of 10 kNm for a solid circular rod of radius 10 cm. Find corresponding principal stresses and principal planes. 4 [4#] [2#]

4(b) A pin-ended strut of aluminum (E=80 GPa) with length 3m is constructed of a circular tubing with outside diameter 100 mm and thickness 10 mm. Determine the Euler buckling load. 4 [5#] [4#]

5(a) Find radial and tangential stresses at inner and outer radii in a thick cylinder of outer radius 0.5m and thickness 0.1m for an internal pressure 5 MPa. Find radial and tangential strains. Find dilation of the cylinder. 4 [6#] [4#]

5(b) Derive Euler's buckling load for a column with pinned ends. 4 [5#] [1#]

6 Write short notes on any two: 8 [3#] [1#]
(a) Stress-strain diagram of mild steel
(b) Theory of bending
(c) Theory of torsion

No. of pages 2 Roll No. _____

3rd SEMESTER **B.Tech. (Mechanical Engg.)**

Back Paper (old scheme)

END TERM EXAMINATION ***Nov-2024***

COURSE CODE: ME 203 COURSE TITLE: Thermal Engg. - I

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

Note : Attempt any FIVE questions. Assume suitable missing data, if any. Use of steam tables and Mollier charts (steam charts) are allowed to solve problems.

1. (a) What is the quality of steam? How quality of steam is measured by using separating and throttling calorimeter. Explain with the help of figure. [4 marks][CO#1] [BTL1]
   (b) Derive Maxwell's equations and Tds equations. [4 marks][CO#1] [BTL2]

2. (a) Give the flow and T-s diagrams of the ideal regenerative cycle. Why is the efficiency of this cycle equal to Carnot efficiency? Why is this cycle not practical? [4 marks][CO#2] [BTL2]
   (b) Steam at 20 bar and 350 ^{0}C is supplied to a steam turbine. After expansion to 2 bar pressure, part of steam is bled out and sent for heating in open type feed water heater. The rest of the steam is expanded to condenser pressure of 0.04 bar. Find the thermal efficiency of this regenerative cycle. Represent the cycle in flow and h-s diagrams. [4 marks][CO#2] [BTL3]

3. (a) Explain the effect of area change in steam flow through nozzles. [4 marks][CO#3] [BTL4]
   (b) The inlet condition to a steam nozzle are 10 bar and 250 ^{0}C. The exit pressure is 2 bar. Assuming isentropic expansion and negligible inlet velocity, determine the throat area, exit velocity and area of the nozzle. [4 marks][CO#3] [BTL5]

Cont.....Page 2

4. (a) Show that the diagram work per unit mass of steam for maximum blading efficiency of a 50% reaction stage is V_b^2, where V_b is the blade velocity. [4 marks][CO#4] [BTL6]
   (b) In a single stage reaction (Parson's) reaction turbine, the mean diameter of the rotor is 1.4 m. The speed ratio is 0.7. The rotor speed is 3000 r.p.m. Determine the blade inlet angle if the blade outlet angle is 20°. Also, find the diagram efficiency. [4 marks][CO#4] [BTL3]

5. (a) What is circulation in boiler, explain. What are the differences between natural and forced circulation? What is circulation ratio? [4 marks][CO#5] [BTL1]
   (b) What are the functions of the steam drum in a water tube boiler? What are drum internals, explain. Why are they required? [4 marks][CO#5] [BTL2]

6. (a) What are the functions of a condenser in a steam power plant? What is surface condenser? Why is an air-cooling section provided in the condenser? Explain with diagram. [4 marks][CO#6] [BTL4]
   (b) What is the function of a cooling tower? What are the different types of cooling towers? Explain. Define approach, range and cooling efficiency. [4 marks][CO#6] [BTL5]

7. Write short notes on any TWO of the following: [8 marks][CO#3,4,2,1] [BTL1]
   (a) Compounding of turbines
   (b) Boiler performance
   (c) Super-saturated flow through nozzle
   (d) Compressibility chart

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

III SEMESTER

B.Tech. (Mechanical Engineering)

END TERM EXAMINATION November-2024

ME205 Fluid Mechanics & Hydraulic Machines

Time: 3 Hours Max. Marks : 40

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

Q-1(a): Prove that in an immersed plane surface, the centre of pressure is always below its centre of gravity [Marks.3][CO-1]

(b) What is manometer. Classify U tube & manometers along with utility. Also describe a differential manometer. [Marks. 2] [CO-1]

(c) Derive analytically and experimentally Meta centric height [Marks.3][CO-1]

Q-2(a):What are the difference between a laminar flow and a turbulent flow and what are the limiting values of Reynold number for each. Analyze the laminar flow between two parallel fixed plates in respect of shear stress, velocity distribution. [Marks.3][CO-3]

(b) Derive the expression for the loss of head in the case of Laminar flow in a pipe [Marks.3][CO-3]

(c) What is a viscometer. What are its different types. Explain the working of any one [Marks.2][CO-3]

Q-3(a) Derived the three dimensional Euler equations. How their related to Bernoulli equations. [Marks.3][CO-2]

(b) What are the advantage of using Bukingham pi theorm . What are the limitation of Rayleigh number. Derive the expression of head loss due to friction in the pipe [Marks.3][CO-2]

(c) what are the methods for separating boundary layer in laminar and turbulent flow [Marks.2][CO-4]

Q-4(a) A collar bearing has external and internal diameters of 100mm and 50mm respectively. The film of oil between the collar surface and bearing is 0.5 mm thick and has coefficient of viscosity as 1.5 poise. Find the power required to overcome the viscous resistance, when shaft rotates at 600rpm .[Marks. 3][CO-3]

(b) Prove that the force of impact of water jet on semi-circular vane is twice of the force on a flat plate. [Marks. 2] [CO-5]

(c) A jet of water impinges upon a series of moving plates tangentially, with a velocity of 50m/sec, resulting in the movement of the plates at a speed of 12m/sec. Find (i) the work done per kg of water/sec (ii) efficiency of plates.(iii) what should be speed of the vanes so that the efficiency may be maximum. Determine its value also. [Marks. 5] [CO-5]

Q-5. (a) In the two dimensional incompressible flow in the x-y plane, stream function is 3xy. show that flow is irrotational and also find out its the corresponding velocity potential [Marks. 4] [CO-2]

(b)What are the considerations/factors on the basis on which hydraulic/fluid machines are classified. Also derive the expression for Euler energy transfer equation and prove that Total energy transfer is the sum of all (three) kinetic energy terms. [Marks.4][CO-6]

or

Explain the utility of following terms with physical significance
(i)Unit speed (ii) Unit discharge (iii) Unit power (iv) specific speed
(v) degree of reaction, (vi) Hydraulic efficiency(vii) speed Ratio (viii) Flow ratio
[Marks.4][CO-6]

(b). Differentiate between fixed-order quantity models and fixed-time period models in inventory management.
Explain the advantages and limitations of each model, and provide scenarios in which each model would be most applicable. Additionally, discuss how these models help manage demand variability.

(c). A company needs to manage the inventory of a product with an annual demand of 10,000 units. The ordering cost per order is ₹500, and the holding cost per unit per year is ₹10.
Using the Economic Order Quantity (EOQ) model, calculate:

- The optimal order quantity.
- The total number of orders required per year.
- The total annual inventory cost.

Q7. Write the short notes on the following:

(a) Flow Charts

(b) Quantitative forecasting

(c) Under stocking

(d) Centroid Method

(e) ABC analysis

(f) Therbligs

Total no. of Pages:03 *Roll no.....*

THIRD SEMESTER **B.Tech.**

END TERM EXAMINATION ***Nov-2024***

ME 207: Industrial Engineering

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

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

Q1.

(a) What are the key differences between total productivity and partial productivity measurement?

(b) How can lean manufacturing principles improve productivity in a production system?

(c) The data for output produced and inputs consumed for a particular type of a manufacturing organisations are given below in constant money value. Find out the partial, total factor and total productivity values.
Output = Rs 3000.00, Labour input = Rs 600.00, Material input = Rs 300.00
Capital input = Rs 800.00, Energy input = Rs 150.00, Other expenses input = Rs 75.00

Q2.

(a) Explain Product Design and Development process.
(b) Discuss about the Product Life Cycle with an Example.
(c) A factory produces a specialised part for the automotive industry. Initially, it takes an operator 10 hours to complete the first unit. The production process follows a learning curve where the time required to produce each unit decreases by 20% every time the cumulative output doubles.

- Calculate the time required to produce the 8th unit.
- Determine the total time taken to produce the first 8 units

Q3.

(a) What are the primary factors affecting facility location decisions? Explain how factorslike proximity to market, supply chain integration, labour availability, and cost influence facility location choices for a manufacturing organisation.

(b) Compare and contrast the different types of facility layout designs.Describe the characteristics, advantages, and limitations of product layout, process layout, and fixed-position layout. When would each type be most appropriate for a production system?

(c) A company wants to set up a new facility to minimize transportation costs based on the location of its main clients. The location coordinates of three clients and their respective demand loads are:

Client A: Coordinates (2, 3), Demand = 50 units
Client B: Coordinates (5, 7), Demand = 70 units
Client C: Coordinates (1, 4), Demand = 30 units

Using the centroid method, calculate the optimal facility location based on these demand-weighted coordinates.

Q4.

(a) Explain Taylor's Scientific Management principles and how they contribute to the field of Work System Design. How did Gilbreth's contributions to motion study and ergonomics further develop these concepts?

(b) Discuss the importance of method study, micro-motion study, and the principles of motion economy in enhancing workplace efficiency. How do these concepts interrelate with work measurement techniques such as work sampling and standard data?

(c) A stopwatch time study was conducted for a specific task, and the following times (in seconds) were recorded over five cycles: 45, 50, 47, 52, and 49 seconds. Calculate the average cycle time and determine the standard time if an allowance factor of 15% is applied.

Q5.

(a) Differentiate between qualitative and quantitative forecasting methods.

1. Describe the primary characteristics of each approach.
2. Identify scenarios where each method is most appropriately applied.

(b) Explain the use of time series models and regression models in demand forecasting.

1. Compare the advantages and limitations of time series and regression models.
2. Discuss how each model can influence the accuracy of demand predictions. Differentiate between qualitative and quantitative forecasting methods.

(c) A retail store wants to forecast its monthly sales for the next month based on the last four months' sales data (in units):

Month	Sales (Units)
1	120
2	150
3	130
4	160

- Calculate the forecast for the 5th month using the moving average method with a 3-month window.
- If the actual sales for the 5th month turn out to be 155 units, calculate the Mean Absolute Error (MAE) based on the forecast you derived for Month 5.

Q6.

(a) Why is inventory management crucial for industrial operations, and what are the potential impacts of understocking and overstocking on a business?

Discuss how effective inventory management affects operational efficiency, customer satisfaction, and cost control. Provide examples of risks associated with understocking and overstocking.

Total no. of pages: 2

THIRD SEMESTER **B. Tech (ME)**

END SEMESTER EXAMINATION 432 **NOV.-2024**

ME-207 ENGINEERING ANALYSIS AND DESIGN

Time: 3 Hours Max. Marks: 40

Note: Attempt any five questions.
Use of statistical table is permitted.
Assume missing data , if any

1 (a) What do you understand by measure of dispersion? Describe skewness and kurtosis with neat sketch. 4[CO1]

(b) Calculate first four moments for the following frequency distribution about the mean. Also comment upon nature of frequency distribution. 4[CO3]

X	-4	-3	-2	-1	0	1	2	3	4
f	3	4	5	7	12	7	5	4	3

2 (a) Briefly discuss about Poisson distribution. Find mean and variance of Poisson distribution. 4[CO2]

(b) An electric firm manufactures light bulbs that have a life, before burn-out, that is normally distributed with a mean 800 hours and standard deviation of 40 hours. Find the probability that a bulb burns between 778 and 834 hours. 4[CO3]

3 (a) Define random variable. Briefly discuss about probability distribution function of a random variable. State its important properties. 4[CO1]

(b) The possible value of random variable x of X and their probabilities are

X	0	1	3
P(X=x)	1/3	½	1/6

Find cumulative distribution function (cdf). 4[CO2]

4 (a) what do you understand by theory of failure? Describe maximum principal stress theory. 4[CO1]

(b) A machine is subjected to following stresses: $\sigma_x = 60$ MPa, $\sigma_y = 45$ MPa, $\tau_{xy} = 30$ MPa. Find the factor of safety if it is made of C45 steel having yield stress 353 MPa, using maximum principal stress theory. 4[CO4]

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5. Find initial basic feasible solution of the following transportation by Vogel's approximation method. Then find optimal solution. 8[CO5]

Factory/warehouse	W1	W2	W3	W4	Capacity
F1	19	30	50	10	7
F2	70	30	40	60	9
F3	40	8	70	20	18
Demand	5	8	7	14	

6. Write short notes on any four of the following: 8[CO1]

(a) Hypothesis
(b) Binomial distribution
(c) Report writing
(d) Computer Aided Engineering Analysis
(e) Finite element analysis
(f) Engineering ethics

Total no. of Pages: 03 *Roll no.....*

THIRD SEMESTER

B.Tech.

END TERM EXAMINATION ***Nov-2024***

ME261 _Theory of Machines

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

Note : All questions carry equal marks.
Question one is compulsory and attempt any four from the rest questions
Assume suitable missing data, if any.

Q.1 Attempt any four of the following:

[a] Enumerate the comparison of the functions and properties of mechanical governor and flywheel. [2][CO1][BTL1]

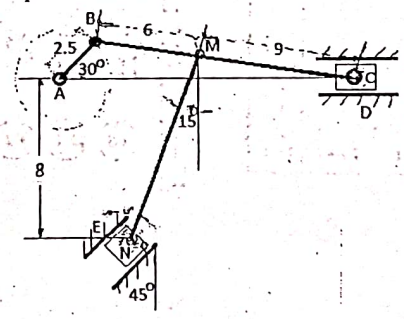
[b] State and derive the law of gearing. [2][CO1][BTL1]

[c] Describe the static and dynamic balancing with the help of examples. [2][CO1][BTL1]

[d] Describe kinematic chain and write the inversions of 2R2P-chain. [2][CO1][BTL1]

[e] Differentiate between primary and secondary unbalance forces in single slider reciprocating I C Engines [2][CO1][BTL1]

Q.2 Draw velocity and acceleration diagram for the mechanism given in figure below, all the dimensions are in centimetres. The crank rotates with 200 rpm CW and makes 30° with the IDC. Also determine the velocity and acceleration of slider C with respect to another slider N.



[8][CO2,3][BTL4]

Q.3 Attempt any two of the following:

i) 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][CO2, 4][BTL5]

ii) Explain the Hunting and its effect on prime mover by the mechanical governor. [4][CO3, 4][BTL5]

iii) Discuss gyroscopic effect on movement of naval ship during steering, pitching and rolling and also state the reason for pithing being dangerous then rolling. [4][CO2, 4][BTL5]

Q.4 Attempt any two of the following:

i) Describe Tractive force, swaying couple and hammer blow with all the necessary condition in 2-cylinder, 90° crank, inline, uncoupled locomotive engine. [4][CO3, 4][BTL4]

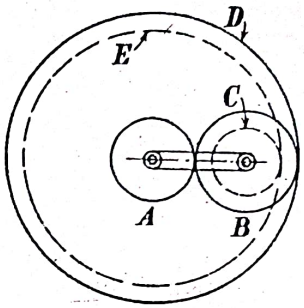
ii) Differentiate among over, under and critical damped vibration with the help of neat diagram and examples. Also describe transmissibility and isolation terms in mechanical vibration. [4][CO2, 4][BTL5]

iii) Explain with the help of neat vector representation the stability of 4-wheel vehicle including various forces apart from Gyroscopic couple. [4][CO2, 4][BTL5]

Q.5 i) Describe the whirling speed of the rotating shafts and the reasons for rotating speed generally kept more than critical speed of the shaft. [4][CO2][BTL6]

ii) The following data refers to a vibratory system with viscous damping. Mass 2.0 kg, spring constant 3N/mm and the amplitude decreases to 0.25 of the initial value after five consecutive cycles. Determine the damping coefficient of the damper in the system. [4][CO3][BTL6]

Q.6 Figure 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 16 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 1000 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 120 Nm. [8][CO5,6][BTL6]



Figure

Q.7 Draw the displacement curve and cam profile for the roller follower having radius 12mm to attain the following specification of cam-follower mechanism.

The base circle of cam has radius 24 mm and lift of follower is 20 mm.

The upward motion of follower is with simple harmonic motion of 120° cam rotation.

The dwell period at tot most position is 30°.

The return motion of follower is with uniform acceleration and retardation for 90° of cam rotation. [8][CO6][BTL6]

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Total No. of Pages- 3

Roll No. .....

Vth SEMESTER

B.Tech. [Mech.]

END SEMESTER EXAMINATION

NOV.-2024

ME301: Fluid Systems

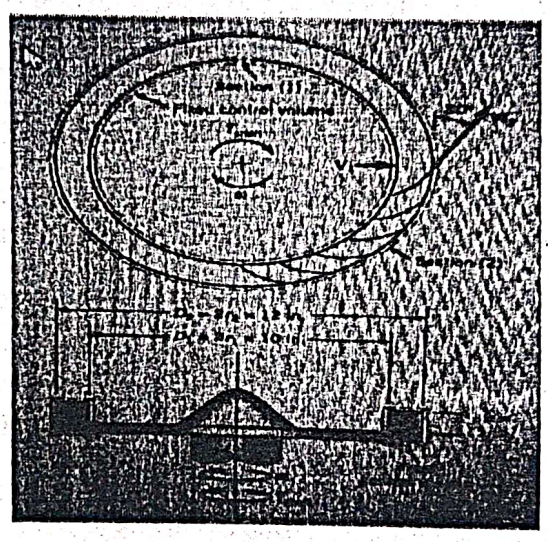
Time: 3:00 Hours

Max. Marks : 40

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

Q.1[a] An air fan has a bladed rotor of 12-in. (30 cm) outside diameter and 10-in (25 cm). inside diameter as illustrated in Fig. The height of each rotor blade is constant at 1 in. (2.5 cm) from blade inlet to outlet. The flowrate is steady, on a time average basis, at 6.5 m^3/min and the absolute velocity of the air at blade inlet, V_1, is radial. The blade discharge angle is 30^0 from the tangential direction. The rotor rotates at a constant speed of 1725 rpm. Estimate the power required to run the fan. Density of air is 1.2 kg/m^3.

[CO2]



[b] A pump is to deliver water from a tank against a total static head of 40 m. The details of suction and delivery pipes are as follows; Suction pipe Length = 5 m,Dia =25 cm, Friction factor f = 0.022 and Delivery pipe Length = 1600 m, Dia =20 cm,Friction factor f = 0.025 The pump characteristic is given by the equation H = 100 – 6000 Q^2 where H = total pump head in metres and Q = discharge in m3 /s. Assuming an efficiency of 0.80, calculate the operating head, operating discharge and power required by the pump. [Neglect minor losses]. [CO3]

Q.2

[a] Following are the details of a 1 : 5 scale model of a large pump: Power supplied = 10 kW, Head developed = 6 m, Speed = 1000 rpm and Efficiency = 0.85. Estimate the prototype speed, power required, discharge by considering the prototype head as 36 m and assuming the efficiency to remain the same as that of the model.

(CO4)

[b] At a site on a river, the power potential is 225 MW under a net head of 15 m. It is desired to operate the turbines at a speed of 60 rpm. Two choices of turbines, as follows, are available: (a) Francis turbine having specific speed not exceeding 300 (b) Kaplan turbine having specific speed not exceeding 600 (i) How many units of each type, all of same size, would be required? (ii) The atmospheric pressure is 9.9 m (abs) and vapour pressure head is 0.30 m. Calculate the maximum draft head in each case. The critical Thoma number can be taken as 0.36 for Francis turbine and 0.73 m for Kaplan turbine

(CO3)

Q.3[a] A centrifugal pump impeller is 40 cm in outer diameter and 2.5 cm wide at the exit. Its blade angle at the outlet is 30^0. When run at a speed of 1500 rpm, the flow rate though the pump is 80 liters/s. (i) Calculate the radial, relative and absolute velocities at the impeller exit. (ii) If there is no inlet whirl, what would be the theoretical head added to the water by the impeller? (CO4)

[b] A single acting reciprocating pump having a cylinder diameter of 150 mm and stroke of 300 mm is used to raise the water through a height of 20 m. Its crank rotates at 60 rpm. Find the theoretical power required to run the pump and the theoretical discharge. If actual discharge is 5 litres/s, find the percentage slip. If delivery pipe is 100 mm in diameter and is 15 m long, find the acceleration head at the beginning of the stroke. (CO5)

Q.4

[a] Explain how to deal nonlinearity in CFD with suitable example.

(CO6)

[b] Following the steps to convert the differential equation into a difference equation , solve $\frac{du}{dx} + u = x^2$ $0 \le x \le 1$ $u(0) = 2$ for N = 3 and compare to the exact solution

$$u_{exact} = x^2 - 2x + 2$$

(CO6)

Q.5 Write notes on the following.

(CO5)

(i) Surge tank and water hammer
(ii) Advantages of air vessels in reciprocating pump
(iii) Priming of centrifugal pump
(iv) Fluid coupling

Q.6

(CO5)

(i) Briefly explain Hydraulic Accumulator and Intensifier with diagram. (2)

(ii) Derive an expression for condition of maximum fluid power transmission through pipe. (3)

(iii) Derive an expression for the head lost due to friction in the delivery pipe of a reciprocating pump, with and without an air vessel. (3)

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

SIXTH_SEMESTER B.Tech.(Mechanical)

END TERM EXAMINATION *Nov-2024*

COURSE CODE: ME 303 TITLE: Dynamics of Machines

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

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

Q.1A. Explain the function of a flywheel and the function of a Governor and their functional differences with respect to a Steam Engine. [M4][CO1][BTL 2]

B. The controlling force in a spring loaded Governor is observed to be 1750N when the radius of rotation is 190 mm and 825 N when the radius of rotation is 140 mm. The mass of each ball is 5 kg. If the controlling force is a straight line, then find:

i. Controlling force when the radius of rotation is 175 mm.
ii. The speed of the Governor at 175 mm radius of rotation.
iii. Increase in initial tension so that the Governor is Isochronous
iv. Isochronous speed. [M4][CO2][BTL5]

Q.2 A. With suitable diagram explain the Gyroscopic effect on a Naval Ship. [M4][CO3][BTL2]

B. The weight of a motor cycle along with it rider is 210 kg. The height of the centre of gravity from the ground may be taken as 0.65 m when the vehicle is moving straight. Each wheel has a radius of 0.30 m. Mass moment of inertia of each wheel is 1.8 kg-m^2 and that of the engine is 0.24 kg-m^2. Assume that the engine rotates 6 times the speed of the wheel and in the same direction. Determine the angle of heel made by the motor cycle, when the speed is 120 kmph and the radius of rotation as 150 m. [M4][CO3][BTL4]

Q.3 A. A shaft carries four masses A,B,C and D which are under complete balancing. The masses B,C and D are respectively 45 kg, 75 kg and 65 kg respectively. The masses C and D make an angle of 85° and 190° respectively from the mass B in the same sense. The masses A,B,C and D are concentrated at radius of 70 mm, 110 mm, 60 mm and 85 mm respectively. The plane of rotation of masses B and C are 300 mm apart. Determine:

i. The mass A and its angular position ii. The position of A and D [M4][CO4][BTL3]

B. The cranks of two cylinder, uncoupled inside cylinder locomotive are at right angle and are 300 mm long. The cylinder centre lines are having a pitch of 600 mm. The rotating mass of each cylinder is 60 kg and the reciprocating mass is 120 kg. The wheel centre lines are 1200 mm apart. The balancing masses are kept on the centre line of each wheel at a radius of rotation of 400 mm. It is proposed to balance complete rotating masses and 2/3 of the reciprocating masses. Find:

i. The magnitude and direction of the balancing masses.
ii. Magnitude of hammer blow.
iii. Variation in tractive effort and
iv. Swaying couple at a crank speed of 360 rpm. [M4][CO4][BTL3]

Q.4 A machine of mass 6 kg is placed on a spring dashpot system. The spring stiffness may be assumed to be 6 N/mm and the damping coefficient to be 0.08 N/mm/sec. The system is initially at rest and a velocity of 120 mm/sec is imparted on the mass. Determine :

i. The displacement and velocity of mass as a function of time and
ii. The displacement and velocity after 1.5 seconds. [M8][CO5][BTL5]

Q.5 A reciprocating I C engine is coupled to a centrifugal pump through a pair of gears. The shaft from the flywheel of the engine to the gear wheel has 50 mm diameter and 1.2 m long. The shaft from the pinion to the pump is 900 mm long and has a diameter of 30 mm. The pump speed is 3 times the engine speed. The moment of inertia of the flywheel, gear wheel, pinion and the pump are respectively 320 kg-m^2, 6 kg-m^2, 3 kg-m^2 and 12 kg-m^2 respectively. If the modulus of rigidity of the shaft material is 80 GN/m^2. Find the natural frequency of torsional vibrating system. [M4][CO5][BTL3]

Q.6 Answer any two of the following questions. [M8][CO1][BTL2]

i. Importance of tribology in IC engines.
ii. Vibration Isolation and transmissibility.
iii. Turning moment diagrams for an IC engines.
iv. Whirling speed of shafts.

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(b) State the essential elements of a hydroelectric power plant. Give the classification of hydroelectric plants according to head. (5 marks)[CO#2,3]

5. (a) What are the different methods of controlling the superheat steam temperature? Explain with diagram any two methods. (5 marks)[CO#3,4]
(b) Explain with schematic diagram, combustion control in the furnace. (5 marks)[CO#3]

6. (a) Discuss the air pollution from coal based thermal power plants. (5 marks)[CO#3,4]
(b) How is the load–duration curve constructed? Explain the significance of the same. (5 marks)[CO#5]

7. Write short notes on any TWO
(a) Electrostatic precipitator (ESP)
(b) Super heaters
(c) Energy audit
(d) Combined cycle gas turbine power plant
(10 marks)[CO#2,3]

Total no. of pages :2 Roll No._____

FIFTH SEMESTER B.Tech (*Elective Subject*)

END SEMESTER EXAMINATION NOVEMBER 2024

ME-351a POWER PLANT ENGINEERING

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

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

1. (a) Briefly explain coal beneficiation processes. Also mention its advantages. (5 marks)[CO#2]
(b) Describe the fuel handling system in a power plant with the help of flow chart. (5 marks)[CO#1,2]

2. (a) What is meant by pulverized coal. Explain with flow diagram pulverized fuel firing system of coal. (5 marks)[CO#1,2,3]
(b) Describe fluidized bed combustion boiler with diagram and write their advantages and disadvantages. (5 marks)[CO#3,4]

3. (a) With the help of schematic and T-s diagrams, explain the binary vapour power cycle. (5 marks)[CO# 3]
(b) Describe the magnetohydrodynamic (MHD) combined cycle power plant with diagram. (5 marks)[CO# 3,4]

4. (a) Explain with diagram, the working of pressurized water reactor (PWR). What is the function of pressurizer. (5 marks)[CO#3,4]

Cont.....Page 2

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Total No. Pages 02

Roll no.....

Vth & VIIth SEMESTER

[B.Tech.]

END TERM EXAMINATION *November-2024*

ME-353 **Renewable Sources of Energy (Elective)**

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

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

Q.1a) What do you mean by primary and secondary energy sources? Distinguish between renewable and non-renewable energy sources. [5] [CO1]

Q.1b) What are the various **Energy Storage** methods? Explain the importance of **Phase change materials** in Energy storage. [5][CO1]

Q.2a) Calculate the Local Apparent Time (LAT or Solar Time) and declination at location of Latitude (24°20' N) and Longitude (77°30' E) at 12:30 (IST or standard time) on 24th July. Equation of time(E) = -1' 06'' (or minus 1 minute & 6 seconds) and standard Longitude is 82° 30' E. [5][CO2]

Q.2 b) With the help of neat sketch, explain the working principle of the **Central Tower Receiver.** [5][CO2]

Q3 a) Explain the I-V characteristics of solar cell. Also define, **maximum efficiency** and **fill factor** of solar cell. [5][CO3]

Q3 b) With the help of suitable schematic diagram, explain the meaning of **solar cell, module, Array,** and **Array field.**

A solar cell (0.9cm^2) receives solar radiation with photons of 1.8eV energy having an intensity of 0.0009 W/cm^2. Measurements show open-circuit voltage of 0.6V/cm^2, short-circuit current of 0.01 Ampere/ cm^2, and the maximum current is 50% of the short-circuit current. The efficiency of cell is 25%. Calculate the maximum voltage that the cell can give and find the "fill factor". [2+3][CO3]

Q.4 a) With the help of suitable diagram, explain the meaning of terms: **wind shear, gradient height, free atmosphere, planetary boundary layer, surface layer, Ekman layer** [5][CO3]

Q.4 b) A propeller type wind turbine has following data: Speed of free wind (at a height of 10 m) = 12 m/s, Air density = 1.226 kg/m^3, α= 0.14, Height of tower = 100 m, Diameter of rotor = 80 m, Wind velocity at the turbine reduces by 20%,

Generator efficiency = 85%, Find:(i) Total power available in wind, (ii) Power extracted by the turbine, (iii) Electrical power generated [5][CO3]

Q5 a) Explain the meaning of Biomass gasification and classify the biogas Gasifiers. With the help of suitable diagram, explain the working principle of **Fluidized bed biomass gasification plant.** [5] [CO4]

Q5 b) Discuss the origin and distribution of Geothermal energy with its merits and demerits. [5][CO4]

Q6 a) With the help of schematic diagram, explain the working of **Open cycle Ocean Thermal Energy Conversion Technology (OTEC) plant.** [5][CO4]

Q6 b) With the help of suitable schematic diagram, explain the working principle **Polymer Electrolytic Membrane Fuel Cell (PEMFC).** [5][CO5]

Q7) Write short notes on ***any two***:

i) Magneto hydrodynamic (MHD) power generator
ii) Thermoelectric Power Generator
iii) Lithium–Ion Battery (LIB)
iv) Hydrogen Storage

[5*2=10][CO5]

Total no. of Pages: 02 442 Roll no.....

V SEMESTER B.Tech.

END TERM EXAMINATION Nov/Dec-2024

ME 355a THERMAL SYSTEMS

Time: 03:00 Hours Max. Marks: 50

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

Q.1 (a) Draw and label the phase equilibrium diagram of a pure substance on a T-S (Temperature-Entropy) plot, clearly indicating the saturation lines and constant property lines such as pressure and specific volume. Explain the significance of each region in the diagram. [5][CO1][BTL3]

Q.1 (b) Compare the functions of a throttling calorimeter and a combined separating & throttling calorimeter. [5][CO1][BTL4]

Q.2 Identify the basic components of a steam power plant and explain their functions briefly. Additionally, derive the thermal efficiency expression for the Rankine cycle. [10][CO2][BTL2,3]

OR

Q.2 Explain the impact of the following modifications on the efficiency of the Rankine cycle: - [10][CO2][BTL2,4]

(a) Superheating

(b) Reheating

(c) Increasing boiler pressure

Q.3 (a) Describe the function of boiler mountings and accessories with examples. [5][CO3][BTL1]

Q.3 (b) Propose a strategy to improve boiler efficiency by modifying its circulation system. [5][CO3][BTL6]

OR

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Q.3 (b) Calculate the height of chimney required to produce a draugl equivalent to 1.7 cm of water if the flue gas temperature is 270°C ar ambient temperature is 22°C and minimum amount of air per kg of fuel 17 kg. [5][CO3][BTL6

Q.4 Classify the types of steam nozzles and explain each with the help neat diagrams. Additionally, derive the equation for the discharge throug a nozzle. [10][CO4][BTL2,3]

OR

Q.4 Convergent-divergent nozzle receives steam at 7 bar and 200°C ar expands it isotopically to 3 bar. Neglect the inlet velocity, and calculate th exit area required for a mass flow rate of 0.1 kg/s (i) when flow is equilibrium throughout, (ii) when the flow is supersaturated with pv1.3 constant. Given that h_1=2846 kJ/kg, h_2 = 2682 kJ/kg, x_2 = 0.98, v_{g2} 0.6057 m^3/kg. [10][CO4][BTL2,3]

Q.5 (a) Compare impulse and reaction turbines in terms of efficiency ar applications. [5][CO5][BTL4]

Q.5 (b) Steam expands isentropically in a simple impulse turbine from bar, 250°C with an enthalpy of 2935 kJ/kg to an enthalpy of 2584 kJ/kg 0.1 bar. The nozzle makes 20° with blade motion and the blades a symmetrical. Calculate the blade velocity that produces maximu efficiency for a turbine speed of 3600 rpm. Assume that the steam ente the nozzle with negligible velocity. [5][CO5][BTL3]

Q.6 (a) List the types of condensers and their working principles. [5][CO6][BTL1]

Q.6 (b) Describe the functions of cooling towers in power plants. [5][CO6][BTL2]

Total No. of Pages _03 *Roll No.....*

5th SEMESTER **Course: B.Tech.(ME)**

END SEMESTER EXAMINATION ***NOV-2024***

ME-361, Industrial Engineering

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

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

1.(a) A factory is producing two products A and B by using either of two materials X or Y. Product 1 is expected to be sold at Rs. 80 per unit and product 2 at Rs. 30 per unit. The operating data are as follows:

	Material X	**Material Y**
Output A	200 units	400 units
Output B	300 units	200 units
Quantity of raw material usage	1,000 Kg	1,000 Kg
Labour usage	300 man hrs.	250 man hrs.
Electric energy consumption	1000 KWhr	1500 KWhr
Cost of raw material/Kg	Rs. 30	Rs. 30
Labour per man hour	Rs. 5	Rs. 5
Electrical energy/KWhr	Rs. 1.5	Rs.1.5

Compare the productivity of material, labour and electrical energy in using materials X and Y. Also, Comment on the relative advantage of using either of the materials.

[6][CO1][L5]

(b) Discuss the job order production system. Differentiate the terms make to stock, make to order, and assemble to order with suitable examples. **[4][CO4][L2]**

2. (a) Discuss the importance and steps of of work sampling. How is it different from time study using time measuring device? **[4][CO3][L2]**

(b) The observed times and the performance ratings for the five elements of a Job are given below. Compute the standard time assuming rest and personal allowance as 15% and contingency allowance as 2% of the normal time.

Job Element	1	2	3	4	5
Observed time (min)	0.2	0.08	0.50	0.12	0.10
Performance rating (in %)	85	80	90	85	80

[6][CO3][L3]

3. (a) What do you mean by control charts for variables and attributes? Discuss the limitations of control charts for variables. **[4][CO4][L2]**

(b) Inspection results of CFL produced by a company in a month of 25 working days are shown in the following Table. The daily production rate is 200 CFLs. Find the control limits using control charts for defectives. **[6][CO4][L3]**

Subgroup number	Number inspected	Number defective	Subgroup number	Number inspected	Number defective
1	200	9	14	200	2
2	200	2	15	200	1
3	200	7	16	200	4
4	200	3	17	200	5
5	200	0	18	200	6
6	200	5	19	200	12
7	200	5	20	200	1
8	200	1	21	200	4
9	200	6	22	200	5
10	200	8	23	200	3
11	200	2	24	200	2
12	200	8	25	200	2
13	200	7			

4. (a) Define the term reliability. Discuss the use of Bath-tub curve used to explain the failure of items. **[4][CO5][L1]**

(b) A component has the following linear hazard rate, where t is in years: $\lambda(t) = 0.08t$, $t \geq 0$ (i) Find $R(t)$ and determine the probability of a component failing within the four months of its operation. (ii) What is the design life if a reliability of 0.85 is desired? **[6][CO5][L5]**

5. (a) Discuss the major elements of Production Planning and Control in detail. **[5][CO4][L1]**

(b) Differentiate the terms maintainability and availability. Define the terms used in 5S principles of housekeeping. **[5][CO4][L1]**

6. Write short notes on any four of the following

(a) Automated Guided Vehicle **[2.5][CO6][L1]**

(b) Principles of Material Handling Systems. **[2.5][CO6][L2]**

(c) MTBF and MTTF **[2.5][CO5][L2]**

(d) Centre Limit Theorem **[2.5][CO4][L1]**

(e) Travel Chart **[2.5][CO4][L2]**

(f) Standard Normal Distribution **[2.5][CO4][L1]**

Total no. of Pages: 02 446 *Roll no.....*

FIFTH SEMESTER **B.Tech. [Elective]**

END TERM EXAMINATION *Nov./Dec.-2024*

ME- 365 COMPUTATIONAL FLUID DYNAMICS

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

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

Q.1. [a] Write down impact of computational fluid dynamics and explain its applications.

[5][CO1][BTL2]

[b] Drive three dimensional Navier–Stokes equations in partial differential form with a neat diagram.

[5][CO2][BTL5]

[c] Drive three dimensional Energy equation in partial differential conservation form with a neat diagram.

[5][CO2][BTL5]

Q.2. [a] Write down the elliptic partial differential equations as applicable to computational fluid dynamics. Discuss its mathematical behavior and its impact on CFD.

[5][CO3][BTL3]

[b] Consider Laplace equation, given by

$$\frac{\partial^2 \emptyset}{\partial x^2} + \frac{\partial^2 \emptyset}{\partial y^2} = 0$$

Show that this is an elliptical equation.

[5][CO3][BTL5]

[c] A two-dimensional small-disturbance velocity potential equation for compressible flows is given as:

$$(1 + M_\infty^2)\frac{\partial^2 \emptyset}{\partial x^2} + \frac{\partial^2 \emptyset}{\partial y^2} = 0$$

Where M is the Mach number of flow. Examine whether this equation is parabolic, elliptic, or hyperbolic?

[5][CO3][BTL5]

Q.3. [a] Using Taylor series drive an expression for first order rearward difference with respect to y. [5][CO4][BTL4]

[b] Using Taylor series drive an expression for first order central difference with respect to x. [5][CO4][BTL4]

[c] Explain explicit equation solving approach in detail and explain its advantages and disadvantages. [5][CO4][BTL3]

Q.4. [a] Define Discretization error and round off error and stability requirements of Numerical Schemes in CFD. [5][CO4][BTL4]

[b] Explain the differences between finite difference, finite element and finite volume methods. [5][CO4][BTL4]

[c] Explain solution of elliptic partial differential equation by explicit relaxation technique.

$$\frac{\partial^2 \varphi}{\partial x^2} + \frac{\partial^2 \varphi}{\partial y^2} = 0$$

Where symbols have their usual meaning. [5][CO4][BTL5]

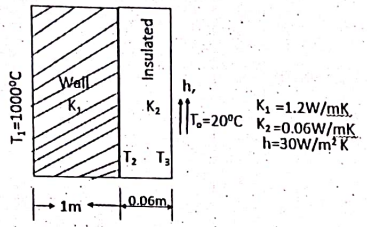
Q.5. [a] Explain structured, unstructured and multiblock grid with neat diagrams. [5][CO5][BTL4]

[b] Explain lift reduction, drag reduction and down force generation. [5][CO6][BTL4]

[c] Write down the procedure to simulate 2D diffuser by help of ANSYS FLUENT. [5][CO6][BTL6]

-----END-----

(7) A wall of 1m thickness has thermal conductivity of 1.2W/mK as shown in figure (7). The wall is to be insulated with a material of 0.06m having an average thermal conductivity of 0.3W/mK. The inner surface temperature is 1000^0C and outside of the insulation is exposed to atmospheric air at 27^0C with heat transfer co-efficient of 30W/m^{2}K. Calculate nodal temperature.



Figure(7) [8] [CO4] [BTL3,4,5]

----------END----------

Total No. of Pages: 04

Roll No. ... .

7th/5th Semester
B. Tech. (ME)

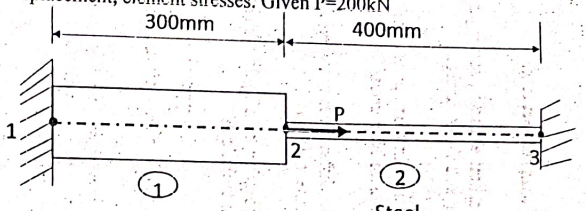
End Term Examination Nov./Dec.-2024

ME367 FINITE ELEMENT METHOD

Time:3hrs *Max. Marks: 40*

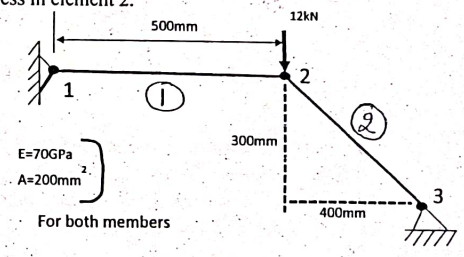
Note: Answer Any Five Questions. Assume suitable missing data, if any.

(1) The bar is loaded as shown in the figure (1). Determine the nodal displacement, element stresses. Given P=200kN



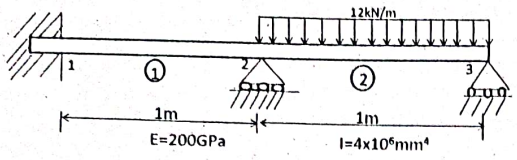
Figure(1) [8] [CO1][BTL2,3,5]

(2) For the two-bar truss shown in figure (2), determine the displacements at node 2 and stress in element 2.



Figure(2) [6+2] [CO2] [BTL3,4,5]

(3) For the beam and loading shown in figure (3). Determine
(i) the slopes at 2 and 3 and
(ii)the deflection at mid-point of the distributed load.



Figure(3) [8][CO5] [BTL1,2,3,5]

(4) A four noded rectangular element is shown in the figure (4). Determine the following (a) Jacobian Matrix (b) Strain displacement matrix for (r=0 and s=0)

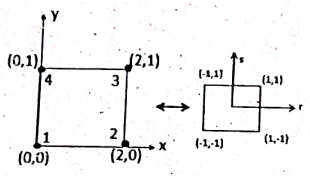
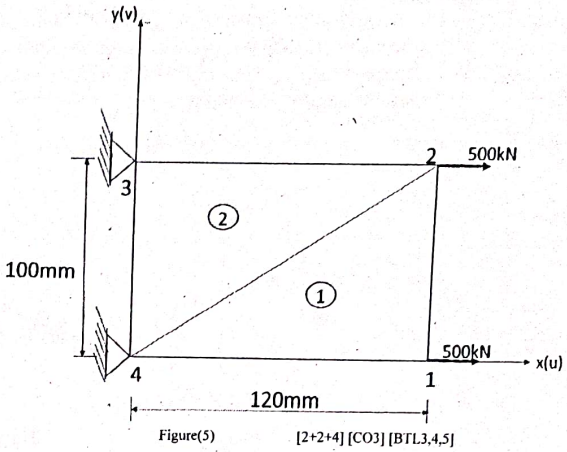


Figure (4) [4+4] [CO3] [BTL3,4,5]

(5) A steel plate 120mm long,100mm wide and 2mm thick is subjected to loading as shown in figure (5). Analyze the plate using CST elements as a problem of plane stress. E=180kN/mm² and Poisson's ratio v=0.30.
(a) Write B matrix for element 1 and 2.

(b)If displacements at node 1 and 2 are given u_1=3.352mm, v_1=0.650mm and u_2=2.936mm, v_2=-0.151mm, find the stresses in element 1.



Figure(5) [2+2+4] [CO3] [BTL3,4,5]

(6) For a stepped bar shown in figure (6), length of the two elements of stepped bar are 200mm and 100mm and their cross sectional area's are A1=400mm² and A2=200mm² respectively. The density is ρ=7800kg/m³ and modulus of elasticity E is 200GPa. Obtain the natural frequencies of vibration.

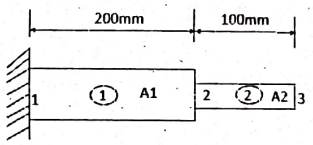


Figure (6) [8] [CO5] [BTL3,4,5]

Total no. Pages: 02

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Roll no.....

(VII SEMESTER)

B.Tech.

END TERM EXAMINATION *Nov-2024*

COURSE CODE ME407 (Refrigeration and Air-Conditioning)

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

Note : All questions are compulsory. Attempt any FIVE question. All questions carry equal marks. Assume suitable missing data, if any. Use of refrigeration tables and chart is allowed.

Q.1(a) An air sample has DBT and WBT as 25°C and 20°C. Calculate without using psychrometric chart (i) Relative humidity (ii) DPT (iii) Partial pressure of water vapour (iv) Enthalpy (v) DPT. Use Apjohn equation $P_v = P'_v - \frac{1.8\,p\,(t-t')}{2700}$. [5][CO4]

(b) Define specific humidity and prove that it given by $0.622\frac{P_v}{P-P_v}$ where P is barometric pressure. [5][CO4]

2(a) Explain the process of cooling and humidification (adiabatic humidification only). Specify the season for which this process is suitable. [5][CO4]

(b) The 25 kg/ min of air at a DBT of 25°C and 50% RH is heated and humidified such that the WBT of air at exit is 26°C and the increase in water vapour is 0.01 kg / kg of d.a. Calculate (i) sensible and latent heat added to air (ii) SHF. [5][CO4]

3(a) The air at 25°C and 50% RH is passed through a spray washer at 4°C. Specify the process which will take place during this interaction of air and spray washer. Assume bypass factor as 0.1 for spray washer, calculate (i) heat added or removed from the air (ii) final condition of air. [5][CO4]

(b) 250 kg/h of air saturated at 2°C is adiabatically mixed with 50 kg/h of air at 35°C and 40% RH. Determine the final state of air. [5][CO4]

Q.4(a) What is meant by effective temperature? What are the factors on which effective temperature depends? [5][CO

(b) (i) What are the various duct design methods? [2.5][CO

(b)(ii) What are various types of expansion devices? [2.5][CO

Q.5 (a) What are the desirable characteristics of a refrigerant? [5] [CO

(b) Decode the chemical name of the following refrigerant (i) R22 (ii) 717. (iii) Can CO_2 be used as a refrigerant? [5][CO

6(a) Explain the working of a vapour absorption system with the help o neat sketch. [5][CO

(b) Explain the working of a Boot Strap system with the help of neat sket Also draw the T-s diagram. [5][CO

7(a) A 5 TR Air-Conditioning plant (refrigerant R22) working on vapo compression refrigeration system operates between the temperatu conditions of 6°C and 40° C. The refrigerant leaves the evaporator superheated state at 10° C and enters the compressor. The refrigerant leav the condenser in saturated state. Calculate (i) mass flow rate of refrigerant in kg/s (ii) Compressor power in kW and (iii) COP of system. [5][CO

(b) Draw the schematic and P-h diagrams of a Cascade refrigeration syst and briefly explain its working. [5][CO

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VII SEMESTER
B.Tech.

Nov/Dec-2024

TERM EXAMINATION

RSE CODE ME 409 COURSE TITLE Mechatronics & Control

Max. Marks: 50

: 3:00 Hours

e: Attempt any 05 questions
All questions carry equal marks.
Assume suitable missing data, if any.

(a)What considerations are essential when designing a mechatronic control system?
(b)What are MEMS sensors, and why are they significant in mechatronics? [5+5] [CO 1]

2 (a)Describe a practical application of shape memory alloys in robotics or biomedical devices.
(b)How do electroactive polymers (EAPs) differ from other smart materials? [5+5] [CO 1]

Q.3 (a)Explain the difference between a permanent magnet, variable reluctance, and hybrid stepper motor.
(b)Compare resolvers with encoders in terms of accuracy, reliability, and applications. [5+5] [CO 2]

Q.4 (a)What is PID control? How are proportional, integral, and derivative terms used in control systems?
(b) Define a control system and differentiate between open-loop and closed-loop systems. [5+5] [CO 4]

Q.5 (a)What is the significance of the sampling period in a digital controller?
(b)What are the key factors to consider when designing a control system with A/D and D/A converters? [5+5] [CO 3,5]

Q.6 (a)Design a feedback system to control the position of a robotic arm?
(b) Discuss how CNC systems are utilized in additive manufacturing. [5+5] [CO 6]

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V/VII SEMESTER **B TECH ELECTIVE**

END SEMESTER EXAMINATION **Nov. 2024**

ME-411 I C Engines

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

Note: Answer ALL questions.

Assume missing data suitably, if any.

Answer to each question (or its part) must start on a fresh page.

Draw neat and properly labelled diagrams, wherever required.

All questions carry equal marks.

1 A. Discuss the utility of I C Engines in modern world? Comment on I C Engine as a threat to the environment. [5] [CO1]

1 B. Discuss the working of a four stroke I C Engine. Explain in brief its advantages and limitations over a two stroke I C Engine. [5] [CO1]

2 A. Explain the problem of cold start in IC Engines. Also elaborate various methods to overcome it. [5] [CO2]

2 B. Explain the various stages of combustion in a CI engine in brief with p-theta diagram. [5] [CO3]

3 A. What are the various factors leading for knock in diesel engines? Explain in brief the measures to control it. [5][CO3]

3 B. Explain the various requirements of an ideal combustion chamber with suitable diagrams. [5] [CO3]

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4 A. What are the desirable properties of engine lubricating oil? Discuss the requirement of lubrication and lubrication methods? [5] [CO5]

4 B. A simple jet carburetor has to supply 4.5 kg of air per minute at an ambient pressure of 1.013 bar and temperature of 27 Degree Celsius. Assuming the flow to be compressible and isentropic with air flow velocity as 49 meter per second. Determine the throat diameter of the choke of the carburetor. Take coefficient of discharge of air and fuel flow as 0.86 and 0.7 respectively. [5] [CO4]

5 A. A four cylinder, four stroke petrol engine has a compression ratio of 6:1. Following test observations were recorded on it:

Net brake load = 20kg	effective brake arm =0.5m
imep =$6x10^5$ N/m^2	engine speed =2400rpm
CLV of the fuel =44MJ/kg	Fuel consumption =10kg/hr
Cylinder bore =86mm	engine stroke =100mm

Calculate (a) Mechanical efficiency (b) Brake thermal efficiency (c) the brake mean effective pressure [5] [CO5]

5 B. Explain the use of CNG as IC engine fuel. [5] [CO5]

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

a) Bio-gas as vehicle engine fuel	b) GDI
c) Consequences of using petrol in CI engine	d) Fuel additives
e) Types of diesel injection systems	f) MPFI

[2.5x4=10] [CO1-6]

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SEVENTH SEMESTER

B. Tech.

END SEMESTER EXAMINATION **Nov.-Dec.-*2024***

ME-413 **Metrology**

Time: 3:00 Hours **Maximum Marks: 50**

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

1 (a) Explain the role of light wave standard in the future of precision measurements. [4][CO1]

(b) Explain the method of measurement with vernier height gauge with sketch. [6][CO3]

2 (a) Describe sigma comparator and clearly explain the magnification method adopted in it. [6][CO3]

(b) Explain the working of back pressure type pneumatic comparator with sketch. [4][CO2]

3 (a) Explain the method of measurement of Taper Plug Gauge with sketch. [4][CO3]

(b) Calculate the limits of tolerance and allowance for a 25 mm shaft and hole pair designated H_8d_9. Given 1T7=16i, 1T8=25i, 1T9=40i, 1T10=64i. Diameter steps specified by ISI are 6-10, 10-18, 18-30, 30-50, 50-80 mm. [6][CO5]

4 (a) Explain how the flatness of a surface plate, approximately 1200 x 900 mm of size, may be tested by means of a sprite level. [6][CO5]

(b) Explain the method of interferometer with sketch. [4][CO3]

5 (a) How you would check the accuracy of pitch of a plug screw gauge? [4][CO4]

(b) How the flatness and straightness of the lathe machine is checked? [6][CO4]

6 Write short notes on any FOUR of the following: [10][CO2]

a) Types of fit
b) Surface roughness
c) Dial indicator
d) Angle gauge
e) Parkinson gear tester

Total no. of pages :2 456 Roll No.

SEVENTH SEMESTER B.Tech (Mech.)

END SEMESTER EXAMINATION Nov 2024

ME-419 ROBOTICS AND AUTOMATION

Time : 03 Hrs. Max. Marks: 50

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

Q.1. a. Explain technical specifications of a robot. Also explain precision, accuracy and spatial resolution of a robot -05-[CO 1,4]

b.Derive rotation matrix for Y-axis of a robotic system. -05-[CO 1,3]

Q.2.a. Differentiate between Forward Kinematics and Inverse Kinematics. -02-[CO 2,5]

b. Explain step by step procedure and derive homogeneous transformation matrix of D-H convention. -08-[CO 2]

Q3.a. Explain with example, the concept of Joint-space trajectory planning of two d.o.f robot. -04-[CO 2,6]

b. It is desired to have the first joint of a six-axis robot go from initial angle of 25° to final angle of 70° in 4 secs. Using cubic polynomial, calculate joint angles at 1,2,3 and 4 secs. Plot the position v/s time, velocity v/s time and acceleration v/s time graphs. -06-[CO 2,6]

Q.4.Explain with neat sketches the working of following sensors:

i. Skin like tactile sensors

ii. Encoders

iii. Optical proximity sensors

iv. Force and Torque sensors -10-[CO 5,6]

Cont... Page 2

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Q.5.a. Explain Energy based L-E approach for determining Force and Torque equations while dealing with dynamic behaviour of the robot. -05-[CO 2,4,5]

b. Derive the matrix representing the Euler angle orientation change of a robot wrist. -05-[CO 1,3]

Q.6.a. Explain with neat diagrams the following drive system/actuators used in the Robotic system:

i. Gear Pump
ii. Piston Pump
iii. Stepper Motor
iv. D C Sevo Motor -10-[CO 4]

Q.7. Write short notes (with diagrams) on:

i. Arc Welding Robot
ii. 3rd order polynomial trajectory planning
iii. Task level programming
iv. Transformation matrices: Pure Translation and Pure Rotation -10-[CO 1,3,4,5]

Total No. of Pages _2_ 458 Roll No.....

7th SEMESTER B.Tech.

END TERM EXAMINATION Nov-2024

ME 423 Advanced Manufacturing Processes

Time: 3:00 Hours Max. Marks : 50

Note : Attempt FIVE full questions.
Assume missing data suitably, if any.

Q.1a. Explain with neat sketch the basic principle, mechanism and working of Photo Chemical Machining. [05][CO1,3]

b. Explain with neat sketch the basic principle, mechanism and working of Abrasive Water Jet Machining. [05][CO1,2]

Q.2a When do you prefer Electron Beam Machining(EBM) process?Explain the process of EBM with neat diagram. [05][CO5]

b. Explain with neat diagram the construction and working of Ion Beam Machining process. [05[CO 4,5]

Q.3a. List various various non conventional machining processes used in industries. Explain with classification of these processes based on various criteria. [04][CO3]

b. Why automatic tool feed arrangement is needed in Electro Discharge Machining (EDM)? Explain with neat diagram working of EDM. [06][CO 4]

Cont.... Page 2

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Q.4a. What are the different types of transducers used in Ultrasonic Machining Process(USM)? With neat diagram explain the basic principle, mechanism and working of USM. [06][CO1,4]

b. Differentiate between Transferred Arc and Non Transferred Arc type Plasma Arc Machining. [04][CO4,6]

Q.5a. Differentiate between Electro Chemical Grinding (EDG) and conventional Grinding using Grinding Machine. [04][CO4,5]

b. State the basic principle of Abrasive Flow Machining (AFM). Explaining with diagram AFM process. [06][CO3,6]

Q.6 What do you mean by "Process Parameters or Process variables"?. List the various process parameters and application of the following Advanced Manufacturing processes:

(i) USM (ii) LBM (iii) EDM (iv) ECM. [10][1,2,3,4,5,6]

Q.7 Explain the following with diagram:

(i)Hole drilling in LBM process

(ii)Techniques of Dielectric flushing in EDM

(iii) De-burring using Non conventional Machining Process.

(iv) Various materials and Characteristics of tools used in EDM process. [10][3,4,5,6]

Total no. of pages: 02 460 *Roll No.*_____

SEVENTH SEMESTER **B. Tech**

END SEMESTER EXAMINATION **NOV. 2024**

ME-427 OPERATION RESEARCH

Time: 3 Hours Max. Marks: 50

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

1 (a) Explain two persons zero sum game. Differentiate between pure strategy and mixed strategy. 5[CO1]

(b) Determine optimum strategies and values of the following game: 5[CO3]

		Player B			
		I	II	III	IV
Player A	I	-3	4	2	9
	II	7	8	6	10
	III	6	2	4	-1

2. A project schedule has the following characteristics: 10[CO4]

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time (Days)	4	1	1	1	6	5	4	8	1	2	5	7

(i) Construct a network diagram

(ii) Find critical path, total float and project duration.

3 (a) A book binder has one printing press and one binding machine. Time required to perform printing and binding operations for each book are given in table below. Determine optimum sequence in order to minimise total time required to turn out all the books. 5[CO2]

Books	1	2	3	4	5	6
Printing time (hours)	30	120	50	20	90	110
Binding time (hours)	80	100	90	60	30	10

(b) Solve the following unbalanced problem of assigning four jobs to three different men. The time to perform the job by different men is given below- 5[CO2]

Men/Jobs	J1	J2	J3	J4
M1	7	5	8	4
M2	5	6	7	4
M3	8	7	9	8

4. Find the optimal solution to the following linear programming problem- 10[CO3]

Minimize $Z = 2x_1+9x_2+x_3$

Subjected to: $x_1+4x_2+2x_3 \geq 5$

$3x_1+x_2+2x_3 \geq 4$

x_1, x_2 and $x_3 \geq 0$

5. Find initial basic feasible solution of the following transportation by Vogel's approximation method. Then find optimal solution. 10[CO5]

Factory/warehouse	W1	W2	W3	W4	Capacity
F1	19	30	50	10	7
F2	70	30	40	60	9
F3	40	8	70	20	18
Demand	5	8	7	14	

6. Write short notes on any four of the following: 10[CO1]

(a) Duality
(b) Replacement model
(c) Project crashing
(d) Resource levelling
(e) Two person zero sum game
(f) Queuing theory

Total no. of Pages:02 462 Roll no.....

SEVENTH SEMESTER **B.Tech. [ME]**

END TERM EXAMINATION *Nov-2024*

ME-435 Optimization Techniques

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

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

Q.1 [a] Discuss applications of optimization in logistics sector. [5][CO#1][BTL#2]

[b] Explain the procedure of grid search technique to solve an unconstrained NLP. [5][CO#2][BTL#3]

Q.2 [a] The profit per acre of a farm is given by:

$F(x_1, x_2) = 20x_1 + 26x_2 + 4x_1x_2 - 4x_1^2 - 3x_2^2$ where x_1 and x_2 denote, respectively, the labor cost and the fertilizer cost. Find the values of x_1 and x_2 to maximize the profit. [5][CO#3][BTL#4]

[b] Find the extremum point(s) and their nature for the function:

$$Z = 4x^2 - 4xy + y^2$$

Subject to constraint: $x^2 + y^2 = 5$; [5][CO#4][BTL#3]

Q.3 [a] Explain the Simplex method to solve an unconstrained multi-variable optimization problem. [5][CO#3][BTL#2]

[b] Find the minima of following function using quadratic interpolation method with an initial step size of 0.1:

$F(x) = x^2 - 4x + 7$. [5][CO#3][BTL#4]

Q.4 Solve the following problem using Dynamic Programming method.

Minimize $Z = 2x_1 + 3x_2 + 20x_3$

Subject to: $x_1 + x_2 + x_3 = 12$

where x_1, x_2, x_3 are positive real numbers; [10][CO#4][BTL#5]

Q.5 Solve the following problem using implicit enumeration method:

Minimize, $Z=2x_1+4x_2+3x_3$

Subject to constraint:

$x_1+x_2 \geq 1$; $x_2+x_3 \geq 1$; $x_1+x_3 \geq 1$; x_1, x_2, x_3 are binary;

[10][CO#3][BTL#6]

Q.6 (a) What are the limitations of nature inspired techniques? Discuss some typical applications of these techniques.

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

(b) Explain the procedure for any one of the nature inspired technique from GA/ACO/PSO/SA.

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

7. Write short notes on **any two topics** out of the following:

[5X2][CO#3][BTL#5]

[a] Gomory cutting plane algorithm
[b] Monte Carlo simulation
[c] Dichotomous search method
[d] Classification of optimization problems

Total no. of Pages: 02

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III SEMESTER

B.Tech. (MC)

END TERM EXAMINATION Nov-2024

MC201: Discrete Mathematics (Old Scheme)

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

Note : Assume suitable missing data, if any.

Q.1 Using inference rules: [2+3][CO1][BTL3]

i. show that R is logically derived from $P \rightarrow Q$, $Q \rightarrow R$, and P.

ii. show that $S \vee R$ is tautologically implied by $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$.

Q.2 Let U = {1,2,3,4,5,6,7,8,9,10}, A = {2,4,6,8,10}, and B = {1,2,3,4,5. Determine $(A \cup B)^c \cap A^c$. [5][CO4][BTL3]

Q.3 Suppose we have a box containing a set of standard chess pieces. You select three pieces from the box. Solve in how many ways can you select the pieces so that: [2+2+1][CO1][BTL3]

(a) all three are the same color.

(b) all three are the same color and all three are pawns.

(c) all three are rooks.

OR

Solve for the following: [1+2+2][CO1][BTL3]

(a) How many ways are there to rearrange the letters in the word "VECTOR"?

(b) How many ways are there to rearrange the letters in the word "TRUST," in such a way that the two Ts are not next to each other?

(c) How many ways are there to rearrange the letters in the word "MATHEMATICS" so that no two consecutive letters are the same?

Q.4 Discuss various types of algebraic structures. [5][CO2][BTL2]

OR

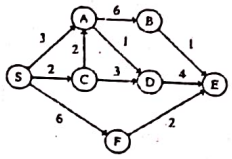
Show that set of all non-zero real numbers is a group with respect to multiplication. [5][CO2][BTL3]

Q.5 Illustrate a Hasse diagram representing the partial ordering {(A,B): A subset of B} on the power set *P(S)* where S = {a, b, c}. Find the maximal, minimal, greatest, and least elements of the poset. [5][CO2][BTL4]

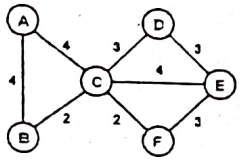
Q.6 Explain what is a complete lattice? Is power set a complete lattice? If yes, explain with the help of an example. [5][CO3][BTL2]

Q.7 Simplify the Boolean Expression $a'b'c + ab'c + a'b'c'$ using Boolean algebra identities. [5][CO4][BTL5]

Q.8 Consider the given graph. Taking *S* as the initial node, execute Dijkstra's algorithm on it and illustrate the resultant graph. [5][CO3][BTL4]



Q.9 Step-wise develop a minimum spanning tree (MST) for the given graph using Prim's and Kruskal's Algorithm. Also state the minimum cost to do so. [10][CO3][BTL6]



Total no. of Pages: 02 466 Roll no.....

III SEMESTER

B.Tech. (MC)

END TERM EXAMINATION Nov-2024

COURSE CODE: MC201n COURSE TITLE: Data Structure

Time: 03:00 Hours Max. Marks: 40

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

Q.1 Explain is the advantage of circular queue over linear queue. Write a C program to simulate the working of a circular queue of integers using array for the insert and delete operations. [5][CO2][BTL2]

Q.2 Design an algorithm MERGE to merge 2 linear linked lists *L1* and *L2*, whose elements are arranged in increasing order (without in-built functions). The created new list NEWLIST should also be arranged in increasing order. [5][CO2][BTL6]

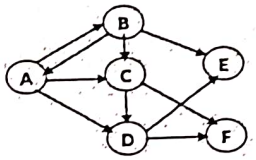
Q.3 Using the following pre-order and post-order traversal, step-wise construct a binary tree: [5][CO1][BTL3]

Pre-order: ABCDEFGHI

Post-order: CBEHGIFDA

Also, state the in-order traversal for the constructed tree.

Q.4 Show the adjacency matrix and adjacency list representation for the given graph, and also step-wise perform breadth-first-traversal on it, considering *B* to be the starting vertex. [5][CO3][BTL3]



Q.5 Illustrate and construct an AVL tree by inserting the following keys in sequence:

21, 26, 30, 9, 4, 14, 28, 18, 15, 10, 2, 3, 7

Also highlight the rotations made at each iteration while constructing the AVL tree. [5][CO3][BTL3]

Q.6 Analyse any array and consider the Quick sort algorithm to sort the array where a pivot element is chosen for partitioning the array in two halves at every iteration. Assume that, at every iteration, the pivot elements always partition the array in the ratio of 1:9. What will be the time complexity of Quick sort in such a scenario where the pivot element always partitions the array in the ratio of 1:9? Further, what will be the complexity if the partition ratio is 1:99? [5][CO4][BTL4]

OR

Using heap sort, sort the following data items in increasing order:
80, 25, 57, 48, 37, 12, 92, 86, 33, 50.

Write a pseudocode for the *heapify* procedure used in this sorting. [5][CO4][BTL3]

Q.7 Explain and write a short note on Indexing in File Organization. [5][CO1][BTL2]

OR

Discuss the Open addressing methods with the help of an example. [5][CO5][BTL2]

Q.8 Consider a hash table of size $m=9$. The division method hash function is used and all the collisions are resolved by chaining. The following keys are inserted in the order: 5, 28, 19, 15, 20, 33, 12, 17, 10. Illustrate and explain what are the maximum, minimum and average chain lengths in the resultant hash table. Also, define hashing and collisions in hashing. [5][CO5][BTL4]

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Total No. of Pages: 02

Roll No:.....

Third SEMESTER **B.Tech. II**

End SEMESTER EXAMINATION November, 2024

MC-203, Real Analysis

Time: 03 Hours Max. Marks: 50

Note: Attempt any five questions, and each question carry equal marks.

Q.1 (i) (a) If $a \in \mathbf{R}$ satisfies $a.a = a$, prove that either $a = 0$ or $a = 1$.

(b) If $a \neq 0$ and $b \neq 0$, show that $\frac{1}{ab} = \left(\frac{1}{a}\right)\left(\frac{1}{b}\right)$

(ii) Prove that every bounded monotonic sequence is convergent.

[$CO_{1,2}$, $L_{1,2,3,4,5}$]

Q.2 (i) Define a metric space, Let (X, d) be a metric space. Define $d' : X \times X \to \mathbf{R}$ by

$$d'(x, y) = \frac{d(x, y)}{1 + d(x, y)}.$$

Prove that d' is a metric on X.

(ii) Define open sets in a metric space. Prove that an arbitrary union of open sets is open.

[CO_3, $L_{1,2,3,5}$]

Q.3 (i) Prove the followings:

(a) $(A \cap B)^\circ = A^\circ \cap B^\circ$

(b) $(A \cup B)^\circ \supseteq A^\circ \cup B^\circ$. Give an example to show that equality may not hold.

(ii) Let (X, d) be a metric space and F be a subset of X. Then F is closed in X if and only if F^c is open in X.

[CO_3; $L_{1,2,3,4,5,6}$]

Q.4 (i) A mapping $f : X \to Y$ is continuous on X if and only if $f^{-1}(G)$ is open in X for all open subsets G of Y.

(II) Define Cauchy sequences in a mettic space. Show that the sequence $\left\{\frac{1}{n}\right\}$ is a Cauchy sequence in $X = (0, 1)$ with usual metric space and not convergent to any point of X.

[$CO_{3,4}$, $L_{1,2,4,5}$]

Q.5 (I) Prove that the function $f(x) = ax + b$ is integrable on $[0, 1]$, where a and b both are positive real numbers.

(II) A bounded function f on $[a, b]$ is integrable if and only if for each $\varepsilon > 0$ there exists a partition P of $[a, b]$ such that

$$U(f, P) - L(f, P) < \varepsilon$$

[CO_5, $L_{1,2,3,4,5,6}$]

Q.6 (I) Define a function f as

$$f(x) = \begin{cases} 0, & \text{if } x \text{ is rational in } [0, 1]; \\ 1, & \text{if } x \text{ is irrational in } [0, 1]. \end{cases}$$

Check whether the function f is integrable on $[0, 1]$.

(II) Prove that every continuous function f on $[a, b]$ is integrable.

[CO_5, $L_{1,2,3,4,5,6}$]

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

Third SEMESTER

END TERM EXAMINATION **Nov-2024**

COURSE CODE MC-203 **COURSETITLE** Mathematics III

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

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

Q.1 If z_1, z_2 and z_3 are the vertices of an isosceles triangle, right angled at the vertex z_2, prove that

$$z_1^2 + 2z_2^2 + z_3^2 = 2z_2(z_1 + z_3).$$

[5][CO1][BTL2]

Q.2 Find the radius of convergence of the series

$$\sum_{n=0}^{\infty} \left(\frac{n+2}{3n+1}\right)^n (z-4)^n.$$

[5][CO1][BTL4]

Q.3 What is the difference between differentiable and analytic function. Check whether the function $f(z) = \sin z$ is analytic or not.

[5][CO2][BTL1]

Q.4 Show that the function $u(x,y) = 4xy - 3x + 2$ is harmonic. Construct the corresponding analytic function $f(z) = u(x,y) + iv(x, y)$. Express $f(z)$ in terms of complex variable z.

[5][CO3][BTL5]

Q.5 Find the bilinear transformation that maps the points $z_1 = -i$, $z_2 = 0, z_3 = i$, into the points $w_1 = -1, w_2 = i, w_3 = 1$, respectively. Into what curve the y-axis is transformed under this transformation.

[5][CO2][BTL6]

Q.6 Sate and prove Fundamental theorem of Algebra. [5][CO1][BTL1]

Q.7 Evaluate

$$\int_C \frac{(z-1)}{(z+1)^2(z-2)}dz$$

where C is $|z-i|=2$. [5][CO2][BTL3]

Q.8 Using Cauchy's residue theorem, find the value of

$$\int_0^{2\pi} \frac{1}{(2+\cos\theta)^2}d\theta.$$

[5][CO2][BTL2]

Q.9 Using the Laurent series expansion of $f(z) = 1/(z(z-1))$ valid for the domains $1 < |z|$ and $0 < |z-1|$, classify the singularities at z=0 and z=1. [5][CO3][BTL6]

Q.10 Evaluate

$$\int_C \left(\frac{ze^{\pi z}}{z^4-16} + ze^{\pi/z}\right)dz,$$

where C is the ellipse $9x^2+y^2=9$ taken counter clockwise. [5][CO4][BTL3]

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3rd SEMESTER Roll No._____

B.Tech **Mathematics and Computing (MCE)**

END SEMESTER EXAMINATION NOV 2024

MC – 205 Probability and Statistics

Time : 3 hrs Max. Marks: 40

Note: Attempt any 5 Questions. Use of statistical table is allowed. Assume any missing data.

1 (a) Obtain the equation of the line of regression of Y *on* x from the following data. Also estimate y when $x = 32$. [4] [CO2] [BTL3]

x:	23	27	28	28	29	30	31	33	35	36
y:	18	20	22	27	21	29	27	29	28	29

(b) Define Moment generating function (m.g.f.) for a random variable X. Obtain m.g.f. for Poisson's Distribution & using it obtain the mean of Poisson distribution. [4] [CO3] [BTL1]

2 (a) A bulb manufacturing company knows that 0.2% of the bulbs produced are defective. The bulbs are supplied in a carton of 30 bulbs to a retailer. If a retailer bought 500 cartons calculate the approximate number of cartons containing one defective bulb. [4] [CO2] [BTL3]

(b) A sample of 80 items is taken from a batch known to contain 35% defectives. Using normal approximations find the probability that sample contains [4] [CO2] [BTL2]
i) at least 30 defectives. ii) 20 < number of defective < 30

3 (a) Define "unbiased estimate" of population parameter. Prove that the mean of the sample is unbiased. [4] [CO3] [BTL1]

(b) A manufacturer claimed that at least 96% of the steel pipes which he supplied to a factory conformed to the specifications. An examination of a sample of 400 pieces of pipes revealed that 24 were defective. Test this claim at $\alpha = 0.05$. [4] [CO3] [BTL3]

4. (a) The marks of 12 students in mathematics are found to be 90, 67, 42, 68, 51, 58, 70, 64, 94, 56, 75, 87 . Is it reasonable to believe that the average mark is greater than 65 ? Test at 5% significance level. [4] [CO3] [BTL3]

(b) Suppose that a dice is tossed 120 times and the data recorded as [4] [CO4] [BTL4,5]

Face:	1	2	3	4	5	6
Observed frequency:	20	22	17	18	19	24

Using chi-square test at 5% level of significance test the hypothesis that coin is unbiased.

5 (a) An experiment to determine if exposure to Carbon Monoxide (CO) has an impact on breathing was conducted on 9 persons, and breathing frequency was counted. The data recorded is given below [4] [CO4 CO1] [BTL3]

With CO	30	45	26	25	34	51	46	32	30
Without CO	30	40	25	23	30	49	41	35	28

Assuming that breathing frequency is approximately normal, using paired t -- $test$ at 5% level of significance test whether the frequency is the same for two environment

(b) Using $\chi^2 - test$ at 5% level test the claim that the precision (as measured by the variance) of an instrument is no more than 0·01. Given 11 measurements of the same subject on the instrument are, 2.5, 2.3, 2.4, 2.3, 2.5, 2.7, 2.5, 2.6, 2.6, 2.7, 2.5. [4] [CO4 CO1] [BTL4,5]

6 (a) A nicotine contents in milligrams of tobacco is found as following [4] [CO4 CO1] [BTL4,5]

Sample A 24 27 26 21 25

Sample B 27 30 28 31 22 36

Using F-test decide the claim at $\alpha = 0.05$ that two samples are from the population with same variance.

(b) The average grades of 12 college students in 1st year entering from three different schools are as following [4] [CO4 CO1] [BTL4,5]

School 1 3.2 3.4 3.3 3.5

School 2 3.4 3.0 3.7 3.3

School 3 2.8 2.6 3.0 2.7

At $\alpha = 0.05$ test the hypothesis that there is no difference in 1st yr grade point average for the three schools entrants.

Total No. of Pages 02

Roll No. .....

THIRD SEMESTER
END SEM EXAMINATION

B.Tech.[MC]
NOV./DEC.-2024

MC-207 Engineering Analysis and Design (Differential Equations)

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

Note: Answer **ALL** questions by selecting **any TWO** from each question. Each question carries equal marks. Assume suitable missing data, if any.

Q.1 (a) Solve the homogeneous linear system of differential equations by matrix method.

$\frac{dx}{dt} = 7x - y + 6z;\ \frac{dy}{dt} = -10x + 4y - 12z;\ \frac{dz}{dt} = -2x + y - z$

(b) Convert the ODE $2y'' + 5y' - 3y = 0$ to a system of first order equations and solve by matrix method.

(c) Find the eigen values and corresponding eigen functions of the

$y'' + \lambda y = 0; \qquad y(0) = 0,\ y(2\pi) = 0$

[CO1, Evaluate]

Q.2 (a) Discuss the stability of the critical point of the following linear autonomous system

$\frac{dx}{dt} = 2x - 7y;\ \frac{dy}{dt} = 3x - 8y.$ [CO1, Analyse]

(b) Form the partial differential equation from

$xyz = f(x + y + z).$ [CO2, Create]

(c) Solve $(mz - ny)p + (nx - lz)q = (ly - mx)$. [CO2, Evaluate]

Q.3 (a) Find the integral surface of $4yzp + q = -2y$ which passes through $y^2 + z^2 = 1,\ \ x + z = 2.$ [CO2, Apply]

(b) Solve $(D^2 - D'^2 - 3D + 3D')z = xy + e^{x+3y}.$ [CO2, U]

(c) Solve $(D^2 - DD' - 2D'^2)z = (y - 1)e^x$ [CO2, U]

(P.T.O.)

Q.4 (a) Classify the following second order PDE

$u_{xx} + 4u_{xy} + (x^2 + 4y^2)u_{yy} = siny.$ [CO3, R]

(b) Find the characteristic curves of $y^2r - x^2t = 0.$ [CO3, Apply]

(c) Solve $u_{xx} - 2u_x + u_y = 0$ by method of separation of variables. [CO3, Apply]

Q.5 (a) Use the method of separation of variables to find the all-possible solutions of $u_t = c^2u_{xx}.$ [CO4, Apply]

(b) A bar AB of length $l\ cm$ with insulated sides is initially at a uniform temperature u_0. Its ends are suddenly cooled to 0^0C and are kept at that temperature. Find the temperature function $u(x,t)$. [CO4, Create]

(c) Solve $u_{xx} + u_{yy} = 0,$ subject to the conditions

$u(0,y) = u(a,y) = u(x,b) = 0,\ \ u(x,0) = a - x$

[CO5, Apply]

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Total No. of Pages: 2 475 Roll No.....

3rd SEMESTER B.Tech. (MC)

END SEMESTER EXAMINATION (Nov-Dec 2024)

MC 207: Modern Algebra

Time: 3:00 Hours Max. Marks: 50

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

Q1. a) Show that $H=\left\{\begin{pmatrix} a & b \\ 0 & 1 \end{pmatrix}: a \neq 0;\ a,b \in R\right\}$ is a subgroup of the multiplicative group of 2×2 non-singular matrices over R.

[5][CO1][BTL3]

b) Evaluate aba^{-1} given $a=(1\ 3\ 5)(1\ 2)$ and $b=(1\ 5\ 7\ 9)$ in S_9.

[5][CO1][BTL5]

Q2. a) Prove that quotient group of a cyclic group is cyclic, but converse is not true.

[5][CO3][BTL5]

b) Verify Fundamental Theorem of group homomorphism for the homomorphism of groups defined by.

$f: S_3 \to G$, such that $f(x)=\begin{cases} 1, & \text{if } x \text{ is even permutation} \\ -1, & \text{if } x \text{ is odd permutation} \end{cases}$

Where $G=\{1,-1\}$ is a group under usual multiplication.

[5][CO3][BTL2]

Q3. a) Demonstrate that homomorphic image of an abelian group is abelian and converse need not hold good. [5][CO5][BTL2]

b) If $\phi: G \to G'$ is a homomorphism, then show that kernel of ϕ is a normal subgroup of G.

[5][CO1][BTL3]

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Q4. a) Show that the characteristic of a Boolean ring is 2. [5][CO4][BTL3]

OR

Let R be a ring, then show that center of a ring $Z(R)$ is a subring of R but may not be an ideal of R. [5][CO5][BTL3]

b) Consider the mapping from $M_2(Z)$ (the set of 2×2 matrices with integer entries) into Z given by

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \mapsto a$$

Analyse that this is a ring homomorphism or not? [5] [CO2][BTL4]

Q5. a) Explain with an example of a finite commutative ring that a maximal ideal may not be a prime ideal. [5][CO3][BTL2]

OR

Build example of two polynomials $f(x)$, $g(x)$ in $R[x]$ such that

(i) $deg(f(x)+g(x)) < max\{deg\, f(x), deg\, g(x)\}$

(ii) $deg(f(x)g(x)) < deg\, f(x) + deg\, g(x)$

[5][CO4][BTL6]

b) Explain that for any prime number p, $<p> = \{px : x \in Z\}$ is an ideal of Z. Further, show that it is prime. [5][CO5][BTL2]

- END –

b. Describe what the following expression does

$\pi_{athlete\_id,event\_id}(\text{Event\_Results}) \div \pi_{event\_id}(\sigma_{athlete\_id='A5'}(\text{Event\_Results}))$

c. Describe what the following expression does

$\pi_{A.athlete\_id}(\rho_A(\text{Athletes})) - \pi_{ER1.athlete\_id}($

$\rho_{ER1}(\text{Event\_Results}) \bowtie_{ER1.athlete\_id=ER2.athlete\_id \wedge ER1.result \neq ER2.result} \rho_{ER2}(\text{Event\_Results}))$

Q5. [a. c. –CO 3, b. –CO 5, d. – CO 1], [BTL 1], [2+2+2+2]

a. Explain join dependencies with help of an example
b. Differentiate between primary index and Clustering index.
c. Define Natural Join with the help of an example
d. State True/ False and justify your answer
   a. In the shrinking phase of strict 2PL, locks cannot be released until the end of the transaction.
   b. Only schedules under 2PL (and not strict 2PL) may lead to deadlocks.

Q6 [CO2], [a - BTL 5, b - BTL 1], [5+3]

a. Consider a database to store information for a social networking website. Design an ER Diagram for the database having following properties:
Every user has a unique user ID (integer) along with a full name, age and phone number. Every group has a unique group ID (integer) and a name. Every group must have at least one user that serves as moderator of the group. A user may be a member of zero or more groups; groups may contain zero or more members (and one or more moderators). Users are allowed to create zero or more albums. An album has a unique album ID (integer), a creation date, and a name. An album is owned by exactly one user: the user that created it. • An album can contain zero or more media files. For every media file, we record its unique URL, the date the file was added to the album, and a caption (if one exists). A media file may belong to at most one album.
b. Explain the Characteristics of a Database Approach for a given application

X---------END----------X

Total no. of Pages:04 *Roll no.....*

3rd SEMESTER B.Tech.

END TERM EXAMINATION *Nov-2024*

MC209: DATABASE MANAGEMENT SYSTEMS

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

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

Q1. **[CO1], [BTL 5], [5+3]**

a. Consider the schedule given below. R(·) and W(·) stand for 'Read' and 'Write', respectively

time	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}	t_{11}
T_1	R(A)		W(A)						R(B)		W(B)
T_2				R(C)	R(A)		W(A)			W(C)	
T_3		R(B)				W(B)		R(A)			

i. Is this schedule serial?
ii. Give the dependency graph of this schedule.
iii. Is this schedule conflict serializable? If "yes", provide the equivalent serial schedule. If "no", briefly explain why.
iv. Is this schedule view serializable?

b. Consider the following lock requests. Note that: S(·) and X(·) stand for 'shared lock' and 'exclusive lock', respectively. T1, T2, and T3 represent three transactions.
i. Give the wait-for graph for the lock requests at time-tick t7.
ii. Determine whether there exists a deadlock in the lock requests, and explain why.

time	t_1	t_2	t_3	t_4	t_5	t_6	t_7
T_1	X(A)						S(C)
T_2			S(B)	S(C)		S(A)	
T_3		S(C)			X(B)		

Q2. **[CO4], [BTL 3], [5+3]**

a. Consider the relation schema with attributes, E = {W, X, Y, Z} and the functional dependencies: XY → W, X → Z, W → X.
i. List all the candidate key(s) for E.
ii. Is the relation E in 3NF? If yes, explain. If not, give a 3NF decomposition of E that is lossless, dependency preserving, and has as few tables as possible.

decomposition of E that is lossless, dependency preserving, and has as few tables as possible.

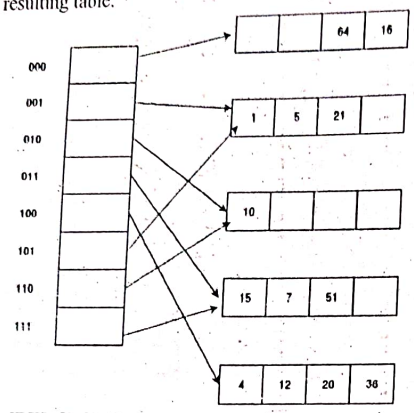
b. Consider the relational schema R = {P, Q, R, S, T, U, V} and the set of functional dependencies FD: P → Q, Q → R, PS → TRV, QT → UR, S → V. Find its minimal cover.

Q3. [CO 5], [a. – BTL 2, b. – BTL 3, c. – BTL 4], [2+3+3]

a. Consider a most dense B-trees of order d = 5 that contains all the integer keys 1, 2, . . ., 120. How many nodes does the structure have?

b. Consider an extendible hash table, where the last insertion forced its directory to double in size, from n_{old}=8 to n_{new}=16 directory entries. how many buckets have exactly one directory entry pointing to them?

c. Starting from the hash table given below, delete keys 36, 12, and plot the resulting table.

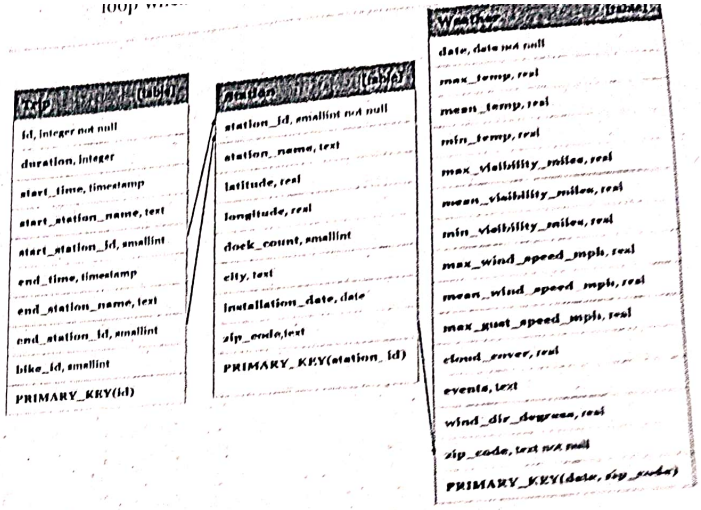


Q4. [CO 3], [BTL 3], [5+3]

a. Following figure gives the schema of bike sharing data collected from five cities in the Bay Area. Write the SQL queries for the following.

i. Count the number of stations in each city. That is print city name and number of stations. Sort by number of stations (decreasing), and break ties by city name (increasing).

ii. List all stations name of which contains its city's name, for example, station "Mountain View Caltrain Station" in city "Mountain View". That is print station name and city name. Sort by city name (increasing), and break ties by station name (increasing).



b. Consider the relations of a database for the 2016 Olympics as given below. These relations record the athletes, events, and outcomes/results of the 2016 Olympic games.

Athletes: For every athlete, we record a unique athlete id, the country they represent, their name, and their age.

Events: This table lists all the events that are part of the 2016 Olympic games with unique integer event id and a name.

Event Results: Lists the outcomes of all events with the event id of the event, the athlete id of the athlete that won a medal in the event, and the standing of the athlete (i.e., gold, silver or bronze).

athlete_id	country	name	age

- Athletes Table

event_id	name

- Events Table

event_id	athlete_id	result

- Event Results Table

Answer the following-

a. List the names of the athletes that have won at least one gold medal, eliminating duplicate names, using Relational Algebraic expression.

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Total No. of Pages : 02

III Semester END SEMESTER EXAMINATION B.Tech.

PAPER CODE - MC251 Nov./Dec.-2024

TITLE OF PAPER - APPLIED MATHEMATICS

TIME: 03 HRS MAX. MARKS: 50

Note: Attempt any FIVE questions. Each question carry equal marks.
Use of calculater is allowed. Assume suitable missing data, if any.

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1. The probabilities of X, Y and Z becoming managers of a company are 4/9, 2/9 and 1/3, respectively. The probabilities that the bonus scheme will be introduced if X, Y and Z becomes manager are 3/10, 1/2 and 4/5, respectively.

   (a) Find the probability that the Bonus Scheme will be introduced. [5] CO-1

   (b) If the Bonus Scheme has been introduced, find the probability that the manager appointed was X or Y. [5] CO-1

2. (a) A consignment of 10 similar computers contains 4 defective computers. Suppose a person makes a random purchase of 3 computers. Then find the probability distribution for the number of defective computers purchased and the distribution function. [5] CO-2

   (b) If the life of a component X has the probability density function [5] CO-2

$$f(x) = \begin{cases} 2e^{-2x}, & \text{for } x > 0 \\ 0, & \text{for } x \leq 0. \end{cases}$$

Find the probabilities that it will take on a value

(i) between 1 and 3, and

(ii) greater than 0.5.

4180

3. A manufacturer produces 200 fuses that are packed in a box. If 2% of the fuses produced are defective. Find the probability that a box contains fuses with

   (a) no defective fuse. [5] CO-3

   (b) at most 5 defective fuses. [5] CO-3

4. (a) Use the method of false position, to find the fourth root of 32 correct to three decimal places upto 3 iterations. [5] CO-4

   (b) Use Newton's method to find the root of equation $e^x = 4x$ near 2 correct to three decimal places upto 3 iterations. [5] CO-4

5. (a) Solve the following system of equations using Jacobi iteration method upto 4 iterations. [5] CO-5

$$2x + y + z = 5; \quad 3x + 5y + 2z = 15; \quad 2x + y + 4z = 8.$$

   (b) Solve by Gauss-Seidal iteration method the following system of equations upto 4 iterations. [5] CO-5

$$10x + y + z = 12, \quad 2x + 10y + z = 13, \quad 2x + 2y + 10z = 14.$$

6. (a) Solve the following equations by Gauss Elimination Method. [5] CO-5

$$2x + 2y + z = 12, \quad 3x + 2y + 2z = 8, \quad 5x + 10y - 8z = 10.$$

   (b) Find the root of $f(x) = x^3 + x - 1$ lying in the interval $[0, 1]$ using Bisection method upto four iterations. [5] CO-4

× × ×

b. For the following disk accesses, compute the number of head movements for the following list of seeks to disk cylinder: 26 37 100 14 88 33 99 12 Assume head is initially positioned over 26.
A. SSTF B. C-SCAN (going up)

Q6. a . – CO5, b. – CO5, a . – BTL 1 , b. – BTL1 (4+4)

a. Write a short on the following
   a. Interrupts and Traps
   b. On-disk and In-memory data structures for File management

b. State four system calls used each for
   a. I/O Device Management
   b. Memory Management

X---------END----------X

Total no. of Pages: 04 *Roll no.....*

5th SEMESTER B.Tech.

END TERM EXAMINATION *Nov-2024*

MC301: OPERATING SYSTEMS

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

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

Q1. a. – CO1, b. – CO3, a . – BTL 2 , b. – BTL 2, (5+3)

a. State True/false and justify the answer
   1) Batch operating systems require user interaction during the execution of jobs.
   2) System calls can be executed directly in user mode without any intervention from the operating system's kernel.
   3) A distributed operating system manages a group of distinct computers and makes them appear to the user as a single coherent system.
   4) A system call incurs more overhead than a simple function call within a user program.
   5) Time-sharing operating systems do not support the concept of multiprogramming.

b. Describe the problems and advantages of dynamic linking over static linking.

Q2. a. – CO3, b. – CO3, a . – BTL3, b. – BTL 3, (5+3)

a. Consider a paging system with a page table stored in memory. Suppose: TLB lookup time = 20 ns, TLB hit ratio = 80% and memory access time = 75 ns. swap page time = 500,000 ns and 50% of pages are dirty. OS uses a single level page table.
   1. What is the effective access time (EAT) if we assume the page fault rate is 0%? (Show your work.) Assume the cost to update the TLB, the page table, and the frame table (if needed) is negligible.
   2. What is the effective access time (EAT) if we assume the page fault rate is 10%?

(Show your work.) Assume the cost to update the PCB, the page table, and the frame table (if needed) is negligible.

b. Assume that we are using an OS with variable size partitions and we have batch processes arriving in order, with the following requests for storage: 20k, 30k, 10k, 100k, 60k. Assume that we have four holes in memory of size: 50k, 30k, 200k, 16k, 30k Where would each of the Worst-fit and Best-fit algorithms place the processes?

Q3. a. – CO4, b. – CO4, a. – BTL 3, b. – BTL 3, (5+3)

a.

Given the following state for the Banker's Algorithm:
6 processes P0 through P5
4 resource types: A (15 instances); B (6 instances)
C (9 instances); D (10 instances)
Snapshot at time T0:

Available			
A	B	C	D
6	3	5	4

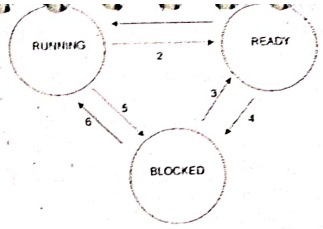
process	current allocation				maximum demand			
	A	B	C	D	A	B	C	D
P0	2	0	2	1	9	5	5	5
P1	0	1	1	1	2	2	3	3
P2	4	1	0	2	7	5	4	4
P3	1	0	0	1	3	3	3	2
P4	1	1	0	0	5	2	2	1
P5	1	0	1	1	4	4	4	4

a. Verify that the Available array has been calculated correctly.
b. Calculate the Need matrix.
c. Show that the current state is safe, that is, show a safe sequence of processes. In addition, to the sequence show how the Available (working array) changes as each process terminates.
d. Given the request (3,2,3,3) from Process P5. Should this request be granted? Why or why not?

b. Assume you have a system in which there is circularity in the wait-for graph of the system. Is this a definitive sign of a deadlock? Justify your answer with the help of an example.

Q4. a . – CO1, b. – CO2, a . – BTL 4, b. – BTL 4, (5+3)

a. Briefly explaining what conditions cause a thread to move between each of the 3 states, and what causes each arrow. Label it N/A if it doesn't happen.



b. Name and justify a CPU scheduling algorithm that
   a. guarantees no starvation given a finite number of processes.
   b. can result in starvation.
   c. Is it possible that a CPU scheduling algorithm can result in a deadlock?

Q5. a. – CO2, b. – CO2, a . – BTL 5 , b. – BTL 3, (4+4)

a. Nicole Kidman, Penelope Cruz, and Mimi Rogers, like all members of Hollywood, often eat at Spago's. But Nicole, Penelope, and Mimi would rather NOT eat at Spago's on the same evening as one of the other two. Think of Spago's as a system resource (e.g., file). Think of Nicole, Penelope, and Mimi as three processes needing access to this resource Does the following solution to the critical section problem for three processes satisfy the desired mutual exclusion requirements (mutual exclusion, no deadlock, no starvation, process can enter empty critical section without delay)? Justify your response by discussing each of the critical section requirements, if the solution is correct; or one of the critical section requirements, if the solution is not correct.

have three flags (shared variables): Cole, Lope, and Mimi
have neon sign (shared variable) which flashes either "Nicole" or "Penelope" or "Mimi-R"
initially: all flags are down and sign flashes "Nicole"

Nicole	Penelope	Mimi

repeat
[play with kids];
raise Cole;
SIGN = Nicole;
while (((Lope is up)
OR (Mimi is up))
AND (SIGN == Nicole)) [do nothing];
[eat dinner];
lower Cole;
forever;
	repeat
	[call Tom];
	raise Lope;
	SIGN = Penelope;
	while (((Cole is up)
	OR (Mimi is up))
	AND (SIGN == Penelope)) [do nothing];
	[eat dinner];
	lower Lope;
	forever;
		repeat
		[make a movie];
		raise Mimi;
		SIGN = Mimi-R;
		while (((Cole is up)
		OR (Lope is up))
		AND (SIGN == Mimi-R)) [do nothing];
		[eat dinner];
		lower Mimi;
		forever;

Total No. of Pages: 03 *Roll No.:.....*

V SEMESTER

B.Tech.

END TERM EXAMINATION December-2024

MC 303 Stochastic Processes

Time: 3 Hours Max. Marks: 40

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

1)

a) Discuss generalized Poisson queuing model and write the formula for calculating the steady state probability of n customers in the systems. (2) [CO1] [BTL1]

b) Explain different steady state measures of performance in queuing systems. (2) [CO2] [BTL2]

c) Differential among trannsient state, recurrent state and absorbing state in context of markov chain with a suitable example. (3) [CO5] [BTL2]

d) Explain the recursive formulation of mean passage time. Discuss its significance in the analysis of Markov process. (3) [CO3] [BTL4]

2)

a) Describe a random walk with two absorbing barriers. Give a suitable example of any such real world process. Derive the probability of absorption at lower barrier. (6) [CO2, CO3] [BTL2]

b) Consider a simple random walk $X_n = \sum z_i$, and suppose it starts from 0. As usual, $P(z_i = 1) = p$, $P(z_i = -1) = q = 1 - p$. Compute $E(e^{\alpha X_n})$ $\alpha \in R$. Comment on the asymptotic behavior of X_n. (2) [CO2] [BTL3]

c) Can we analyze the random walk problem with Markov chain for obtaining the steady state probability? If so, what should be your assumptions on random walk problem? (2) [CO4] [BTL3]

3)

a) Assume that a computer system is in one of three states: busy, idle, or undergoing repair, respectively denoted by states 0, 1, and 2. Observing its state at 2 P.M. each day, we believe that the system approximately behaves like a homogeneous Markov chain with the transition probability matrix:

$$P = \begin{bmatrix} 0.6 & 0.2 & 0.2 \\ 0.1 & 0.8 & 0.1 \\ 0.6 & 0.0 & 0.4 \end{bmatrix}$$

Prove that the chain is irreducible, and determine the steady-state probabilities. (4) [CO4] [BTL3]

b) Prove the Chapman-Kolmogorov Equations $P_{ij}(t+s) = \sum_{k \in S} P_{ik}(t) P_{kj}(s)$ for continuous-time Markov chain with state space S. (4) [CO5] [BTL4]

c) Define continuous time Markov chain (CTMC) along with two real world example. (2) [CO5] [BTL2]

4)

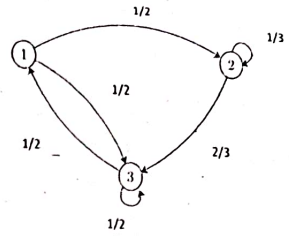
a) Discuss the consequences of higher expected waiting time in a queuing system. Discuss some suggestions to solve the issues raised due to higher expected waiting time. (2) [CO3] [BTL3]

b) For a small batch computing system, the processing time per job is exponentially distributed with an average time of 3 minutes. Jobs arrive randomly at an average rate of one job every 4 minutes and are processed on a first-come-first-served basis. The manager of the installation has the following concerns. (4) [CO2] [BTL3]

i) What is the probability that an arriving job will require more than 20 minutes to be processed (the job turn-around time exceeds 20 minutes)?

ii) A queue of jobs waiting to be processed will form, occasionally. What is the average number of jobs waiting in this queue?

c) Consider a continuous-time Markov chain X(t) with the jump chain shown in following Figure. Assume $v_1 = 2, v_2 = 3$ *and* $v_3 = 4$. Find the generator matrix G for the chain and steady state distribution of the states. (4) [CO2] [BTL3]



5)

a) Define Renewal process. Give two real world examples of renewal processes. Let $N(t)$ represents number of renewals upto time t and S_n represent time of nth renewal. Comment on the distribution of S_n if $N(t)$ follows the poission distribution. (3) [CO1] [BTL4]

b) Define the renewal function $H(t)$ and renewal density function $h(t)$ Derive the renewal equation $h(t) = f(t) + \int_0^t h(t-u) f(u) du \; t \geq 0$. (5) [CO3] [BTL5]

c) An ordinary renewal process has the renewal function $H(t) = \frac{t}{5}$. Determine the probability $Prob[N(15) < 2]$. (2) [CO2] [BTL4]

**********All The Best**********

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

B.Tech. V SEMESTER

END TERM EXAMINATION *Dec-2024*

MC305 (Operations Research)

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

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

Q.1 Solve the linear programming problem

$$Max.Z = \frac{3}{4}x_1 - 150x_2 + \frac{1}{50}x_3 - 6x_4$$

Subject to the constraints

$$\frac{1}{4}x_1 - 60x_2 - \frac{1}{25}x_3 + 9x_4 \leq 0$$

$$\frac{1}{2}x_1 - 90x_2 - \frac{1}{50}x_3 + 3x_4 \leq 0$$

$$x_3 \leq 1$$

And $x_1, x_2, x_3, x_4 \geq 0$ [CO1,2]

Q.2 Write the dual of the LPP and Solve it:

$$Max.Z = 3x_1 - 2x_2$$

Subject to the constraints

$$x_1 \leq 4$$

$$x_2 \leq 6$$

$$x_1 + x_2 \leq 5$$

$$-x_2 \leq -1$$

And $x_1, x_2, \geq 0$

[CO3]

Q.3 Solve the integer programming problem by the cutting plane method.

$$Max.Z = 7x_1 + 9x_2$$

Subject to the constraints

$$-x_1 + 3x_2 \leq 6$$

$$7x_1 + x_2 \leq 35$$

And $x_1, x_2, \geq 0$ *and are integers.* [CO3,4]

4 8 6

Q.4 Given transportation cost, supply, and demand quantity in the tabl
Find the initial basic feasible solution to the transportation problen

	M_1	M_2	Available
M_1	5.0	5.5	920
M_1^*	6.25	6.75	250
M_2	--	5.0	920
M_2^*	--	6.25	250
Requirement	800	1400	

[CO4]

Q.5 A small project consisting of eight activities and the probabilistic tin
are assign has mention in the following table

Time estimated (in days)

Activity	Most optimistic (t_0)	Most likely (t_m)	Most pessimistic (t_p)
1-2	3	6	15
1-6	2	5	14
2-3	6	12	30
2-4	2	5	8
3-5	5	11	17
4-5	3	6	15
5-8	1	4	7
6-7	3	9	27
7-8	4	19	28

a) Draw the network diagram.
b) Find the critical path. Also, find the expected duration of the proje
c) Calculate the Standard deviation of the project length.
d) Find the probability that the project will be completed in 31 day
[Z(2.166)= 0.4886]. [CO5]

(ii) Overload the addition, subtraction and multiplication operators for this class.

(b) Explain the concept of composition (objects as members of classes) with the help of a suitable C++ program. [CO4]

Q.5. [4×2=8 marks]

(a) What is deadly diamond of death problem in Java? Explain how this problem is handled in Java. [CO3]

(b) Find the error(s) in the given code. If there is no error, then write its output. [CO1]

```
class ok
{
 private int a;
 public static void main(String[ ] args)
  {
      ok obj = new ok();
       System.out.println(obj.a);
  }
}
```

Q.6. [4×2=8 marks]

(a) Write a Java program to create a method that takes an integer as a parameter and throws an exception if the number is odd. [CO5]

(b) Explain the concept of class templates in C++ with the help of a program. [CO5]

**********ALL THE BEST**********

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

Vth SEMESTER **B.TECH. [MCE]**

END-TERM EXAMINATION **(Nov/Dec - 2024)**

MC307: OBJECT ORIENTED PROGRAMMING

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

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

Q. 1. [4×2=8 marks]

(a) Consider the following program in Java: [CO2]

```
class Quiz
{
 int id=0;
 public static void main(String args[ ])
 {
      int x=0;
      Quiz[ ] hq = new Quiz[5];
      while(x<3)
      {
           hq[x] = new Quiz();
           hq[x].id = x;
           x = x+1;
      }
      hq[3] = hq[1];
      hq[4] = hq[1];
      hq[3] = null;
      hq[4] = hq[0];
      hq[0] = hq[3];
      hq[3] = hq[2];
      hq[2] = hq[0];
 }

}
```

In the above program, how many objects are created? Highlight at each step of the program, which reference variable is pointing to which object.

(b) Explain "super" and "this" keyword in Java with the help of brief Java programs. Can we use both these keywords in one constructor ? Explain with reason. [CO6]

Q.2. [4×2=8 marks]

(a) What is serialization and deserialization of objects in Java ? Explain with the help of a Java program. [CO6]

(b) Explain the concept of rethrowing an exception with the help of a C++ program. [CO4]

Q.3. [4×2=8 marks]

(a) Consider the following incomplete Java program: [CO3]

```
public class Test {
   public static void main(String [] args) {
        A a = new A();
        B b = new B();
        C c = new C();
        A a2 = new C();
        ----------------------        \\ insert missing statements here
        ----------------------
        ----------------------

   }
}

class A {
      int x = 7;
      void m1()
      {
            System.out.print("A's m1, ");
      }
      void m2()
      {
            System.out.print("A's m2, ");
      }
      void m3()
      {
            System.out.print("A's m3, ");
      }

}

class B extends A {
      void m1()
      {
            System.out.print("B's m1, ");
      }
}

class C extends B {
      void m3()
      {
            System.out.print("C's m3, ");
      }
}
```

There are some missing statements in the main function written above. Write the missing statements within the main function so that the complete program produces the following output. Note that three different reference variables must be used for the following output.

B's m1, A's m2, A's m3

Further, what should be the missing statements within the main function so that the complete program produces the following output. Note that only one reference variable must be used for the following output.

B's m1, A's m2, C's m3

(b) Differentiate between Arrays and ArrayList in Java. Explain the syntax and the member functions associated with ArrayList class in Java. [CO4]

Q.4. [4×2=8 marks]

(a) Create a class RationalNumber in C++ with following features: [CO4]

(i) Create a constructor that prevents a 0 denominator in the fraction, and reduces or simplifies the fractions that are not in reduced form.

Total no. of Pages: 1 489 Roll no.....

B.Tech. V SEMESTER

END TERM EXAMINATION *Dec-2024*

COURSE CODE: MC 319 **COURSE TITLE:** Complex Analysis

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

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

Q.1 (a) State and prove Poisson's integral formula for analytic function and derive for its real part. [5][CO1][L2]

(b) Expand the following in a Laurent series valid in the region indicated: (i) $z^n e^{1/z}$ $(|z| > 0)$ (ii) $e^{1/(z-1)}$ $(|z| > 1)$. [5][CO1][L3]

Q.2 (a) State and prove Weierstrass's theorem for sequence of analytic functions. [5][CO1][L2]

(b) Discuss the Gamma function in $\mathbb{C}$ and show that $\Gamma(z+1) = \Gamma(z)$ for $z \in \mathbb{C}$. [5][CO2][L3]

Q.3 (a) State and prove Hadamard's factorization theorem. [5][CO1][L4]

(b) Show that a locally uniformly bounded family of analytic functions $\mathcal{F}$ in a domain D is equicontinuous on compact subsets of D. [5][CO2][L4]

Q.4 a) Suppose that the boundary of a simple connected region Ω contains a line segment γ as a free boundary arc. Then show that the function f(z), which maps Ω onto the unit disk, can be extended to a function which is analytic and one-to-one on $\Omega \cup \gamma$. The image of γ is an arc γ' on the unit circle. [5][CO3][L5]

(b) State and prove Schwarz's theorem for harmonic functions. [M][CO2][L2]

Q.5 (a) State and prove Harnack's principle for harmonic functions. [5][CO2][L2]

(b) What is simple periodic functions. Find all the solutions of $\cos z = 2$. [5][CO4][L3]

Q. 6 State and prove the Riemann mapping theorem. [10][CO4][L6]

Total No. of Pages: 03 Roll No. _____

7th SEMESTER

B.Tech.

END SEMESTER EXAMINATION ***NOV-2024***

MC 405 GRAPH THEORY

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

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

ATTEMPT ANY 8 QUESTIONS

Q.1 [a] Show that there is no simple graph with six vertices of which the degrees of five vertices are 5,5,3,2, and 1. (3)[CO1][L2]

[b] Show that two graphs need not be isomorphic even if they have same size and order. (2)[CO1][L2]

Q.2 Let G be a network with source s, sink t, and integer capacities. Prove or disprove the following statements:

[i] In any network G with integer edge capacities, there always exists an edge e such that increasing the capacity of e increases the maximum flow value in G.

[ii] If all capacities are odd then there is a maximal flow f such that f(e) is odd for all edges e. (5)[CO1][L2]

Q.3. What is the chromatic number of an n-vertex (n >= 2), simple connected graph which does not contain any odd length cycle ? Prove. (5)[CO1,2][L3]

Q.4

[a] Find the values of n for which the graph K_n contain an Euler tour ? (2.5)[CO1][L3]

[b] Find a graph such that every vertex has even degree but there is no Euler tour. (2.5)[CO2,4][L3]

P.T.O.

Q.5 Prove that a tree with n vertices has $(n-1)$ edges. (5)[CO2][L2]

Q6. Define chord and branch of a graph. Find the number of chords in the graph of the circuit given below: (5)[CO3,4][L4]

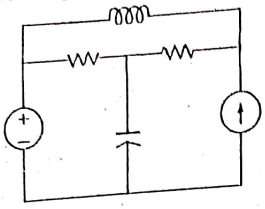

Figure 1: Circuit for calculating chords

Q7. Apply Prim's Algorithm to find the Minimal spanning tree in the weighted graph below: (5)[CO2,3,4][L3]

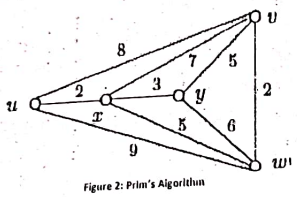

Figure 2: Prim's Algorithm

Q.8 Seven seniors Ben (B), Don (D), Felix (F), June (J), Kim (K), Lyle (L) and Maria (M) are looking for positions after they graduate. The University Placement Office has posted open positions for an accountant (a) , consultant (c) , editor (e) , programmer (p) , reporter (r), secretary (s) and teacher (t). Each of the seven students has applied for some of these positions:

B: c,e
D: a,c,p,s,t
F: c,r
J: c,e,r
K: a,e,p,s
L: e,r
M: p,r,s,t

Is it possible for each student to be hired for a job for which he or she has applied? (5)[CO3,4][L5]

P.T.O.

Q.9 Eight chemicals are to be shipped across country by [illegible]. The cost of doing this depends on the number of containers shipped. The cost of shipping one container is \$125. For each additional container the cost increases by \$85. Some chemicals interact with one another and it is too risky to ship them in the same container. The chemicals are labeled by *c1, c2, ···, c8* and chemicals that interact with a given chemical are given below:

c1: c2,c5,c6
c2: c1,c3,c5,c7
c3: c2,c4,c7
c4: c3,c6,c7,c8
c5: c1,c2,c6,c7,c8
c6: c1,c4,c5,c8
c7: c2,c3,c4,c5,c8
c8: c4,c5,c6,c7

What is the minimum cost of shipping the chemicals and how should the chemicals be packed into containers? (5)[CO3,4][L5]

Q. 10 Prove that every circuit has even number of edges in common with any cut-set. (5)[CO2][L3]

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B.Tech. (MC) VII Semester

END SEMESTER EXAMINATION Nov-Dec 2024

MC407: CRYPTOGRAPHY AND NETWORK SECURITY

Time: 3:00 Hours Maximum Marks: 50

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

1(a) Explain in detail the concepts of active and passive security threats with examples. Identify the type of security attacks that compromise data integrity.

[5 Marks] [CO1, CO2, L1]

1(b) What are weak keys in DES? What is the difference between a week key, a semi weak key and a possible weak key in DES?

[5 Marks] [CO2, L1, L4]

2(a) Using Chinese remainder theorem find an integer that has a remainder of 3 when divided by 7 and 13, but is divisible by 12.

[5 Marks] [CO2, L3]

2(b) Alice uses Bob's RSA public key (e = 7, n = 143) to send the plaintext P = 8 encrypted as ciphertext C = 57. Show how Eve can use the chosen-ciphertext attack if she has access to Bob's computer to find the plaintext.

[5 Marks] [CO2, L5]

3 (a) Assume that Alice uses Bob's ElGamal public key ($e_1 = 2$ and $e_2 = 8$) to send two messages P = 17 and P' = 37 using the same random integer r = 9. Eve intercepts the ciphertext and somehow, she finds the value of P = 17. Show how Eve can use a known-plaintext attack to find the value of P'.

[5 Marks] [CO3, L4]

3 (b) Show an example of the vulnerability of RSA digital signature scheme to selective forgery when the values of p and q are small. Use p = 19 and q = 3.

[5 Marks] [CO3, L4]

4 (a) Define message authentication code (MAC). Explain, with an example, the working of MAC.

[5 Marks] [CO3, L2]

P.T.O.

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4 (b) Define hash functions. Explain three security requirements of hash functions. **[5 Marks] [CO3, L2]**

5 (a) Explain the working of the Kerberos authentication protocol. Discuss its architecture, key components, and the significance of using tickets in the authentication process. **[5 Marks] [CO3, L4]**

5 (b) Differentiate between SSL and TLS. Explain their roles in secure communication and the steps involved in the TLS handshake process. **[5 Marks] [CO4, L5, L2]**

6 (a) Compare PGP and S/MIME as email security protocols. Discuss their key features, similarities, and differences. **[5 Marks] [CO4, L4, L2]**

6 (b) Describe the Encapsulating Security Payload (ESP) in IPsec. Highlight its structure, functionality, and advantages over the Authentication Header (AH). **[5 Marks] [CO4, L4, L2]**

~End~

Total No. of Pages: 01 494 Roll no.....

8th SEMESTER

B.Tech.

END SEMESTER EXAMINATION November-2024

COURSE CODE: MC 409

COURSE TITLE: Mathematical Modeling and Simulation

Time: 3:00 Hours Max. Marks: 40

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

Q.1 Obtain the cubic spline fit for the data

x	0	1	2	3
$f(x)$	1	0	1	10

Hence or otherwise compute $f(4)$ and $f'(2)$. [7][CO 1, 5][BTL 3, 5]

Q.2 Compare discrete and continuous models of population growth. What are the advantages and limitations of each approach? [6][CO2, 4][BTL 2, 4]

Q.3 Solve the recurrence relation

$$a_n = 3a_{n-1} + 4a_{n-2} \text{ with } a_0 = a_1 = 1$$ [5][CO 3][BTL 5]

Q.4 Consider the Lotka-Volterra equations:

$$\frac{dx}{dt} = x(1-y), \quad \frac{dy}{dt} = -y + xy$$

Find the equilibrium points and determine their stability. Sketch the phase plane. [7][CO 1, 3][BTL 2, 4, 5]

Q.5 Derive the differential equations for the SI model. Solve for the number of infected individuals as a function of time and discuss the long-term behaviour of the epidemic. [7][CO 2, 3][BTL 2, 3 4]

Q.6 Formulate a mathematical model for a predator-prey system where the prey protect their young from the predators. The model should have three dependent variables: $X_1(t)$, the juvenile prey numbers; $X_2(t)$, the adult prey numbers; and $Y(t)$, the predator numbers. In your model the juvenile prey are completely sheltered from the predators. [8][CO 2, 5][BTL 2, 3]

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

VII SEMESTER

B.Tech.

END TERM EXAMINATION November-2024

MC 419 Machine Learning

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

Note: Answer any five questions. (Assume suitable missing data, if any.)

1)
a) Explain why decision trees are suitable for problems involving categorical and continuous data. [5] [CO2] [L2]
b) Demonstrate how the EM (Expectation-Maximization) algorithm can be used to estimate parameters in a mixture of Gaussian models. [5] [CO1] [L3]

2)
a) Explain the concept of a kernel function in SVMs and its role in handling nonlinear data using a suitable example. [4] [CO2] [L2]
b) Propose a novel method for reducing the computational complexity of training SVMs on large datasets. Explain how this method addresses scalability issues. [6] [CO3] [L6]

3)
a) Explain the difference between maximum likelihood estimation and least squared error hypotheses. [4] [CO2] [L2]
b) Analyze the assumptions of Naive Bayes in scenarios with highly correlated features. How does it affect classification accuracy? [6] [CO3] [L4]

4)
a) Describe how the choice of activation function affects the output of a perceptron and a multi-layer neural network. [5] [CO2] [L2]
b) Demonstrate the working of K-means clustering algorithm. How one can dynamically adjusts the number of clusters based on data distribution? [5] [CO5] [L3]

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5)

a) Demonstrate how the Gini index and entropy can be used as alternative measures for selecting attribute values during tree construction. [4] [CO1] [L3]

b) Illustrate the impact of using ReLU versus sigmoid activation functions in a deep neural network mathematically. How does it affect the vanishing gradient problem? [6] [CO4] [L3]

6)

a) Examine the impact of overfitting in decision trees with a suitable example of your choice and explain how pruning can mitigate it. [4] [CO4] [L3]

b) Evaluate the impact of using different distance metrics (e.g., Euclidean vs. Manhattan distance) in KNN. How does it affect classification accuracy? [6] [CO3] [L5]

**********All The Best**********

Total no. of Pages: 03 *Roll no.....*

VII / V SEMESTER **B.Tech.**

END TERM EXAMINATION ***Nov-2024***

COURSE CODE MBA-105 COURSE TITLE -Financial and cost accounting

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 Explain any two of the following concepts:

(i) Money Measurement concept

(ii) Cost concept

(iii) Business entity concept

(b) Define Trial balance. Why it is prepared?[M 5+5][CO1,2][BTL2]

Q.2 (a)

(i) Calculate amount of annul depreciation and rate of depreciation under straight line method (SLM) from following information,

X Ltd. purchased as second hand machinery for 96,000, spent 24,000 on its cartage, repairs and installation, estimate useful life of machine is 5 years. Estimated residual (scrap) value is 72,000.

(ii) Distinguish between Straight line method and written down value of depreciation. [M 3+2][CO3][BTL3]

(b)The following transactions occurred during the month of June 2024

June 1 Beginning Inventory 800 units at ₹50 each.
June 5 Purchase 400 units at ₹55 each.
June 10 Sale 600 units.

June 15 Purchase 700 units at ₹60 each.
June 20 Sale 600 units.
June 30 Purchase 400 units at ₹65 each.

Calculate the value of the ending inventory using FIFO method

[M 5][CO3][BTL3]

Q.3 (a)

(i) Give two examples each of current assets and current liabilities.

(ii) Explain any three characteristics of financial statements.

(iii) Mention any two reasons why supplier would be interested in analysis of financial statement. [M 1+2+2][CO4][BTL4]

(b) Prepare a balance sheet for XYZ Ltd. using assumed figures to balance total assets with total liabilities and shareholders' equity.

[M 5][CO4][BTL4]

Q.4 (a) (i) From following data calculate, Current ratio and Liquid ratio

	Amount		Amount
Short term investment	81,900	Outstanding expenses	38,220
Stock	99,645	Prepaid expenses	2.730
Sundry debtors	1,73,355	Bank overdraft	54,600
Cash in hand	27,300	Bills payable	43,680
Bills receivable	24,570	Sundry creditors	68,250

(ii) Calculate gross profit ratio and net profit ratio from following figures

Sales	1,50,000
Cost of goods sold	1,20,000
Operating expenses	12,000

[M 3+2][CO4][BTL5]

(b) Classify the following transactions as belonging to operating, investing or financing activities, while preparing cash flow statement

Cash sale of goods	Sale of fixed assets
Rent received	Income tax paid
Cash purchase of goods	Loss on sale of machinery
Cash received from debtors	Purchase of land and building
Issue of equity shares	Repayment of bank loan

[M 5][CO4][BTL5]

Q.5 (a) Differentiate between

(i) Fixed and variable cost

(ii) Direct and indirect cost [M 5][CO5][BTL4]

(b) Following information is given for period ending 31st March 2023

Particulars	Amount
Stock of raw material as on 1.4.2022	12,500
Purchase of raw material	1,36,000
Stock of raw material 31.3.2023	8,500
Direct wages	54,000
Direct expenses	12,000
Factory overheads	100% of direct wages
Office and administration overheads	20% of work cost
Selling and distribution overheads	26,000
stock of finished goods 1.4.2022	12,000
stock of finished goods 31.3.2023	15,000
Profit on cost is 20%	

Calculate-

(i) Prime cost (ii) Work cost (iii) Cost of production (iv) Profit

[M 5][CO5][BTL4]

Q-6 (a)Who are the primary users of financial statements, and what are their main interests when analysing a company's financial performance?

(b) Discuss the different types of decisions that managers might make based on insights gathered from internal financial statements.

[M5+5][CO1][BTL3]

M99

Total no. of Pages:02

Roll no.....

Fifth Semester

BTech

END TERM EXAMINATION

Nov-2024

MG-301: Fundamentals of Management

Time: 03:00 Hours

Max. Marks: 50 Marks

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

Q.1 Q1. Analyse the key stages in the new product development process. How would you prioritize these stages if you were launching a product in a highly competitive market, and why? [10 Marks] [CO 3,4] [BTL3,4]

Q2. How does the SECI model of knowledge creation serve as a dynamic framework for transforming tacit insights into explicit strategies, driving innovation and organizational growth? [10 Marks] [CO 5] [BTL1, 4]

Q3. ABC Cafe, a mid-sized coffee shop, has seen a decline in customer visits over the past six months. Competitors are offering loyalty programs, eco-friendly initiatives, and live music events. The management wants to revamp its marketing strategy. Assume you are hired as a marketing consultant. Develop a comprehensive strategy for ABC Cafe addressing all 7 Ps to attract more customers and capture more market share. [10 Marks] [CO 4] [BTL2, 6]

Q4. Analyse how the primary objectives of financial management—profit maximization, wealth maximization, and liquidity management—interact to influence organizational decision-making. Discuss how these objectives must be balanced to adapt to contemporary business challenges.

[10 Marks] [CO 1,3] [BTL4]

Q5. ABC Ltd., a leading manufacturing company, recently faced criticism for violating environmental regulations and not disclosing key information about its waste disposal practices in its annual report. To restore stakeholder confidence, the company plans to implement stronger corporate governance practices and introduce a comprehensive Corporate Social Responsibility (CSR) program. The proposed CSR initiatives include:

1. Setting up a fund to support local community development projects.
2. Reducing carbon emissions by 30% over the next five years.
3. Publishing quarterly reports [illegible]

SOD

Analyse how the company's proposed initiatives align with the principles of corporate governance. Discuss how these measures can help improve transparency, stakeholder trust, and long-term business sustainability.

[10 Marks] [CO 2,3] [BTL4, 5]

Q6. Tata Steel, one of India's largest steel manufacturers with a significant global presence, faces challenges from its reliance on raw materials like iron ore and coal, which are controlled by a few key suppliers. Additionally, its buyers, including major industries like automotive and construction, exert significant price pressures. The company also faces stiff competition from global players such as ArcelorMittal and POSCO. Apply Michael Porter's Five Forces Model to analyse how Tata Steel can address these competitive dynamics.

[10 Marks] [CO 1,2] [BTL1,4]

Total no. of Pages: 02 501 Roll no.....

IIIrd SEMESTER

B.Tech.

END TERM EXAMINATION *Nov-2024*

MA 261: Numerical & Engineering Optimization Methods

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) Write an algorithm to solve algebraic equation using NR method. [4][CO1][BTL1]

(b) Determine the root of the following equation correct upto 3 decimal places using Newton Raphson method.

$$x^3 - 3x + 1 = 0$$ [4][CO1][BTL3]

Q.2 (a) Using 4th order Runge Kutta method, find $y(0.2)$ for the following equation:

$$\frac{dy}{dx} = \frac{cosx}{2y-1}$$

given that $y(0) = 2$ and $h = 0.1$. [4][CO1][BTL3]

(b) Convert the following Linear Programming Problem (LPP) to standard form:

Minimize $Z = 3x_1 + 4x_2$

s.t.

$2x_1 - x_2 - 3x_3 = -4$

$3x_1 + 5x_2 + x_4 = 10$

$x_1 - 4x_2 = 12$

$x_1, x_3, x_4 \geq 0$; x_2 *is unrestricted.* x_3, x_4 are slack/surplus variables. [4][CO2][BTL2]

Q.3 Solve the following Linear Programming Problem (LPP) by Simplex method:

Maximize $Z = 5x_1 + 3x_2$

s.t.

$x_1 + x_2 \leq 2$

$5x_1 + 2x_2 \leq 10$

$3x_1 + 8x_2 \leq 12$

$x_1, x_2 \geq 0$ [8][CO2][BTL4]

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Q.4 (a) Write the Fibonacci series. Derive the Golden ratio from the Fibonacci series.

(b) Minimize $f(x) = x^2 - 2.6x + 2$ in the interval [-2, 3] using Golden Section method. Perform four (04) iterations. [4][CO3][BTL3]

Q.5 Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ starting from the point $X_1 = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ using Univariate method. Perform three iterations. [8][CO3][BTL3]

Q.6 (a) State mathematically general nonlinear problem with equality and inequality constraints. Name the various techniques used to solve the constrained problems. [4][CO4][BTL1]

(b) Explain a method for solving a multivariable constrained nonlinear problem. [4][CO4][BTL2]

Q.7 Maximize the following function using PSO.

$f(x) = -x^2 + 2x + 12$

in the range $-2 \leq x \leq 2$

Use 4 particles with initial positions $x_1 = -1.5$, $x_2 = -1.5$, $x_3 = 1.25$ and $x_4 = 0.5$. Assume $C_1 = C_2 = 1.0$; $r_1 = 0.35$ $r_2 = 0.95$. Show detailed computation for three (03) iterations and comment on the results obtained. [8][CO5][BTL4]

Q.8 Write notes on *any two* of the following: [4x2=8][CO5][BTL1,2]

(a) GA Operators

(b) Advantages of PSO

(b) Pattern Search Method

(d) Steepest Descent Method

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Roll. No. ----------

Total no. of pages: 2

B.Tech. (2nd SEMESTER)
PE-201 ENGINEERING MATERIALS AND METALLURGY

NOV/DEC 2024

END TERM EXAMINATION

Time: 03:00 Hours

Max. Marks: 40

Note: Answer all the questions.
Assume missing data.

Q.1 For a BCC iron, determine (i) Inter-planar spacing (ii) Diffraction angle for the (220) set of planes. The lattice parameter for Fe is 0.2866 nm. Assume that monochromatic radiation have a wavelength of 0.1790 nm with order of reflection as one. **[10 Marks] CO-1**

OR

Discuss various point imperfections in a crystal in detail. Calculate the number of vacancies in copper at room temperature of 20°C. Assume Boltzmann Constant k = 0.0000862 eV/atom-k and free energy required to form the defect (E_d = 0.9 eV/atom) at room temperature, the density of copper ρ = 8.94 g/cc at 20°C, atomic weight of copper A_{Cu} = 63.55 g/mole. **[10 Marks] CO-1**

Q.2 Write the composition and applications of following alloys:

(a) Al-bronze, Babbit metals

(b) Brasses and Muntz metal

(c) Inconel **[10 Marks] CO-2**

OR

What do you mean by galvanic corrosion? Discuss the mechanism, causes, and preventive measures for galvanic corrosion with the help of diagrams in detail. **[10 Marks] CO-2**

Q.3 Classify the heat treatment processes commonly employed in engineering practice. Describe Carburising, Cyaniding, and Nitriding processes with the help of diagrams. **[04 Marks] CO-3**

5.4

Q.4 Classify phase diagrams on the basis of components present in the system. Draw iron-carbon phase diagram and describe the invariant reactions involved in detail. **[04 Marks] CO-3**

Q.5 Define the terms creep and creep strength. Draw and discuss the creep curve for metals. **[04 Marks] CO-4**

Q.6 Classify composite materials on the basis of type of matrix material present and describe the metal matrix composites. **[04 Marks] CO-5**

Q.7 Write short notes on the following:

(a) Powder Metallurgy **[02 Marks] CO-6**

(b) Applications on the polymer matrix composites in industry. **[02 Marks] CO-5**

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Roll No. .....

B.Tech. (PE)

NOV 2024

Total No. of Pages -1

IIIrd SEMESTER

END TERM EXAMINATION

PE 203hTHERMAL ENGINEERING I

Max. Marks: 40

Time: 3 Hours

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

Steam table and Mollier chart permitted

1(a) State and explain first law of thermodynamics for a process and cycle. Derive the expression for workdone during an isentropic process.

(b) In a gas turbine the gas enters at the rate of 6 kg/s with a velocity of 60 m/s and enthalpy of 1050 KJ/kg and leaves the turbine at the velocity of 160 m/s and enthalpy of 450 KJ/kg. The loss of heat from the gases to the surrounding is 900 KJ/min. Determine the power output of the turbine. State assumptions made. (4,4) [CO1]

2(a) State and explain (i) Carnot theorem (ii) TD temperature scale.

(b) A reversible heat Engine receives heat from two thermal reservoirs maintained at constant temperatures of 900 K and 600 K. The engine develops 70 kW and rejects 2400 kJ/min of heat to a sink at 300 K. Determine thermal efficiency of the engine and heat supplied by each thermal reservoirs. (4,4) [CO2]

3(a) Explain the process of steam generation and show the various stages on T-h diagram.

(b) Steam at 20 bar and 250^0 C is available. Determine the final quality of steam in each of the following case:

(i) 225 kJ/kg of heat is removed at constant pressure

(ii) It is cooled at constant volume till its temperature falls to 170^0 C. (3,5) [CO3]

4(a) Explain the working principle of rankine steam power cycle with neat sketch. Draw Ts diagram and writedown the expression for efficiency of cycle and steam consumption.

(b) Steam at 90 bar and 450^0 C is supplied to a turbine plant and steam expands in HPT till it becomes dry saturated. The steam is reheated to its initial temperature in a reheater and expands to 0.1 bar in LPT. Determine the reheat pressure of steam, quality of steam leaving LPT and thermal efficiency of the cycle. (3,5) [CO3]

5(a) Explain the difference between a fire tube boiler and water tube boiler. State which type of boiler is used for power generation and why?

(b) Why mountings are essential in a boiler? Name the different boiler mountings and accessories and state function of each. (4,4) [CO4]

6(a) Define the function of a nozzle. Explain with the help of h-s diagram the effect of friction on flow through a steam nozzle and define nozzle efficiency.

(b) Steam at 12 bar and 200^0 C expands in a convergent divergent nozzle to a exit pressure of 1 bar and the nozzle is required to discharge 2 kg of steam / s. Determine (i) the velocity of steam at throat and exit (ii) C.S. area of nozzle at throat and exit. (3,5) [CO5]

7(a) What is principle operation of a steam turbine? Make a comparison between the impulse and reaction type steam turbines.

(b) Define blade efficiency of a steam turbine. Derive the expression for blade efficiency, condition for maximum blade efficiency and maximum blade efficiency of impulse steam turbine. (3,5) [CO6]

Total no. Of Pages:02 506

THIRD SEMESTER B.Tech. [PE]

END TERM EXAMINATION *November-2024*

PE205 MANUFACTURING MACHINES

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

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

[a]	What is the main function of a lathe? State the function of lathe parts.	[CO #1]	5
[b]	Differentiate between Capstan and Turret lathe.	[CO #2]	3
2	State with sketches and show the job- tool motion of the following lathe operations: (i) Eccentric turning (ii) Spinning (iii) Knurling (iv) Parting-off	[CO #1]	8
3[a]	Enumerate the machining parameters and related quantities in shaping.	[CO #1,3]	5
[b]	What are the advantages of a step-less drive? Name some commonly used mechanical step-less drives.	[CO #4]	3
4	Sketch different views of a twist drill and state its various elements and angles.	[CO #3]	8
5[a]	What is up-milling and down-milling? Explain any two types of milling cutters.	[CO #3]	5
[b]	What is meant by machine tool testing? Explain its importance.	[CO #4]	3

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6[a] A taper pin of length 80 mm has a taper length of 48 mm. The larger diameter of taper is 83 mm and the smaller diameter is 73 mm. Determine (i) Taper in mm/meter and in degrees (ii) The angle to be set on compound slide for turning the taper on lathe (iii) The tail stock set over. [CO # 5]

[b] Enumerate the machining parameters and related quantities in drilling. [CO # 3]

7[a] How a grinding wheel is designated? Discuss the essential factors for selecting a grinding wheel. [CO # 5]

[b] Name the gear generating cutting processes. Explain the gear shaping process. [CO # 3]

----------End----------

SD 8

Total No of Pages...Two... *Roll No.....*

Third Semester B Tech [Prod. & Indl. Engg.]

End Semester Examination (November – 2024)

PE - 205 MECHANICS OF SOLIDS

Paper Code Title of the Subject

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. (4x02=08) CO 01

(i) – Principal Stress and Strain.

(ii) – Flexural Rigidity and Torsional Rigidity.

(iii) – Beam and Column.

(iv) – Fixed Beam and Continuous beam.

No 2 (a) A 1.35 m long concrete post is reinforced with six steel bars each with a 28 mm diameter. Knowing that the modulus of elasticity of steel is 200 GPa and modulus of elasticity of concrete is 29 GPa, determine the normal stresses in concrete and steel when a 1560 kN axial centric force P is applied to the post. (04) CO 04

No 2 (b) A hollow steel column has to carry an axial load of 2,00,000 kg. If the external diameter of the column is 25 cm, find its internal diameter, taking the ultimate stress for the steel column to be 4800 kg/cm^2 and considering factor of safety of 4. (04) CO 02

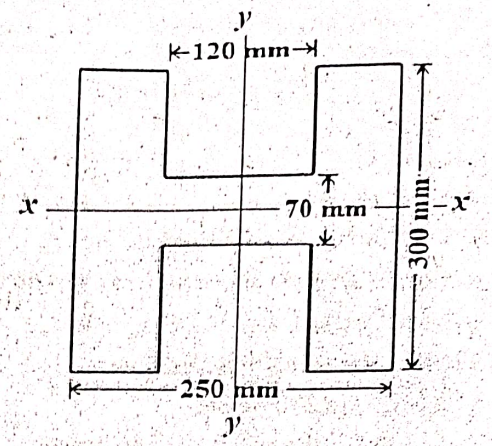
No 3 (a) Determine the elongation of a right circular cone due to its self-weight, whose axial length is L with base diameter D, which is made of steel having modulus of elasticity E and density ρ. It is hanging vertically with circular base fixed at the top and its vertex downside. (04) CO 03

No 3 (b) Establish relationship between all the Elastic constants. (04) CO 02

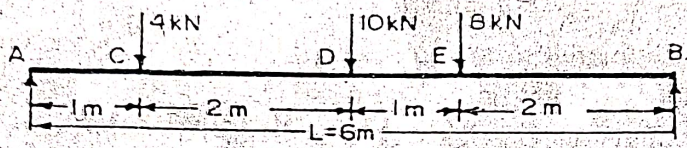
No 4 (a) A cylindrical shaft of steel of yield strength 700 MPa and shear strength 400 MPa is subjected to static loads consisting of bending moment 15 kNm and a torsional moment 25 kNm. Determine the safe diameter of the shaft using maximum normal stress theory and maximum shear stress theory. Take E = 210 GPa & Poisson's ratio = 0.25. (04) CO 03

No 4 (b) A steel shaft transmits 140 horse power at 160 rpm. If the shaft diameter is 100 mm, find the Torque on the shaft and the maximum shear stress induced. Find also the twist of the shaft in a length of 6 meters. Take G = 8.0 x 10^5 kg/cm^2. (04) CO 01

Q No 5 (a) Find out the Moment of Area of the following H shape cross section about its centroidal $x-x$ and $y-y$ axis. (04) CO 02



Q No 5(b) Draw the SFD & BMD of the following Beam, under loading as shown. (04) CO 04



Q No 6(a) Make a comparison between Section modulus of a solid cylindrical shaft of diameter 50 mm and hollow cylindrical shaft with external diameter 60 mm and thickness of 08 mm. (04) CO 03

Q No 6(b) Find out the slope and deflection at the free end of a cantilever of length **L**, having uniformly distributed load w up to length l from its fix end. Modulus of Elasticity of the material is E and moment of area of the cross section of the beam is **I**. (04) CO 02

Q No 7(a) A column 2.50 meters long is 6 cm in diameter. One end of the column is fixed while its other and is hinged. Find the safe compressive load for the member using Euler's formula allowing a factor of safety of 3.5. Take $E=2.1\times10^6\ kg/cm^2$. (04) CO 04

Q No 7(b) Explain various Theories of Failure in brief. (04) CO 02

Q No 8 Write Short Notes on any Two of the following. (2x04=08) CO 01

(i) – Mohr's Circle.

(ii) – Cylinders & Spheres.

(iii) – Mechanical Properties.

(iv) – Rankine's equation of Columns.

Total no. Of Pages:02 S/O Roll No .....

THIRD SEMESTER

B.Tech. (PE)

END TERM EXAMINATION *November-2024*

PE207n MACHINE TOOLS and MANUFACTURING

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

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

1[a] What are the health hazards due to cutting fluids? Discuss the various types of cutting fluids. [CO #1] 5

[b] How do you differentiate between orthogonal cutting and oblique cutting? [CO #1] 3

2[a] What are the various types of work holding devices generally used in a lathe? Distinguish between face plate and a driving plate. [CO #2] 5

[b] What are the various methods of taper turning in a lathe machine? What are the advantages of using a taper turning attachment? [CO#2] 3

3[a] Discuss the principal parts of a Radial drilling machine. [CO#3] 5

[b] What are the benefits of having NC and CNC machines in place of conventional machines? [CO#2] 3

4 Explain with sketches the following milling operations: [CO#4] 8
(i) Angular milling
(ii) Straddle milling
(iii) T- slot milling
(iv) Form milling

5[a] Differentiate between shaping and planning machines. [CO#5] 5

[b] What do you mean by indexing? Name the different types of indexing. Explain the method of plain indexing. [CO#4] 3

6[a] A cast iron block of 190 mm length and 100 mm width is to be machined on a shaper. The ratio of forward speed to reverse speed is 0.7. Determine the time of machining the face and metal removal rate if the mean cutting speed is 20m/min, depth of cut is 3mm and table feed is 0.3 mm/stroke. [CO#5] 5

[b] Explain the functional difference between a Straight fluted drill and Twist drill. [CO#3] 3

7[a] Specify a grinding wheel with the following wheel designation:
45A60L5V33. [CO#6] 4

[b] Describe in brief the honing and lapping processes. [CO#6] 4

S/2

Total No of Pages...Two... *Roll No.....*

Third Semester **B Tech [Prod. & Indl. Engg.]**

End Semester Examination *(November - 2024)*

PE - 207 Engineering Analysis and Design (Modeling and Simulation)

Paper Code **Title of the Subject**

Time: 03 Hrs. **Max Marks. 40**

Note : Question No. 01 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 1 Answer the following Questions in brief. **(2x04=08)** **CO 01**

(i) – What is Varignon's theorem?

(ii) – What is Transmissibility of Force?

(iii) – Differentiate between Beam and Column.

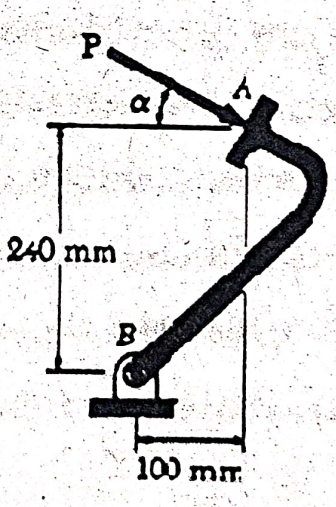
(iv) – Differentiate between Modulus of Elasticity & Modulus of Rigidity.

Q No 2(a) What are the steps of Engineering Design process? Discuss in brief. **(04)** **CO 04**

No 2(b) Discuss any Case study of the Situation, when the failure would have been caused by some fault in Design, in brief. **(04)** **CO 02**

No 3(a) What are various Equivalent systems of Forces? Explain in brief. **(04)** **CO 03**

No 3(b) A force P is applied to the brake pedal at A. Knowing that P = 450N and α = 30°, determine the moment of P about B. **(04)** **CO 02**



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Q No 4(a)	What are the fundamental principles of Ethics for Professional Engineers? Discuss in Brief.	(04)	CO 01
Q No 4(b)	What are the guidelines for writing a good Technical report? Discuss its features in brief.	(04)	CO 04
Q No 5(a)	What is Flexure formula? Explain all the terms of it. A steel wire of 08 mm diameter is bent into a circular arc of 22 m. Determine the maximum stress induced in it. (E = 200 GPa).	(04)	CO 03
Q No 5(b)	What do you understand by Torsional rigidity? Design a Steel shaft, having shear strength as 92 N/mm^2. The shaft is being operated by a Motor of 960 kw, running at 1600 rpm.	(04)	CO 01
Q No 6(a)	Draw Stress strain diagram of mild steel, showing & explaining different distinct points on it.	(04)	CO 03
Q No 6(b)	A steel bar, which is 50 mm wide, 12 mm thick and 300 mm long is subjected to an axial pull of 84 kN. Find the change in the length, width, thickness and volume of the bar. Take E = 2×10^5 N/mm^2 & Poisson's ratio = 0.32.	(04)	CO 02
Q No 7(a)	What are the purpose and features of CREO software? Also discuss about its various modules in brief.	(04)	CO 04
Q No 7(b)	Write any 4 Commands/Options used in the CREO Parametric Software for converting 2D sketches into 3D. Explain with Examples in brief.	(04)	CO 02
Q No 8	Write Short Notes on any Two of the following. (i) – Unethical Behavior (ii) – Poster presentation. (iii) – Theories of Failure. (iv) – Design Softwares.	(2x04=08)	CO 01

Total no. of Pages: 2

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Roll No.....

THIRD SEMESTER
END SEMESTER EXAMINATION

B. Tech (PE)
NOV./Dec.-2024

PE209n: QUANTITATIVE TECHNIQUES

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

Note: 1. Attempt any five questions.
2. Each question carries equal marks
2. Use of non-programmable calculators and statistical tables are Permitted.
3. Assume missing data, if any.

1 (a) What is central tendency? Describe about skewness and kurtosis with neat sketch? [CO1]

(b) The following data give the daily emission (in tonnes) of SO_2 from an Industrial plant observed for 80 days. Calculate the mean, mode, variance and standard deviation of the daily emission. Also, find the Karl Pearson's measure of skewness.

Emission	5-8.99	9-12.99	13-16.99	17-20.99	21-24.99	25-28.99	29-33
No. of days	3	10	15	24	17	9	2

[CO1]

2 (a) What do you understand by Bernoulli's trials. Derive the expression for mean and variance of Binomial distribution. [CO2]

(b) A random sample of 510 coins has the mean weight of 28.57 gm with standard deviation of 1.25 gm. Another random sample of 390 coins has the mean weight of 29.62 gm with standard deviation of 1.42 gm. Can the samples be considered to be drawn from the same population? Assume 5% level of significance. [CO3]

3 (a) Solve the following LPP:

$$Max\ Z = 3x_1 + 2x_2 + 5x_3$$

Subject to

$$x_1 + x_2 + x_3 \leq 9$$
$$2x_1 + 3x_2 + 5x_3 \leq 30$$
$$2x_1 - x_2 - x_3 \leq 8$$
$$x_1, x_2, x_3 \geq 0$$

[CO4]

(b) By using the graphical approach explain the following terms
(i)Multiple Solution (ii) No feasible solution (iii) Unbounded solution.

[CO4]

S 15

4 (a) Find the initial basic feasible solution to the following Transportation Problem using: Vogel's approximation method. Then find optimal solution.

		Destinations					
		P	Q	R	S	T	Supply
Origin	A	2	11	10	3	7	4
	B	1	4	7	2	1	8
	C	3	9	4	8	12	9
Demand		3	3	4	5	6	

[CO5]

(b) Find optimal solution to the following assignment problem:

	I	II	III	IV	V
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	13

[CO5]

5 (a) The following matrix gives the payoffs of different strategies S_1, S_2, S_3 against different conditions N_1, N_2, N_3 and N_4. Indicate the decision taken under the following approach:
(i)Pessimistic (ii) Optimistic (iii) Equal Probability (iv) Regret

	N_1	N_2	N_3	N_4
S_1	4,000	-100	6,000	18,000
S_2	20,000	5,000	400	0
S_3	20,000	15,000	-2,000	1,000

[CO6]

(b) Solve the following game by using dominance principle. Then find optimal strategies for both the players with game value.

		Player Y			
		A	B	C	D
Player X	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

[CO6]

6 Discuss any four of the following:
(a) Analysis of variance (ANOVA)
(b) Regression Analysis
(c) Sequencing Models
(d) Decision Tree
(e) Duality
(f) Random varialbe

[CO1]

Total No. of Pages 02

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THIRD SEMESTER **B.Tech. (ME)**

END TERM EXAMINATION *November-2024*

Paper Code : PE251 **Engineering Material and Metallurgy**

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)	Draw Iron – carbon (Fe-C) diagram and mark all the phases and explain the reactions?	(6) (CO 4)
Q.1(b)	Derive the equation for Gibb's phase rule.	(2) (CO 4)
Q.2(a)	Explain the Griffith theory on brittle fracture and deduce an expression for the critical stress required to propagate a crack simultaneously in a brittle material?	(6) (CO 2)
Q.2(b)	A material with a fracture toughness (σf) of 80 MPa$\sqrt{m}$ has a critical crack length of 0.05 mm. Calculate the surface energy (γ) of the material. Take E=120GPa.	(2) (CO 2)
Q.3(a)	Write down any three methods for powder production in powder metallurgy. Write step involved in the production of cemented carbide tools.	(5) (CO 6)
Q.3(b)	Discuss the processes of annealing and normalizing in terms of their effects on the microstructure of metallic materials.	(3) (CO 5)
Q.4(a)	Discuss the three stages of a creep curve in detail. Draw a diagram and explain the mechanisms operating in each stage.	(4) (CO 2)

4a	Differentiate between 520 Chance causes and Assignable Causes p- chart and np chart Producer's Risk and Consumer's Risk	4	CO3
4b	Control charts are maintained on a certain quality characteristics. The subgroup size is 4. The value of X bar and R are computed after each subgroup. After 25 subgroups, $\sum X$ bar = 4125 and $\sum R$ = 118. Compute the value of the 3 sigma limits for the X bar and R charts and estimate the value of σ' on the assumption that the process is in statistical control.	4	CO3
5a	Design a Sequential sampling plan for the following parameters $\alpha = 0.05$ $\beta = 0.25$ $p_1 = 0.10$ $p_2 = 0.30$ Also compute: (i) Average outgoing quality when $p=p_1$ (ii) Minimum number of items inspected for accepting the lot (iii) Minimum number of defectives for rejecting the lot.	4	CO1 CO3
5b	Define preventive maintenance and predictive maintenance. How Internet of Things can be applied to reduce the down time of a plant?	4	CO1, CO4
6a	Define Reliability. How the reliability of an equipment can be enhanced (i) at the design stage and (ii) at the actual usage stage.	4	CO1, CO3
6b	An equipment has three components. Each component has an exponential failure distribution with a constant failure rate. Component A = 0.10 per 10000 hours. Component B = 0.12 per 10000 hours. Component C = 0.08 per 10000 hours What is the reliability of the system after 2000 hours? What is Mean Time to Failure (MTTF)?	4	CO5
7a	Briefly discuss the functions of material handling. What do you understand by Unit Load? How Robots are useful in manufacturing activities to enhancing productivity?	4	CO1 CO2
7b	Write brief notes on Bath Tub curve Kanban system	4	CO3 CO4

Total No. of Pages _3 Roll No. .....

5th &7th SEMESTER End Sem Exam B.Tech (ME)

END SEMESTER EXAMINATION NOV-2024

PE305 Advanced Machine Design

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

Note : Answer only five questions. Assume suitable missing data, if any. **Design data handbook is allowed.**

Q1. Derive a condition for ratio of friction radii for maximum torque transmission for uniform wear theory. A single plate friction clutch is to be designed for a bus developing 80kW at 2400rpm. The maximum torque developed is 376Nm at 1600rpm. A maximum wear of friction surface of 3mm is permitted resulting in decrease in axial spring force by 20%. Assume a uniform wear condition for maximum torque transmission and a safe pressure intensity of 190kPa. Determine clutch plate dimensions. If nine compression springs with allowable shear stress 500MPa are used to exert the clamping force find out the spring stiffness and spring diameter assuming a suitable spring index and Wahl's correction factor. [10]CO-1

Q2. Explain bearing modulus with the help a characteristic curve for sliding contact bearing. Consider a full hydrodynamic journal bearing with a radial load of 22kN at journal speed of 960rpm. If the length of the bearing is equal to journal diameter and ratio of minimum oil thickness to radial clearance is 0.2; then determine (i) dimension of the bearing (ii) minimum film thickness, (iii) requirement of oil flow. Assume viscosity of the lubricant as 20centipoise. [10]CO-2

Q3. An electric motor drives a pump using open flat belt drive. Determine the width and length of the belt for following data: power 15kW, speed of motor: 1440rpm, motor pulley and pump pulley dia: 250mm and 500mm respectively, coefficient of friction :0.26, centre distance: 1200mm,

thickness of belt: 5mm, density of belt material:1000kg/m3, permissible stress for the belt: not to exceed 2MPa. [10]CO-3

Q3. A pair of spur gears with a minimum teeth on the pinion 14 and 49 teeth on the gear is used to transmit power of 10kW at 450 rpm of driving pinion. The gear tooth is 20° full depth involute. Both the gears are made of hardened steel with allowable stress of 100MPa and 85MPa, respectively. Mod of elasticity for pinion and gear are 200GPa and 170GPa respectively. Gears are machined with an accuracy of grade 8, with a service factor of 1.25 and assume a velocity factor $C_v = 3/(3+v)$. Design the gear pair on the basis of strength and wear. Surface endurance strength of the pinion is 550MPa. Take a Lewis form factor of [0.154-(0.912/Z)] and a wear factor K_w =0.755. [10]CO-4

Q4. Explain a leading shoe and a trailing shoe with help of a free body diagram. The internal expanding brake is actuated by a cam mechanism exerting the same force F on each shoe having a face width of 40mm. The lining is moulded asbestos with a friction coefficient of 0.42 and a pressure limited to 900kPa. Determine the actuating force and total braking torque capacity (Refer Figure 1.0). [10]CO-5

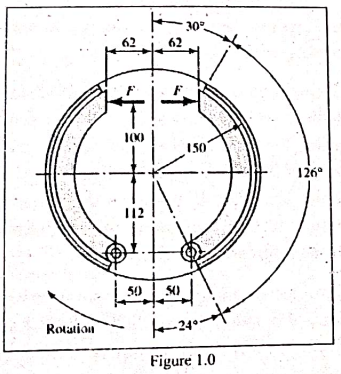
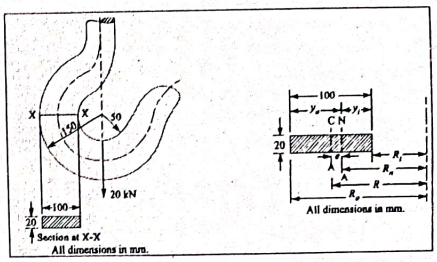


Figure 1.0

Q5. The crane hook carries a load of 20 kN as shown below. The section at X-X is rectangular whose horizontal side is 100 mm. Find the stresses in the inner and outer fibres at the given section. [10]CO-6



Q6. Design a connecting rod (I-section) with a non split big end for a single cylinder petrol engine with following data: piston diameter=100mm, stroke=140mm, length of CR=300mm, weight of reciprocating parts=1.8kg, rpm=1600 with an over speed of 2500rpm. Compression ratio=7:1, maximum explosion pressure=2.75MPa. assume that the CR is made of SAE1045 steel with UCS of 660MPa and UTS of 580MPa. [10] CO-7

Q7. Design a cast iron piston with a design stress of 55MPa for a four stroke petrol engine having cylinder diameter of 85mm running at 3000rpm. Assume a fuel consumption of 0.2kg/kW/hr at an over speed of 2500rpm and Basic mean effective pressure of 0.8MPa. maximum gas pressure is 7 times the mean effective pressure. Length to diameter ratio is 1.2. conductivity of the cast iron is 50W/m/C. HCV of the fuel is 47000 kJ/kg. Assume a radial wall pressure of 0.03MPa for two compression rings and one oil ring. Bearing pressure at small end is 25MPa. Assume temperatures at centre and edge of piston as 440C and 290C respectively. Also, design the piston pin assuming that it is made of the alloy steel with design stress of 95MPa. [10]CO-7

Total no. of Pages:03 Roll no.....

VII SEMESTER

B.Tech. [E2]

END TERM EXAMINATION Nov/Dec-2024

PE351 : Advanced Machining Process

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 To get the nano finish of flat and hollow steel workpiece, select the best advanced manufacturing process, explain its procedure and its limitation.

[Marks 5][CO1][BTL6]

Q.2 Explain the working principle of Abrasive Jet Machining (AJM) with a neat diagram. The material removal rate in Abrasive Jet Machining is 1.0 mm^3/s. Calculate the material removed per impact if the mass flow rate of the abrasive is 5 g/min, the abrasive density is 3 g/cm^3, and the grit size is 50 µm. Also, determine the indentation radius.

[Marks 5][CO2][BTL5]

Q.3 What is the function of the "horn" in Ultrasonic Machining (USM)? Derive the equation for the volumetric material removal rate of the workpiece due to the hammering mechanism in USM.

[Marks 5][CO3][BTL4]

Q4. Explain working principle one way and two-way abrasive flow machining with a suitable diagram. Discuss the process parameters in AFM.

[Marks 4][CO4][BLT1]

Q.5 Explain the working principle of Magnetorheological Abrasive Flow Finishing (MRAFF) with a neat diagram. Discuss the key process variables and their influence on the finishing performance. Perform a parametric analysis to describe how factors such as magnetic field strength, abrasive concentration, and flow rate affect the material removal and surface finish.

[Marks 4][CO3][BTL2]

OR

Q.5' Explain the working principle of Magnetic Float Polishing and Magnetic Abrasive Finishing. Discuss how these processes enhance surface finish and their applications in precision machining.

[Marks 4][CO4][BTL6]

Q.6 Determine the metal removal rate of a nickel superalloy with the composition of Ni = 70%, Cr = 20%, Fe = 5%, and Ti = 5%, in ECM when the current applied is 1000A.

Given

$A_{Ni} = 58.71$, $\rho_{Ni} = 8.9$, $v_{Ni} = 2$

$A_{Cr} = 51.99$, $\rho_{Cr} = 7.19$, $v_{Cr} = 2$

$A_{Fe} = 55.85$, $\rho_{Fe} = 7.86$, $v_{Fe} = 2$

$A_{Ti} = 47.9$, $\rho_{Ti} = 4.51$, $v_{Ti} = 3$

[Marks 4][CO5][BTL5]

Q.7 Explain the working principle of ECM with a neat sketch. Prove that volumetric removal rate in ECM is given by $Q = AI/\rho vF$ cm^3/s; where ρ = density of the anode (g/cm^3), F = Faraday constant, A = Atomic weight, v = valency, I= Current (A).

[Marks 5][CO4] [BTL4]

OR

Q.7' Explain the working principle of the Electric Discharge Machining (EDM) process and discuss the phases of discharge during EDM with neat diagrams. What are the functions and desirable properties of the dielectric fluid used in the EDM process?

[Marks 4][CO5][BTL2]

Q.8 Prove that in RC-based relaxation circuit for an EDM operation, the discharging voltage for maximum transfer of power should be 72% of the output voltage of the source. In a RC type generator, the maximum charging voltage is 80V and the charging capacitor is 200 μF. Determine spark energy.

[Marks 4][CO5][BTL5]

Q.9 Explain the steady state hole penetration model in Laser beam machining. A laser beam with a power intensity of 10^5 W/mm^2 is used to drill holes in a tungsten sheet of 1.00 mm thickness. The drill diameter is 200 μm. If 3×10^4 joules/cm^3 are required to vaporize tungsten, calculate the time required to drill a through hole. The efficiency may be taken to be 10%.

[Marks 4][CO6][BTL5]

Q.10 Explain the working principle of Focused Ion Beam (FIB) machining with a sketch. Describe the different sources of ions used in FIB. Providing a suitable example and explain how the process enhances the precision and capabilities of nanofabrication.

[Marks 4][CO6][BTL6]

OR

Q.10' Explain the working principle of Plasma Arc Machining (PAM) with a clear, labelled sketch. Describe the different types of torches used in PAM, and discuss the factors that influence the quality of the cut in this process.

[Marks 4][CO6][BTL1]

Total no. of Pages: 525 Roll no.....

B.Tech. (ME) _V_SEMESTER

END TERM EXAMINATION Nov-2024

PE353: Supply Chain Management.

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

Note: All questions carry equal marks. Attempts Any **Five** Questions. Assume suitable missing data, if any.

Q.1(a) Explain the objectives of a supply chain and analyse how supply chain decisions influence a firm's overall success and competitive advantage. [05][CO1][BTL1]

(b) Why is it important to consider uncertainty when evaluating supply chain design decisions? Explain. [05][CO1][BTL1]

Q.2 (a) Explain the different models of inventory used by warehouses to effectively stock the goods. [05][CO2][BTL2]

(b) The demand for an item is 8000 units per annum and the unit cost is Re.1/-. Inventory carrying charges of 20% of average inventory cost and ordering cost is Rs. 12.50 per order. Calculate optimal order quantity, optimal order time, optimal inventory cost and number of orders. [05][CO2][BTL5]

Q.3 (a) Briefly explain the following with the help of flow chart

i) Aggregate planning ii) Master scheduling [05][CO3][BTL3]

(b) Define Material Resources Planning (MRP) and with a block diagram, explain the various inputs to an MRP system. [05][CO3][BTL3]

Q.4 (a) Discuss the barriers to worldwide sourcing and ways a company can overcome the barriers. [05][CO3][BTL4]

(b) Describe the important factors that should be considered while making the selection of a Vendor. [05][CO4][BTL1]

Q.5 (a) Discuss the Strategic importance of Customer Relationship Management. [05][CO5][BTL2]

(b) Examine how advancements in transportation and communication technologies are transforming the world into a global village. Discuss the role of various information and communication technology (ICT) tools in enhancing efficiency and connectivity in international logistics. [05][CO5][BTL5]

Q.6 (a) Zara has developed a lean and agile supply chain that sets it apart in the fashion industry. Analyze how Zara achieves this efficiency in key areas such as apparel design, sourcing, inventory management, production, and warehousing. [05][CO5][BTL4]

(b) Logistics costs in India are significantly higher than those in most developed countries, posing a major challenge to the success of the 'Make in India' initiative. A key contributing factor is the country's inadequate logistics infrastructure. Discuss the government initiatives aimed at addressing this issue. Additionally, explain how containerization has revolutionized global transportation and trade efficiency. [05][CO5][BTL5]

Q.7 (a) What is the bullwhip effect and what are the main causes of the bullwhip effect? What can a firm do to minimize demand distortions across the chain? [05][CO2][BTL4]

(b) Consider the supply chain involved when a customer purchases a book at a bookstore. Identify the cycles in this supply chain and the location of the push/pull boundary. [05][CO1][BTL4]

Total no. of Pages: 02 *Roll no……..*

V SEMESTER **B.Tech.**

END TERM EXAMINATION **Nov-2024**

PE361 Total Quality Management

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

Answer ANY 5 questions
Assume suitable missing data, if any.

Q.1 Write about Crosby and Ishikawa contribution to TQM. [Marks =10][CO#1][BTL#1]

Q.2 Explain the various steps used for the implementation of ISO 9000:2000. [Marks=10][CO#2][BTL#2]

Q.3 Describe the steps of benchmarking relative to a company manufacturing of mobile phones. What is the role of top management in this process? [Marks=10][CO#3][BTL#3]

Q.4 Data from a rural bank showing monthly loan applications for home mortgage and the number rejected are given in following Table 1. Construct an appropriate control chart and comment on the loan approval process. [Marks=10][CO# 4][BTL#6]

Table 1

Month	Number of Applications	Number rejected	Month	Number of Applications	Number rejected
1	54	3	11	76	5
2	45	4	12	68	6
3	68	5	13	70	6
4	75	4	14	56	3
5	50	3	15	63	6
6	68	4	16	65	4
7	75	10	17	72	6
8	60	5	18	78	3
9	55	5	19	70	2
10	45	4	20	65	3

Q.5 Draw the OC curve for a single sampling plan; given N = 5000; n = 60; c=0, c = 1 & c=2, c=3. Discuss the producer's and consumer's risk in sampling plan. [Marks=10][CO# 5][BTL#4]

Q.6 Explain the failure pattern for complex product. Write the integration of quality and reliability functions.

[Marks=10][CO# 4,5][BTL#5]

c	np_0				
	0.1	0.2	0.3	0.4	0.5
0	0.905 (0.905)	0.819 (0.819)	0.741 (0.741)	0.670 (0.670)	0.607 (0.607)
1	0.091 (0.996)	0.164 (0.983)	0.222 (0.963)	0.268 (0.938)	0.303 (0.910)
2	0.004 (1.000)	0.016 (0.999)	0.033 (0.996)	0.054 (0.992)	0.076 (0.986)
3		0.010 (1.000)	0.004 (1.000)	0.007 (0.999)	0.013 (0.999)
4				0.001 (1.000)	0.001 (1.000)

c	np_0				
	0.6	0.7	0.8	0.9	1.0
0	0.549 (0.549)	0.497 (0.497)	0.449 (0.449)	0.406 (0.406)	0.368 (0.368)
1	0.329 (0.878)	0.349 (0.845)	0.359 (0.808)	0.366 (0.772)	0.368 (0.736)
2	0.099 (0.977)	0.122 (0.967)	0.144 (0.952)	0.166 (0.938)	0.184 (0.920)
3	0.020 (0.997)	0.028 (0.995)	0.039 (0.991)	0.049 (0.987)	0.061 (0.981)
4	0.003 (1.000)	0.005 (1.000)	0.008 (0.999)	0.011 (0.998)	0.016 (0.997)
5			0.001 (1.000)	0.002 (1.000)	0.003 (1.000)

c	np_0				
	1.1	1.2	1.3	1.4	1.5
0	0.333 (0.333)	0.301 (0.301)	0.273 (0.273)	0.247 (0.247)	0.223 (0.223)
1	0.366 (0.699)	0.361 (0.662)	0.354 (0.627)	0.345 (0.592)	0.335 (0.558)
2	0.201 (0.900)	0.217 (0.879)	0.230 (0.857)	0.242 (0.834)	0.251 (0.809)
3	0.074 (0.974)	0.087 (0.966)	0.100 (0.957)	0.113 (0.947)	0.126 (0.935)
4	0.021 (0.995)	0.026 (0.992)	0.032 (0.989)	0.039 (0.986)	0.047 (0.982)
5	0.004 (0.999)	0.007 (0.999)	0.009 (0.998)	0.011 (0.997)	0.014 (0.996)
6	0.001 (1.000)	0.001 (1.000)	0.002 (1.000)	0.003 (1.000)	0.004 (1.000)

c	np_0				
	1.6	1.7	1.8	1.9	2.0
0	0.202 (0.202)	0.183 (0.183)	0.165 (0.165)	0.150 (0.150)	0.135 (0.135)
1	0.323 (0.525)	0.311 (0.494)	0.298 (0.463)	0.284 (0.434)	0.271 (0.406)
2	0.258 (1.000)	0.264 (0.758)	0.268 (0.731)	0.270 (0.704)	0.271 (0.677)
3	0.138 (0.999)	0.149 (0.907)	0.161 (0.892)	0.171 (0.875)	0.180 (0.857)
4	0.055 (0.994)	0.064 (0.971)	0.072 (0.964)	0.081 (0.956)	0.090 (0.947)
5	0.018 (0.976)	0.022 (0.993)	0.026 (0.990)	0.031 (0.987)	0.036 (0.983)
6	0.005 (0.921)	0.006 (0.999)	0.008 (0.998)	0.010 (0.997)	0.012 (0.995)
7	0.001 (0.783)	0.001 (1.000)	0.002 (1.000)	0.003 (1.000)	0.004 (0.999)
8					0.001 (1.000)

c	np_0				
	2.1	2.2	2.3	2.4	2.5
0	0.123 (0.123)	0.111 (0.111)	0.100 (0.100)	0.091 (0.091)	0.082 (0.082)
1	0.257 (0.380)	0.244 (0.355)	0.231 (0.331)	0.218 (0.309)	0.205 (0.287)
2	0.270 (0.650)	0.268 (0.623)	0.265 (0.596)	0.261 (0.570)	0.256 (0.543)
3	0.189 (0.839)	0.197 (0.820)	0.203 (0.799)	0.203 (0.779)	0.214 (0.757)
4	0.099 (0.938)	0.108 (0.928)	0.117 (0.916)	0.125 (0.904)	0.134 (0.891)
5	0.042 (0.980)	0.048 (0.976)	0.054 (0.970)	0.060 (0.964)	0.067 (0.953)
6	0.015 (0.995)	0.017 (0.993)	0.021 (0.991)	0.024 (0.985)	0.028 (0.986)
7	0.004 (0.999)	0.005 (0.998)	0.007 (0.998)	0.008 (0.995)	0.010 (0.396)
8	0.001 (1.000)	0.002 (1.000)	0.002 (1.000)	0.003 (0.995)	0.003 (0.999)
9				0.001 (1.000)	0.001 (1.000)

c	np_0				
	2.6	2.7	2.8	2.9	3.0
0	0.074 (0.074)	0.067 (0.067)	0.061 (0.061)	0.055 (0.055)	0.050 (0.050)
1	0.193 (0.267)	0.182 (0.249)	0.170 (0.231)	0.160 (0.215)	0.149 (0.199)
2	0.251 (0.518)	0.245 (0.494)	0.238 (0.469)	0.231 (0.446)	0.224 (0.423)
3	0.213 (0.736)	0.221 (0.715)	0.223 (0.692)	0.224 (0.670)	0.224 (0.647)
4	0.141 (0.877)	0.149 (0.864)	0.156 (0.848)	0.162 (0.832)	0.168 (0.815)
5	0.074 (0.951)	0.080 (0.944)	0.087 (0.935)	0.094 (0.926)	0.101 (0.916)
6	0.032 (0.983)	0.036 (0.980)	0.041 (0.976)	0.045 (0.972)	0.050 (0.966)
7	0.012 (0.995)	0.014 (0.994)	0.016 (0.992)	0.019 (0.990)	0.022 (0.988)
8	0.004 (0.999)	0.005 (0.959)	0.006 (0.598)	0.007 (0.997)	0.008 (0.996)
9	0.001 (1.000)	0.001 (1.000)	0.002 (1.000)	0.002 (0.999)	0.003 (0.939)
10				0.001 (1.000)	0.001 (1.000)

c	np_0				
	3.1	3.2	3.3	3.4	3.5
0	0.045 (0.045)	0.041 (0.041)	0.037 (0.037)	0.033 (0.033)	0.030 (0.030)
1	0.140 (0.185)	0.130 (0.171)	0.122 (0.159)	0.113 (0.146)	0.106 (0.136)
2	0.216 (0.401)	0.209 (0.380)	0.201 (0.360)	0.193 (0.339)	0.185 (0.321)
3	0.224 (0.625)	0.223 (0.603)	0.222 (0.582)	0.219 (0.558)	0.218 (0.537)
4	0.173 (0.798)	0.178 (0.781)	0.182 (0.764)	0.186 (0.744)	0.189 (0.726)
5	0.107 (0.905)	0.114 (0.895)	0.120 (0.884)	0.126 (0.870)	0.132 (0.858)
6	0.056 (0.961)	0.061 (0.956)	0.066 (0.950)	0.071 (0.941)	0.077 (0.935)
7	0.025 (0.986)	0.028 (0.984)	0.031 (0.981)	0.035 (0.976)	0.038 (0.973)
8	0.010 (0.996)	0.011 (0.995)	0.012 (0.993)	0.015 (0.991)	0.017 (0.990)
9	0.003 (0.999)	0.004 (0.999)	0.005 (0.998)	0.006 (0.997)	0.007 (0.597)
10	0.001 (1.000)	0.001 (1.000)	0.002 (1.000)	0.002 (0.999)	0.002 (0.999)
11				0.001 (1.000)	0.001 (1.000)

Total no. of Pages:02 5229 Roll no.....

VII SEMESTER

B.Tech./B.Des./BBA/BAE/MAE/M.Sc./M.Des./M.Tech./MBA/EMBA/MBA(BA) Ph.D/ B.Tech. (Eve)

END TERM EXAMINATION *NOV-2024*

CODE PE-405 **TITLE-Metal Forming & Press Working**

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

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

Q.1 (a) Discuss with a neat sketch the effect of recovery, recrystallization and grain growth on mechanical properties of a low carbon steel. [5][CO1]

(b) What is the purpose of yield criteria? If an aluminium specimen is in plastic state under an action of following state of stress:

$$T = \begin{bmatrix} 21 & 5 & 9 \\ 6 & -8 & 6 \\ 10 & 6 & 22 \end{bmatrix} \text{MPa}$$

Determine the yield strength of material in tension and shear according to von-Mises yield criterion. [5][CO1]

Q.2 What is slipping and sticking friction? Derive an expression for average and total die pressure with sticking friction, when the strip is being compressed between two flat dies. [10][CO2]

Q.3 Explain the preparation of stock for wire drawing operation. Calculate the drawing load required to obtain a reduction of 30% in the area on a 12 mm diameter copper wire $\sigma o = 240$ MPa, $\alpha = 12°$, $\mu = 0.18$. Also, determine the power of draw bench if the drawing speed is 2.3 m/s, assuming an efficiency of 98%. [10][CO3]

Q.4 In a single pass rolling operation, calculate the rolling load if stee is hot rolled with 30% reduction in thickness from a 40mm thic and 760mm wide plate using 900mm diameter rolls. Assume n change in the width and μ=0.3. the mean uniaxial flow stress c steel under these conditions is given by σ=120 MPa. If the roll rotate at 65rpm what are the torque and power required for thi mill? [10][CO4]

Q.5 Define the following press operations with a neat sketch:

(a) Blanking (b) Coining
(c) Piercing (d) Embossing
(e) Lancing

[10][CO5]

Q.6 (a) Classify different types of presses. State the basic elements of hydraulic press and give their functions. [5][CO6]

(b) Differentiate between a compound die and a progressive die Explain with the help of a sketch. [5][CO6]

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B.Tech -PE411
VII SEMESTER
END SEMESTER EXAMINATION
COMPUTER INTEGRATED DESIGN AND MANUFACTURING

Time: 3:00 Hrs

Max. Marks: 50

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

Q1 a) Define with examples NC,CNC,DNC,NCMT,CIDM,CIM.
b) Discuss the parameters to be considered by the Production engineering department to adopt CIDM technology for the first time in the industry.
c) Discuss advantages and limitations of using CNC and CIDM technology in industries. 10[CO1]

Q2. a) Describe in details the construction of CNC MILLING machine tool with a neat sketch giving specific emphasis upon the Design of bearings, Design of slides, types of materials which can be machined, Design of magazine etc.
b) Discuss the difference between CNC jig boring and CNC milling machine
c) Elaborate the applications of CNC MILLING machine tool and CNC JIG BORING machine tool in today's industries. 10 [CO2]

Q3. a) Describe various types of programming with examples used for CNC machine tools.
b) What are G codes and M codes? Give eight examples of each.
c) Write APT program to turn a cylindrical component of total length of 450mm and diameters as 20,30,40mm at an equidistance of 150mm.Turning is to be done in two passes and material of component of mild steel. 10[CO3]

5732

Q4. a) Discuss in detail AI, IOT, Machine Learning, Deep Learning, Big Data their role in Industry 4.0 as well as CIDM.

b) Elaborate typical control cycle used in FMS along with neat sketch.

c) Discuss various types of flexibilities.

d) Discuss various advantages and limitations of FMS used in Indian indu

10 [CO4]

Q5. a) Discuss various types of sensors used in industrial robots.

b) Explain the various configurations of industrial robots.

c) Elaborate the applications of industrial robots.

d) Discuss computer aided design and the benefits of its integration with com aided manufacturing. 10[CO5].

Q6 Write short notes on the following :(Any five)

a) Computer Aided Process Planning and its types.

b) Parallel programming and its advantages in CIDM.

c) Group technology and its benefits in CIDM

d)Advantages and disadvantages of point to point and continuous path co systems in CIDM.

e) Reverse engineering, its implementation and applications in to industries.

f) Manual Data Input g) Unidirectional and bidirectional appr

10[CO2 & CO4]

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Total No. of Pages 02 *Roll No..... .....*

SEVENTH SEMESTER

B.TECH.

END-TERM EXAMINATION *Nov.-Dec.-2024*

PE-417 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? Explain them. [4][CO1]

(b) Explain optimal policy curve for rationalization. [6][CO4]

2 (a) A hardware store procures and sells hardware items. The following information is available: [7][CO5]

Expected annual sales – 2000 units
Ordering cost – Rs. 200 per order
Holding cost – 25% of average inventory value

The item can be purchased in the following schedule:

Lot size	Unit price (Rs.)
1 – 499	30.00
501-999	27.00
1000 and above	25.00

Determine order size.

(b) What are the reasons of low materials productivity? [3][CO2]

3 (a) Explain Finite Replenishment Rate Model and calculate optimum system cost, economic lot size. [7][CO4]

(b) Show that under estimation is costlier than over estimation by deviation from optimal order quantity. [3][CO4]

4 (a) What are the advantages and disadvantages of decentralized of material management system? [4][CO3]

(b) What is the need and rationale of physical verification? [6][CO3]

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5 (a) Explain different types of inventory policy with sketches. [6][CO

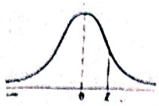
(b) What are the factors considered in favour of buying? [4][CO

6 Write short notes on any FOUR of the following: [10][CO

(a) Purpose of Color coding of ABC items
(b) JIT
(c) Inventory Turnover Ratio
(d) FIFO and LIFO
(e) Selection of vendor

The Cumulative Standardized Normal Distribution (continued)

Entry represents area under the cumulative standardized normal distribution from $-\infty$ to Z



Cumulative Probabilities

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7518	0.7549
0.7	0.7580	0.7612	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.99865	0.99869	0.99874	0.99878	0.99882	0.99886	0.99889	0.99893	0.99897	0.99900
3.1	0.99903	0.99906	0.99910	0.99913	0.99916	0.99918	0.99921	0.99924	0.99926	0.99929
3.2	0.99931	0.99934	0.99936	0.99938	0.99940	0.99942	0.99944	0.99946	0.99948	0.99950
3.3	0.99952	0.99953	0.99955	0.99957	0.99958	0.99960	0.99961	0.99962	0.99964	0.99965
3.4	0.99966	0.99968	0.99969	0.99970	0.99971	0.99972	0.99973	0.99974	0.99975	0.99976
3.5	0.99977	0.99978	0.99978	0.99979	0.99980	0.99981	0.99981	0.99982	0.99983	0.99983
3.6	0.99984	0.99985	0.99985	0.99986	0.99986	0.99987	0.99987	0.99988	0.99988	0.99989
3.7	0.99989	0.99990	0.99990	0.99990	0.99991	0.99991	0.99992	0.99992	0.99992	0.99992
3.8	0.99993	0.99993	0.99993	0.99994	0.99994	0.99994	0.99994	0.99995	0.99995	0.99995
3.9	0.99995	0.99995	0.99996	0.99996	0.99996	0.99996	0.99996	0.99996	0.99997	0.99997
4.0	0.99996832									
4.5	0.99999660									
5.0	0.99999971									
5.5	0.99999981									
6.0	0.99999999									

Total no. Of Pages:04 *Roll No* .....

SEVENTH SEMESTER **B.Tech. (PE)**

PE419 PROJECT MANAGEMENT

END TERM EXAMINATION ***November-2024***

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

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

1[a] How global projects are different from national projects? 4[CO#1]

[b] The fixed cost for a cottage industry is Rs. 400,000. The sales is of Rs. 1000,000. The variable cost per unit is Rs. 20. The selling price of each product is Rs. 100. Detrmine the following: 6[CO# 2]
(i) Break-even point
(ii) Minimum number of products to earn profit
(iii) Profit earned at a turn-over of Rs. 800,000
(iv) Margin of safety

2[a] What is Earned Value Analysis? 3[CO#2]

[b] The data associated with a project are shown in the following table:- 7[CO#1,3]

Activity	Optimistic Time (weeks)	Most likely Time (weeks)	Pessimistic Time (weeks)
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

(i) Draw the project network.
(ii) Find the expected duration and variance of each activity. What is the expected project length?
(iii) Calculate the variance and standard deviation of the project length? What is the probability that the project will be completed no more than 6 weeks later than expected time.
(iv) If the project due date is 19 weeks, what is the probability of not meeting the due date.

3[a] What are the essential attributes of a good project manager? 3[CO#1]

[b] The data associated with a project are shown in the following table:- 7[CO#1,3]

Activity	Predecessors	Duration (weeks)
A	None	5
B	A	2
C	A	6
D	B	12
E	D	10
F	D	9
G	D	5
H	B	9
I	C,F	1
J	G	2
K	F,I,J	3
L	K	9
M	H,G	7
N	M	8

(i) Draw the network diagram for this project.
(ii) Find the critical path as well as the project completion time.
(iii) Find out the total float and free float for each non-critical activity.

4[a] What do you mean by project appraisal? What are the type of risks that the project is going to face? 5[CO#2]

[b] The details of a proposed project are as under:- 5[CO#2,4]

Capital Investment : Rs. 20,00,000/-
Life of the project : 6 years
Project Implementation period : 1 year
Cost of capital : 14%

Year	: Cash inflow (Rs.)
1	200,000
2	300,000
3	500,000
4	400,000
5	400,000
6	300,000

Assess if the project is worthwhile to be taken up for implementation. Use Net present value method of evolution.

5[a] Explain the meaning of crashing and resource allocations in relation of network analysis. 3 [CO#3]

[b] The data on normal time and normal cost and crash time and crash cost associated with the project are given in the following table:- 7[CO#3]

Activity	Normal time (weeks)	Normal cost (Rs.)	Crash time (weeks)	Crash cost (Rs.)
1-2	3	300	2	400
2-3	3	30	3	30
2-4	7	420	5	580
2-5	9	720	7	810
3-5	5	250	4	300
4-5	0	0	0	0
5-6	6	320	4	410
6-7	4	400	3	470
6-8	13	780	10	900
7-8	10	1,000	9	1,200

The Indirect cost is Rs. 50 per week. Crash the relevant activities and determine the optimal project completion time and cost.

6[a] What is a project contract? Why are contracts important in project management? 3[CO#5]

[b] A project with the following activities durations and manpower requirement is given:- 7[CO#3]

Activity	Duration(days)	Manpower required
1-2	2	5
1-3	2	4
1-4	0	0
2-5	2	2
2-6	5	3
3-7	4	6
4-8	5	2
5-9	6	8
6-9	3	7
7-8	4	4
8-9	6	3

(i) Draw the network diagram and find out the total float and free float for each activity.
(ii) If only 11 persons are available for the execution of the project, then rearrange the activities suitable for levelling the manpower resources.

7[a] What are the typical problems in managing a project? Discuss in detail the issues of conflict management in implementing the projects. 5[CO#6]

[b] How does a pure project organization differ from a functional organization? 5[CO#1]

Total no. of Pages:01 537 Roll no.....

III-SEMESTER

B.Tech. (SE)

END TERM EXAMINATION Nov-2024

SE201n DIGITAL SYSTEMS DESIGN

Note : Question 1 is compulsory.
Attempt any four out of the remaining.
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 (a) Explain Fan-In and Fan-Out. [2][CO6][BTL2]
(b) What is PLA? [2][CO5][BTL1]
(c) What is resolution and full-scale output? [2][CO5][BTL1]
(d) What is meant by race around condition? [2][CO3][BTL1]

Q.2 (a)Reduce $f(A,B,C,D) = \Sigma m(2,3,4,5,7,8,10,13,15)$ using K-map. [4][CO1][BTL3]
(b) Minimize $\Sigma m(0,1,6,7,8,9,13,14,15)$ using tabulation technique. [4][CO2][BTL3]

Q.3 (a) Distinguish between Johnson counter and ring counter. Which is better and why? [4][CO3][BTL4]
(b) Design 3-bit up ripple counter. [4][CO3][BTL6]

Q.4 The excitation and output functions of an asynchronous sequential circuit are given as respectively, [8][CO4][BTL6]

E = AB+(A+B) e, O = E

For the above circuit draw the transition table, flow table and output map.

Q.5 Demonstrate the working of successive approximation type ADC by block diagram and suitable example. [8][CO5][BTL3]

Q.6 (a) Draw basic structure of PAL circuit and explain it. Use it to implement Boolean function F = AB'C+A'BC. [4][CO5][BTL2]
(b) Design and explain tristate logic in detail. [4][CO6][BTL6]

Q.7 Design Bi-stable multivibrator using BJT and explain with working operation and output waveform. [8][CO6][BTL6]

Total no. of Pages: 02 S 3 8 Roll no.....

III SEMESTER

B.Tech.

END TERM EXAMINATION *Nov-2024*

COURSE CODE SE 203 COURSE TITLE DATA STRUCTURE

Time: 03:00 Hours *Max. Marks: 40/50*

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

Q.1 (a) Write algorithm to remove duplicates from a linked list of numbers sorted in descending order using constant space. [4][CO2][BTL5]

(b) Describe an efficient algorithm to find the earliest repeating character in a string with constant space. [4][CO1] [BTL3]

Q.2 (a) Discuss what is a Binary Search Tree (BST) and write the algorithm to search of an element in BST. [4][CO3][BTL1]

(b) Construct an AVL tree with the following numbers 50 , 20 , 60 , 10 , 8 , 15 , 32 , 46 , 11 , 48. [4][CO3][BTL3]

Q.3 (a) Construct a Tree from given Inorder and Preorder traversals inorder[] = [3 1 4 0 5 2], preorder[] = [0 1 3 4 2 5] [4][CO3][BTL4]

(b) Sort even-placed elements in increasing and odd-placed in decreasing order with an efficient algorithm with constant space as in example Input: arr[] = {0, 1, 2, 3, 4, 5, 6, 7},
Output: arr[] = {0, 2, 4, 6, 7, 5, 3, 1} [4][CO4][BTL3]

Q.4 (a) Explain an algorithm that can be used for sorting large list of numbers stored on a hard disk with limited memory with reasons. [4][CO4][BTL4]

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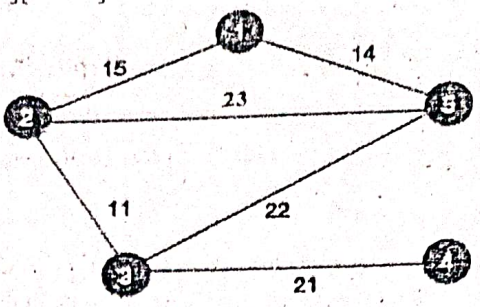
(b) Explain the Breadth First search graph traversal algorithm with an example [4][CO5][BTL1]

Q.5 (a) Explain with steps which edges are part of the minimum spanning tree for the following graph using Prims algorithm [4][CO5][BTL3]



(b) What is hashing and how does it help in efficient searching. Explain with example and a hashing function how elements can be stored in a hash table [4][CO6][BTL1]

Total no. of Pages:02 S-40 Roll no.....

THIRD SEMESTER **B.Tech. (SE)**

END TERM EXAMINATION *Nov-2024*

SE205/SE207n OPERATING SYSTEM

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] Define following (I) System call [2] [CO 1][BTL1]

(II) Real time operating system. [2] [CO 1][BTL2]

[b] Explain the three different types of schedulers? [4] [CO2][BTL4]

Q.2 [a] For below processes compute the average waiting time using FCFS, SJF scheduling algorithms.

Process	Arrival time (AT)	Burst time (BT)
P1	0	9
P2	0	5
P3	2	6
P4	3	7

[4] [CO2][BTL3]

[b] Draw and explain the lifecycle of process.? [4] [CO2][BTL2]

Q.5 [a] What is paging and how it different from segmentation? If program size =64MB page size =1KB page size entry size =4 bytes . What is the size of page table for this process and how many pages are required to store page table? Explain the solution in steps. [4] [CO4][BTL5]

[b]Differentiate between external and internal fragmentation with example? [4] [CO4][BTL4]

Q.4 [a] What is semaphore? Discuss three classical synchronisation problems? [4] [CO2][BTL4]

[b] Discuss the significance of feedback in multilevel queue feedback scheduling. Also provide the diagrammatic representation of multilevel queue feedback scheduling? [4] [CO2][BTL4]

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Q.5 [a] Determine whether the following system is safe using Banker's algorithm. If the request for P1 arrives for (1 0 2) can the request be granted immediately.

Process	Allocation	Maximum	Available
	a b c	a b c	a b c
P0	0 1 0	7 5 3	3 3 2
P1	2 0 0	3 2 2	
P2	3 0 2	9 0 2	
P3	2 1 1	2 2 2	
P4	0 0 0	4 3 3	

[4] [CO3][BTL3]

[b] What is Wait-for graph? Explain with an Example.

[4] [CO3][BTL2]

Q.6 [a] Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67. The FCFS scheduling algorithm is used. The head is initially at cylinder number 53. The cylinders are numbered from 0 to 199. Find the total head movement (in number of cylinders) incurred while servicing these requests? [4] [CO5][BTL5]

[b] Consider the page reference string 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 3 with 4 page frames. Find number of page faults using LRU Page Replacement Algorithm. [4] [CO5][BTL5]

Total no. of Pages:02 542 Roll no.....

THIRD SEMESTER

B.Tech.

END TERM EXAMINATION Nov-2024

SE205/SE-205 Object Oriented Programming

Time: 03:00 Hours Max. Marks: 40

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

Q.1 a. Design a system to manage access to a private data member called `balance` in a `BankAccount` class. Normally, only the `BankAccount` class has direct access to this member. However, you also want another class, `BankManager`, to access and modify `balance` directly when needed, without using a `BankAccount` method. Explain how you would use a friend function or a friend class to allow `BankManager` to access the private member `balance` of `BankAccount`. Write the necessary code to declare `BankManager` as a friend class in `BankAccount` so that it can access `balance`. [3][CO1][BTL2]

b. Create a class `Student` that overloads the `new` and `delete` operators to track memory allocation and deallocation. Implement the overloaded `new` and `delete` operators to print messages whenever memory is allocated or freed for a `Student` object. Write the necessary code to demonstrate this functionality. [5][CO2][BTL3]

Q.2 Explain the differences between vector and ArrayList in terms of:

1. Memory management and resizing.
2. Performance when adding or removing elements.
3. How each handles type safety.

Provide examples to illustrate each difference. [8][CO3][BTL2]

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Q.3 Create a multithreading program with two threads: one that prints numbers from 1 to 10 and another that prints letters from A to J. Use synchronization to ensure the threads do not interfere with each other's output. Set different priorities for the threads and explain how it affects their execution. Additionally, describe the lifecycle of a thread, explaining each state such as new, runnable, blocked, and terminated, and how these states are represented in your program. Provide the complete code along with comments and explanations. [8][CO4][BTL4]

OR

Write a program that demonstrates exception handling. Use nested try-catch blocks to handle different types of exceptions. Implement a throw statement to throw a custom exception and use throws in a method signature to declare an exception. Additionally, include a finally block to ensure that a cleanup action, such as closing a resource, occurs regardless of whether an exception is thrown or not. Provide the complete code along with explanations of how each part works. [8][CO4][BTL4]

Q.4 Explain the client-server model in networking, focusing on the roles of the client and server. Provide a simple example of client-server interaction using sockets. [8][CO5][BTL2]

Q.5 a. Create an applet that contains a button and a text field. When the button is clicked, the applet should display a message in the text field. Implement event handling for the button click using an appropriate listener. Write the code for the applet and explain the event handling mechanism used. [4][CO6][BTL6]

b. Explain the differences between Swing and Servlets in Java. Discuss how Swing provides a GUI for desktop applications and how Servlets are used to create dynamic web applications. [4][CO6][BTL5]

Total no. of Pages:03 Roll no.....

3rd SEMESTER [B.Tech.]

END TERM EXAMINATION ***Nov-2024***

SE-207a: ENGINEERING ANALYSIS AND DESIGN (SOFTWARE ENGINEERING)

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

Note : All questions carry marks at the end of the sentences. Assume suitable missing data, if any.

Q.1 Explain the following with examples **(ANY TWO):** [8 M]
a) Alpha testing vs beta testing [CO1]
b) Coupling and Cohesion with types [L_1, L_6]
c) Hardware reliability vs Software reliability

Q.2 Suppose a system for office automation is to be designed. It is clear from requirements that there will be five modules of size 0.5 KLOC, 1.5 KLOC, 2.0 KLOC, 1.0 KLOC & 2.0 KLOC respectively. Complexity, and reliability requirements are high. Programmer's capability and experience is low. All other factors are of nominal rating. Use COCOMO model to determine overall cost and schedule estimates. Also calculate the cost and schedule estimates for different phases. (for values refer to both the tables) [8 M] [CO 2] [L_2, L_3,L_5]

Organic	3.2	1.05	2.5	0.38
Semidetached	3.0	1.12	2.5	0.35
Embedded	2.8	1.20	2.5	0.32

Cost Drivers	Very Low	Low	Nominal	High	Very High	Extra High
Product attributes						
Required software reliability	0.75	0.88	1.00	1.15	1.40	
Size of application database		0.94	1.00	1.08	1.16	
Complexity of the product	0.70	0.85	1.00	1.15	1.30	1.65
Hardware attributes						
Run-time performance constraints			1.00	1.11	1.30	1.66
Memory constraints			1.00	1.06	1.21	1.56
Volatility of the virtual machine environment		0.87	1.00	1.15	1.30	
Required turnabout time		0.87	1.00	1.07	1.15	
Personnel attributes						
Analyst capability	1.46	1.19	1.00	0.86	0.71	
Applications experience	1.29	1.13	1.00	0.91	0.82	
Software engineer capability	1.42	1.17	1.00	0.86	0.70	
Virtual machine experience	1.21	1.10	1.00	0.90		
Programming language experience	1.14	1.07	1.00	0.95		
Project attributes						
Application of software engineering methods	1.24	1.10	1.00	0.91	0.82	
Use of software tools	1.24	1.10	1.00	0.91	0.83	
Required development schedule	1.23	1.08	1.00	1.04	1.10	

Q.3 Consider a simple program to classify a triangle. Its inputs are a triple of positive integers (say x, y, z), and the data type for input parameters ensures that these will be integers greater than 0 and less than or equal to 100. The program output may be one of the following words: [Scalene; Isosceles; Equilateral; Not a triangle] [8 M] [CO 3] [L4,L6]

a) Design the boundary value test cases and robust test cases for this program.

b) Identify the test cases for the above triangle problem along with its decision table.

Q.4 On the basics of SDLC's design phase, answer the following questions: [8 M] [CO3,4]

a) Discuss the objectives of software design. How do we transform an informal design to a detailed design? [L1,L2]

b) Design an ER Diagram for a DTU university management system that tracks professors, students, classes, and assignments. Each class is taught by one professor but may have multiple students. Each student can have multiple assignments, and each assignment has a grade. Ensure your diagram includes primary keys, foreign keys, and relationships. Explain your design decisions.

OR

On the basics of case study and it application in SDLC's phase, answer the following questions: [8 M]

a) A company plans to develop an online library management system. As a software engineer, create a high-level SRS outline for this system, focusing on functional and non-functional requirements. [L1,L2]

b) A team working on a smart online library application is facing challenges due to frequent changes in requirements. Suggest a suitable development model for this project and justify your choice. Also explain the model.

Q.5 Write a short note on **(ANY 2 ONLY):** [8 M] [CO2-5] [L3,L4, L5]

a) Software Metrics

b) Software Maintenance with types

c) CMM with diagram

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

3rd SEMESTER [B.Tech.]

END TERM EXAMINATION *Nov-2024*

SE209a: Engineering Analysis Design (Software Engineering)

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

Note : All questions carry marks at the end of the sentences. Assume suitable missing data, if any.

Q.1 What do you understand by the term Software Development Life Cycle (SDLC)? Why is it important to adhere to a life cycle model while developing a large software product? Explain any one SDLC model in detail. [8 M] [CO1] [L_1, L_2]

Q.2 A project size of 600 KLOC is to be developed. Software development team has average experience on similar type of projects. The project schedule is not very tight. Calculate the effort, development time, average staff size and productivity of the project. [8 M] [CO 2] [L_2, L_3,L_5]

Software Project	a_b	b_b	c_b	d_b
Organic	2.4	1.05	2.5	0.38
Semidetached	3.0	1.12	2.5	0.35
Embedded	3.6	1.20	2.5	0.32

Q.3 Consider a program for the determination of the nature of roots of a quadratic equation. Its input is a triple of positive integers (say a,b,c) and values may be from interval [0,100]. The program output may have one of the following words. [8 M] [CO 3] [L_4,L_6]

[Not a quadratic equation; Real roots; Imaginary roots; Equal roots]

a) Identify the robust test cases and the equivalence class test cases for output and input domains for this program.

b) Identify the test cases for the roots of a quadratic equation with its decision table.

Q.4 On the basics of SDLC's design phase, answer the following questions: [8 M] [CO3,4] [L_3,L_2]

a) What is modularity? Define module coupling and module cohesion and explain different types of coupling and cohesion.

b) Assume an application for soccer teams with the details:

- We have a set of teams, each team has an ID (unique identifier), name, main stadium, and to which city this team belongs.
- Each team has many players, and each player belongs to one team. Each player has a number (unique identifier), name, DoB, and shirt number that he uses.
- Teams play matches, in each match there is a host team and a guest team. The match takes place in the stadium of the host team. [8 M] [CO2,4] [L_1,L_2]
- Each match has exactly three referees. For each referee we have an ID (unique identifier), name, DoB, years of experience. One referee is the main referee and the other two are assistant referee.

Design an ER diagram to capture the above requirements. State any assumptions you have that affects your design. Make sure cardinalities and primary keys are clear.

OR

On the basics of case study and its application in SDLC's phase, answer the following questions:

a) What is SRS? Explain, in detail about various component of an SRS.

b) An IT company plans to develop an online biometric system (BMS) along with thumb punch and face punch. As a software engineer, create a high-level SRS outline for this system, focusing on functional and non-functional requirements.

Q.5 Write a short note on **(ANY 2 ONLY):** [8 M] [CO2-5] [L_3,L_5,L_6]

a) Risk Management Activities

b) Reverse Engineering with its levels

c) Top-down design and bottom-up design

Total no. of Pages:03 Roll no.....

3rd SEMESTER [B.Tech.]

END TERM EXAMINATION Nov-2024

SE-209n: SOFTWARE ENGINEERING METHODOLOGIES

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

Note : All questions carry marks at the end of the sentences. Assume suitable missing data, if any.

Q.1 Explain the following with examples **(ANY TWO):** [8 M] [CO1] [L_1, L_6]

a) Alpha testing vs beta testing

b) Coupling and Cohesion with types

c) Hardware reliability vs Software reliability

Q.2 Suppose a system for office automation is to be designed. It is clear from requirements that there will be five modules of size 0.5 KLOC, 1.5 KLOC, 2.0 KLOC, 1.0 KLOC & 2.0 KLOC respectively. Complexity, and reliability requirements are high. Programmer's capability and experience is low. All other factors are of nominal rating. Use COCOMO model to determine overall cost and schedule estimates. Also calculate the cost and schedule estimates for different phases. (for values refer to both the tables) [8 M] [CO 2] [L_2, L_3,L_5]

Organic	3.2	1.05	2.5	0.38
Semidetached	3.0	1.12	2.5	0.35
Embedded	2.8	1.20	2.5	0.32

Cost Drivers	Ratings					
	Very Low	Low	Nominal	High	Very High	Extra High
Product attributes						
Required software reliability	0.75	0.88	1.00	1.15	1.40	
Size of application database		0.94	1.00	1.08	1.16	
Complexity of the product	0.70	0.85	1.00	1.15	1.30	1.65
Hardware attributes						
Run-time performance constraints			1.00	1.11	1.30	1.66
Memory constraints			1.00	1.06	1.21	1.56
Volatility of the virtual machine environment		0.87	1.00	1.15	1.30	
Required turnabout time		0.87	1.00	1.07	1.15	
Personnel attributes						
Analyst capability	1.46	1.19	1.00	0.86	0.71	
Applications experience	1.29	1.13	1.00	0.91	0.82	
Software engineer capability	1.42	1.17	1.00	0.86	0.70	
Virtual machine experience	1.21	1.10	1.00	0.90		
Programming language experience	1.14	1.07	1.00	0.95		
Project attributes						
Application of software engineering methods	1.24	1.10	1.00	0.91	0.82	
Use of software tools	1.24	1.10	1.00	0.91	0.83	
Required development schedule	1.23	1.08	1.00	1.04	1.10	

Q.3 Consider a simple program to classify a triangle. Its inputs are a triple of positive integers (say x, y, z), and the data type for input parameters ensures that these will be integers greater than 0 and less than or equal to 100. The program output may be one of the following words: [Scalene; Isosceles; Equilateral; Not a triangle] [8 M] [CO 3] [L_4,L_6]

a) Design the boundary value test cases and robust test cases for this program.

b) Identify the test cases for the above triangle problem along with its decision table.

Q.4 On the basics of SDLC's design phase, answer the following questions: [8 M] [CO3,4] [L_1,L_2]

a) Discuss the objectives of software design. How do we transform an informal design to a detailed design?

b) Design an ER Diagram for a DTU university management system that tracks professors, students, classes, and assignments. Each class is taught by one professor but may have multiple students. Each student can have multiple assignments, and each assignment has a grade. Ensure your diagram includes primary keys, foreign keys, and relationships. Explain your design decisions.

OR

On the basics of case study and it application in SDLC's phase, answer the following questions: [8 M] [CO2,4] [L_1,L_2]

a) A company plans to develop an online library management system. As a software engineer, create a high-level SRS outline for this system, focusing on functional and non-functional requirements.

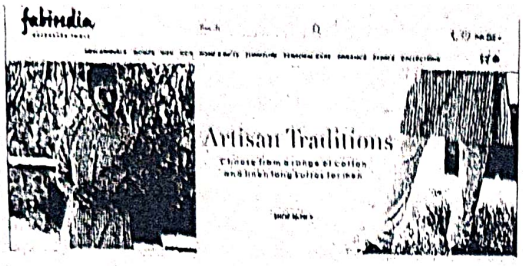
b) A team working on a smart online library application is facing challenges due to frequent changes in requirements. Suggest a suitable development model for this project and justify your choice. Also explain the model.

Q.5 Write a short note on **(ANY 2 ONLY):** [8 M] [CO2-5] [L_3,L_4, L_5]

a) Software Metrics

b) Software Maintenance with types

c) CMM with diagram



[5] CO#5

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

FIFTH SEMESTER

B.Tech.

END TERM EXAMINATION ***Nov-2024***

SE 301a COURSE TITLE SOFTWARE TESTING

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) What is the role of Quality Assurance in software development? How is it different from Quality Control?

(b) Discuss the significance of decision tables in testing. What is the purpose of a rule count?

(c) Differentiate between black box and white box testing.

[8][CO1, CO2, CO3][BTL2]

Q.2 The BSE Electrical company charges its domestic consumers using the following slab:

Consumption Units	Energy Charges
0 – 150	2.00 per unit
151 – 300	Rs. 200 + Rs. 3.00 per unit in excess of 150 units
301 – 400	Rs. 300 + Rs. 3.90 per units in excess of 300 units
>400	Rs. 350 + Rs. 4.40 per unit in excess of 400 units

(a) Generate equivalence test cases for input domain and output domain.

[4][CO3][BTL2, BTL3]

(b) Develop a decision table and generate test cases.

[4][CO3][BTL2, BTL3]

Q.3 Consider the following program

```
#include<stdio.h>
#include<conio.h>
1.  void main()
2.  {
3.  int custnum, numcalls, valid = 0;
4.  float netamount;
5.  clrscr();
6.  printf("Enter customer number & number of calls:");
7.  scanf("%d%d", &custnum, &numcalls);
8.  if(custnum>10&&custnum<20000){
9.  valid = 1;
10. if(numcalls<0){
11. valid = -1;
12. }
13. }
14. if(valid == 1){
15. if(numcalls<76){
16. netamount = 500;
17. }
18. else if(numcalls>75&&numcalls<201){
19. netamount = 500 + 0.80*(numcalls – 75);
20. }
21. else if(numcalls>200&&numcalls<501){
22. netamount = 500 + 1.00*(numcalls – 200);
23. }
24. else{
25. netamount = 500 + 1.20*(numcalls – 500);
26. }
27. printf("\n Customer number:%d\t Total Charges:%.3f",
    custnum, netamount);
28. }
29. else if(valid == 0){
30. printf("invalid customer number");
31. }
32. else{
34. }
35. getch();
36. }
```

Generate test cases for all du paths, all uses paths and all definition paths. [8][CO4][BTL2, BTL3]

Q.4 Consider the program given in Q.3. Consider all variables and generate possible program slices. Design at least one test case from every slice. [8][CO5][BTL2, BTL3]

Q.5 Consider the program given in Q.3. Generate two first order mutants. Design a test suite of five test cases and calculate the mutation score of the test suite. [8][CO5][BTL2, BTL3]

Q.6 (a) Explain the various steps of the regression testing process. Which step is the most important and why? [5][CO6][BTL2]

(b) Why is debugging so difficult? What are the various steps of a debugging process? [3][CO6][BTL2]

Q.7 (a) What is load testing? What metrics must be captured during load testing? List some commercially available software testing tools. [3][CO7][BTL2]

(b) Consider the following webpage. Design questionnaire for usability testing. [5][CO7][BTL2, BTL3]

iii. Find the decrement of failure intensity per failure.
iii. Calculate the failures experienced and failure intensity after 30 and 150 CPU hrs. of execution.
iv. Assume that a program will experience 300 failures in infinite time. It has now experienced 200. The initial failure intensity was 10 failures/CPU hr.

[6][CO5][BTL3, BTL5]

[b] i. What are the various types of review techniques? How do they vary in terms of 'degree of formality' associated with them?

[4][CO1][BTL2]

Q6. [a] During testing, a development team identified 75 defects in a software project with 50,000 lines of code (LOC). Calculate the defect density and compare the defect density with the industry benchmark of 0.00002 defects per LOC and suggest measures if it is higher. [2][CO4][BTL3, BTL4]

[b] A team found 120 defects during development and 40 defects after the software was delivered. Calculate Defect Removal Efficiency (DRE). Interpret the result and discuss ways to improve DRE. [2][CO4][BTL3, BTL4]

[c] Consider a program given in Q4. Design cross-reference list. Compute number of live variables, average number of live variables, and module weakness. [6][CO4][BTL5]

Q7. Write a short note on ***any four*** of the following:
i. Application areas of software metrics
ii. Cohesion Metrics
iii. McCall's Software Quality Model
iv. Software Quality Estimation Tools
v. Components of Software Quality Assurance

[2.5*4][CO1, CO2, CO4][BTL2]

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

FIFTH SEMESTER

B.Tech.

END TERM EXAMINATION ***Nov-2024***

SE303a Software Quality and Metrics

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

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

Q1. [a] Define standards, process, metrics, and measurement scale.
[b] Differentiate between product and process metrics.
[c] What is meant by 'process variation' in the context of 'Six-Sigma'.
[d] Why was the capability maturity model created?
[e] Consider the dataset given below for cyclomatic complexity of a project. Construct boxplot and identify outliers in the given dataset.
17, 67, 58, 27, 100, 95, 70, 200, 71, 20, 3, 71, 63, 10

[10][CO1, CO2, CO3][BTL2, BTL3]

Q2. [a] What is Software Quality Assurance (SQA)? Explain the SQA life cycle with the help of a diagram. Also, state the SQA tasks that should be performed to prevent, detect, and remove defects from software. [6][CO2][BTL2]

[b] Explain the typical change management procedure with the help of a diagram. [4][CO1, CO2][BTL2]

Q3. [a] Explain coupling metrics provided by various researchers with the help of a example. [4][CO5][BTL2]

[b] Consider the program given below:

```
class M
{
```

```
    int x, y, z;
public:
    void setX(int i, int j, int k)
    {
    x = k;
    y = j;
    k = i;
    }
    void print()
    {
    cout<<x;
    cout<<y;
    cout<<z;
    }
};
class N: public M
{
    public:
      N()
      {setX(10, 20, 30);}
};
class P: public M
{
    public:
      P()
      {setX(40, 50, 60);}
};
class Q: public N, public P
{
};
int main()
{
    Q q;
    M m;
    N n;
    q.print();
```



```
    return 0;
}
```

Find out the value of following object-oriented metrics for the above program: CBO, RFC, WMC, DIT. [6][CO5][BTL3, BTL5]

Q4. Consider the following program to find the GCD of two numbers. List out the operators and operands and also calculate the values of all the measures related to Halstead metrics for the following program:

```
#include <math.h>
#include <stdio.h>
int gcd(int a, int b)
{
  int result = ((a < b) ? a : b);
  while (result > 0) {
    if (a % result == 0 && b % result == 0) {
      break;
    }
    result--;
  }
return result;
}
int main()
{
  int a = 84, b = 56;
  printf("GCD of %d and %d is %d ", a, b, gcd(a, b));
  return 0;
}
```

[10][CO5][BTL5]

Q5. [a] Assume that a program will experience 300 failures in infinite time. It has now experienced 200. The initial failure intensity was 10 failures/CPU hr. Using the basic execution time model.

i. Determine the current failure intensity.

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

5th and 7th SEMESTER **B.Tech.**

END TERM EXAMINATION *Nov-2024*

COURSE CODE: SE305

COURSE TITLE: Software Requirements Engineering

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

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

Q.1 (a) Illustrate the Process Improvement Cycle using a diagram. [5][CO1][BTL2]

(b) What are the different types of software requirements? Explain it with the help of sample requirements for any project of your choice. [5][CO1,CO2][BTL2, BTL3]

Q.2 (a) A client has requested a detailed SRS for a new e-commerce platform. Identify the essential sections that should be included in the SRS and briefly describe their purpose. [5][CO2][BTL3]

(b) Evaluate the effectiveness of questionnaires as a tool for requirements elicitation. In what scenarios would they be most suitable or unsuitable? [5][CO2][BTL4]

OR

Compare the benefits and drawbacks of using interviews versus workshops for requirements elicitation in a large-scale project. [5][CO2][BTL5]

Q.3 (a) Analyze the factors that can lead to the failure of implementing a requirements management tool in an organization. What preventive measures could be taken? [5][CO3][BTL2]

OR

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Describe the purpose of version control in managing requirements. How does it help in maintaining project consistency? |5||CO3||BTL4|

(b) A software development team is facing frequent scope creep. Suggest a change control process they could adopt to manage this effectively. |5||CO3||BTL3|

Q.4 (a) Using a well-labelled diagram, explain the capabilities of requirements management tools. Highlight the role of each capability in ensuring effective requirements management. |5||CO4||BTL3|

i. (b) EmergeIT Inc., a software company, struggles with managing requirements due to version control issues, lack of traceability, and poor collaboration among teams. The company plans to implement a requirements management tool. |5||CO4||BTL4,3,5|

ii. What criteria would you use to select an appropriate tool for EmergeIT Inc.?

iii. Outline a brief implementation plan for the selected tool.

iv. Identify potential risks and suggest mitigation strategies.

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Total No. of Pages- 02 *Roll No. .....*

FIFTH SEMESTER *B.Tech. (SE)*

END SEMESTER EXAMINATION *NOV-2024*

SE323 THEORY OF COMPUTATION

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] How many strings are there in the language described by regular expression? $(0 \cup \varepsilon)(1 \cup 011)(\varepsilon \cup 1)$

[5] [CO 1] [BTL 5]

[b] Draw the DFA for the language L,

$L = \{w \mid w \in (a, b)^* \mid n_a(w)$ is divisible by 2 but not $n_b(w)$ is divisible by 3

[5][CO 1] [BTL 6]

2) [a] Design the moore Machine which Produce the sum of present bit and the previous bit of the input of binary string over 0 and 1.

[5] [CO 2] [BTL 6]

[b] Define and show the relationship between following terms (use Venn diagram)

i. Recursively Enumerable Language
ii. Recursive Language
iii. Recursive Enumerable Language but not Recursive Language
iv. Not Recursive Language

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

3) [a] Explain the Pumping lemma for Regular Language with Algorithm steps, also prove that weather $\{a^n b^n \mid n>0\}$ is regular or not using pumping lemma.

[5] [CO 2] [BTL 2]

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[b] Find the language and its type based on Chomsky normal form describe below.

i. S → Saa / Ab
   A → Sb/Ac/e

ii. S → Sa/Ab/c
   A → Sb / d

[5] [CO 4] [BTL 2]

4) Which of the following operations are closed under regular sets. Justify your Answer with examples.

i. Complementation
ii. Set difference
iii. Infinite Union
iv. Intersection
v. Subset

[10] [CO 2] [BTL 2,4]

5) Define halting problem in tuning machine, Consider the Turing machine M which has States q and p, q is the start state, Tape symbols are 0, 1, and B and the following next-move function. For the following strings, run the Turing machine and Find whether M halts or not.
(i) 001010 (ii) 0110 (iii) 00001 (iv) 0000

State	Tape Symbol	Move
q	0	(q, 0, R)
q	1	(p, 0, R)
q	B	(q, B, R)
p	0	(q, 0, L)
p	1	None (Halt)
p	B	(q, 0, L)

[10] [CO 6] [BTL 3]

6) Design the minimal DFA of the following

i. If the 4th symbol from the end is a,
ii. $\{w / w \in (a,b)^* | |w| = 3n + 5\}$

[10] [CO 1] [BTL 6]

Total No. Of Pages 2 S S8 Roll no.....

THIRD SEMESTER B.TECH (SE)

END SEMESTER EXAMINATION Nov 2024

SE325 WEB TECHNOLOGY

Time: 3 hours Max. Marks: 50

Note: All Questions Carries equal marks. Assume suitable missing data, if any.

Q.1 Answer the following:

(a) What is the Internet, and how has it grown over the years? What do mean by mask in IPv4 addressing? List default mask Class A, Class B and Class C in binary as well as Dotted-Decimal notations.

(b) Explain the concept of Internet Protocols. What roles do TCP/IP protocols play in Internet communication? Explain the basic terminology related to the Internet.

[5*2=10][CO1][BTL1, BTL2]

Q.2 Answer the following:

(a) What do you mean by CIDR notation. Explain rules to allocate a block of address in CIDR notation. A company has been assigned the IP address 192.168.10.64/26 (CIDR notation). Calculate the following:

(i) First address of the block

(ii) Last address of the block

(iii) Total number of usable addresses available for hosts in this block.

(b) Illustrate the following terms:

(i) File transfer (FTP), telnet, UseNet.

(ii) Packet-switching technology, netiquette guidelines

(iii)Machine Addressing (IP address), E-mail Address.

[5*2=10] [CO1][BTL3]

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Q.3 (a) Outline the key features of Web 1.0, including the role of hypertext, HTTP, and the client-server model. What are the main differences between Web 1.0 and Web 2.0? Discuss the technologies involved in Web 2.0 and provide examples of its practical applications, such as social networking sites, wikis, and webservices.

(b) Analyse Web 3.0 and the Semantic Web. How does it differ from Web 2.0, and what are its primary objectives? Discuss the potential impact and challenges associated with the evolution from Web 3.0 to Web 4.0.

[5*2=10][CO2][BTL4]

Q.4 Answer the following:

(a) Formulate the phases of web development, including web pages, websites, and web applications. Compose examples of each. What role does HTML (specifically HTML5) play in client-side web development? How does it contribute to building web pages?

(b) Describe the difference between client-side scripting using JavaScript and server-side scripting using PHP. Integrate the use of web application development frameworks like Django and Ruby on Rails. How do they streamline server-side web development?

[5*2=10][CO3,CO4][BTL6]

Q.5 (a) Summarise Web Information Retrieval (IR) system? Assess the roles of search engines and web crawling in web search. Define Search Engine Optimization (SEO) and Web Analytics. How do they contribute to enhancing web search performance?

(b) What is Web Mining? Evaluate its taxonomy and the framework used for Social Web Mining. Summarise the concepts of Text Mining, including Opinion Mining, Recommendation Systems, and Topic Detection and Tracking. **[5*2=10][CO5][BTL5]**

[e] Choose whether the following statement is true or false: A data frame is an unstructured representation of data?

i. True
ii. False

[f] What does the range() function in Python return?

i. A list of numbers
ii. A tuple of numbers
iii. A sequence of numbers
iv. A dictionary of numbers

[g] Which of the following is a good way of performing experiments in data science?

i. Generalize to the problem
ii. Have Replication
iii. Measure variability
iv. All of the mentioned

[h] What will be the output of the following program?

```
z.set('efg')
z.add('xyz')
z.update(set(['i', 'j']))
z
```

i. {'e', 'g', 'g', 'i', 'j', 'x', 'y', 'z'}
ii. {'e', 'f', 'g', 'i', 'j', 'xyz'}
iii. {'efg', 'i', 'j', 'xyz'}
iv. {'e', 'f', 'g', ['i', 'j'], 'xyz'}

[8][CO1, CO2, CO4][BTL2, BTL4]

Q6. Write a short note on ***any four*** of the following:

i. Descriptive Statistics
ii. Data Collection Methods
iii. Correlation Techniques
iv. Web Scrapping
v. SPSS

[2*4][CO1, CO3][BTL2]

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

FIFTH and SEVENTH SEMESTER

B.Tech.

END TERM EXAMINATION ***Dec-2024***

SE327 Methods for Data Analysis

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

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

Q1. [a] What are the ethical considerations of data analysis?
[b] Differentiate between feature selection and feature extraction techniques with example.
[c] Differentiate between statistical and algorithmic modelling.
[d] What is the significance of Exploratory Data Analysis (EDA).
[8][CO1][BTL2]

Q2. [a] Find the correlation coefficient between age and playing habits of the following students using Karl Pearson's coefficient of correlation method.

Age	17	18	19	20	21	22	23	24
Number of students	250	200	150	120	100	80	60	50
Regular Players	180	150	90	60	50	30	20	10

[4][CO5][BTL2]

[b] A manager is struggling with her nine employees reporting time. She tried two strategies to improve employee timeliness. First, over the course of a month, she punishes employees with a $10 paycheck deduction for each day that they arrive late. Second, the following month she punishes employees by docking their pay $20 for each day that they do not arrive on time. Consider the data given below shows the number of times each employee was late. The baseline indicates the employees monthly tardiness before the strategies. Month 1 shows the employees monthly tardiness after a month of the $10 paycheck deductions. Month 2 shows the employees monthly tardiness after a month of the $20 paycheck deductions. We want to determine of either of the paycheck deductions strategies reduced employee tardiness at 95% significance level.

Employee No.	Baseline	Month 1	Month 2
1	12	30	5
2	40	5	2
3	17	8	29
4	9	8	5
5	37	2	6
6	8	7	5
7	17	25	7
8	45	3	19
9	55	2	5

[4][CO5][BTL3]

Q3. [a] The coupling values of a number of classes are provided below for two different samples. Test the hypothesis using F-test whether the two samples belong to the same population at 5% significance level.

Sample 1	32	42	33	40	42	44	42	38	32
Sample 2	31	31	31	35	35	32	30	36	30

[4][CO5][BTL3, BTL5]

[b] A market survey is conducted to evaluate the effectiveness of three text editors by 20 probable customers. The customers assessed the text editors on various criteria and provided a score out of 300. Test the hypothesis whether there is any significant differences among the three text editors using Kruskal–Wallis test at 5% significance level.

Text Editor A	Text Editor B	Text Editor C
200	110	260
60	200	290
150	60	240
190	70	150
150	140	250
270	30	280
	210	230

[4][CO5][BTL3, BTL5]

Q4. [a] A survey was conducted among 500 students who are studying either in "Government funded colleges" (GVT) or "Privately funded colleges" (PVT). The objective of the survey to see the choice of "Classroom based learning" (C) over the "Internet based learning" (I). The survey results are summarized in the table given below:

Colleges	Learning: C	Learning: I	
GVT	75	125	200
PVT	60	240	300
	135	365	500

It is proposed to apply the χ^2-test to verify if there exist any association between "colleges" and "learning" at 5% significance level.

[4][CO5][BTL3, BTL5]

[b] Compare and contrast various statistical tests with respect to their assumptions and normality conditions of the underlying data.

[4][CO1, CO2][BTL4]

Q5. [a] If the value of α, the significant level is increased, then
- i. Type I error increases while Type-II error decreases
- ii. Type I error decreases while Type-II error increases
- iii. Both Type I and Type II errors increase
- iv. Both Type I and Type II errors decrease

[b] Which of the following statement(s) is (are) NOT true?
- i. Pearson's correlation analysis is applicable to only numeric data.
- ii. χ^2 correlation analysis is applicable to only categorical data.
- iii. Spearman's correlation analysis is applicable to only ordinal data.
- iv. Any non-parametric statistical learning approach is applicable when the entire population is known.

[c] The point where the Null Hypothesis gets rejected is called as?
- i. Level of Significance
- ii. Level of Confidence
- iii. Level of Margin
- iv. Level of Rejection

[d] The probability of Type 1 error is referred as?
- i. 1-α
- ii. B
- iii. α
- iv. 1-β

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Total No. of Pages: 01

Roll No.....

SEVENTH SEMESTER

B.Tech. (SE)

END SEMESTER EXAMINATION DEC-2024

SE-409 SOFTWARE MAINTENANCE

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

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

Q1. [a] Discuss tools used for reverse engineering? [5][CO2][BTL1]
[b] What do you mean by Halstead's measure? How to calculate the program length and program effort? [5][CO4][BTL1]

Q2. [a] What is generic reuse model? Explain each steps in detail. [5][CO5][BTL1]
[b] Draw the comprehension process model explain each step. [5][CO3][BTL6]

Q3. [a] What are the various criteria for selecting software maintenance tools. [5][CO2][BTL6]
[b] Write about the limitations of software change? Explain each. [5][CO4][BTL4]

Q4. [a] Discuss the objectives of reverse engineering. [5][CO5][BTL2]
[b] Explain different categories of testing. [5][CO1][BTL1]

Q5. Write the features of the types of all software maintenance framework components. [10][CO4][BTL1]

Q6. Explain the features of models used in program comprehension strategies. [10][CO2][BTL4]

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[b] What are the grounds for refusal of registration of a trademark? What is the position of an unregistered trademark under the Trade Marks Act, 1999? [5] [CO2] [L3]

[c] Explain the major contributions of the Berne Convention towards the protection of Intellectual Property rights globally. [5] [CO2] [L6]

Q4 [a] "TRIPS Agreement governs and protects the IPR in global countries, sometimes it is critiqued by some situations". How do you judge this statement? Illustrate with examples. [5] [CO1] [L4]

[b] Define Copyright Infringements. How to deal with the issues arising out of copyright infringements? [5] [CO2] [L5]

Q5 [a] Enumerate the general procedure for registering an industrial design. What are the essential requirements for the registration of a design under the Designs Act, 2000? [5] [CO2] [L5]

[b] Write short notes on the following:
(i) Copyright societies
(ii) WPPT [5] [CO1] [L6]

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Total No. of Pages 02

Roll No. .....

SEVENTH SEMESTER

B.Tech. (SE)

END SEMESTER EXAMINATION

November-2024

SE427 Software Project Management

Time: 3 Hours

Max. Marks: 40

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

Q.1 Answer the following:

[a] What are the key principles of Project Management Concepts? How do they support successful project delivery? **[4] [CO1] [L2: Understand]**

[b] How does the Process Framework guide the execution of various project phases? **[4] [CO1, CO2] [L3: Apply]**

Q.2 Answer any TWO of the following:

[a] What are the different levels of COCOMO, and how do they influence cost, effort, schedule, and productivity estimation? **[6] [CO2, CO4] [L4: Analyze]**

[b] What are the key differences between the Putnam Estimation Model and Algorithmic Models in predicting project outcomes? **[6] [CO2, CO3] [L3: Apply]**

[c] How does COCOMO II enhance effort, cost, and schedule estimation, and what are the critical factors it considers? **[6] [CO3, CO2] [L4: Analyze]**

Q.3 Answer the following:

[a] How does the Putnam Estimation Model calculate software development effort and schedule? **[4] [CO3, CO4] [L4: Analyze]**

[b] How do risk management and defect tracking processes, including reviews, inspections, and walkthroughs, ensure project quality and control? **[6] [CO4, CO3] [L4: Analyze]**

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Q.4 Answer the following:

[a] What steps are involved in performing a thorough Closure Analysis, and w
key elements should be included? **[4] [CO1, CO3] [L3: Apply**

[b] What is the purpose of a Closure Analysis Report, and how can it be use
improve future projects? **[6] [CO1, CO3] [L4: Analyze**

Total No of pages:3 Roll No:.....

FIRST SEMESTER
B.TECH(CEEE)
END SEMESTER EXAMINATION NOV/DEC-2024
CEE-101 NETWORK ANALYSIS AND SYNTHESIS
TIME:3HRS MAX. MARKS:50

NOTE: ATTEMPT ANY FIVE QUESTIONS. ASSUME MISSING DATA IF ANY.

1(a) Define the following terms:
- I) Periodic and Aperiodic
- II) Continuous and Discrete
- III) Impulse and Step signal

[4][CO1]

(b) Find the Thevenin equivalent circuit for the following circuit with respect to the terminals a, b **[6][CO1]**

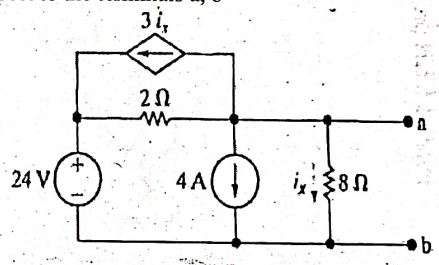

Figure 1

2(a) State and prove superposition theorem. **[5][CO1**

(b) Determine the maximum power delivered to the load in the circuit shown in fig below **[5][CO1]**

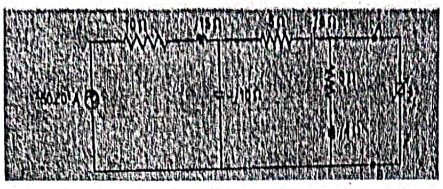

Figure 2

3(a) Explain the following terms: **[4][CO5]**

I) Cut set
II) Loops
III) Graph
IV) Link and Twigs

(b) Determine cut-set and fundamental cut-set matrix of the given graph as shown in figure 3: **[6][[CO5]**

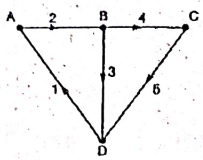

Figure 3

4(a) Consider the circuit shown below. The switch is in closed position for a long time. It is opened at time t = 0. Find the current i(t) for t > 0. **[5][CO3]**

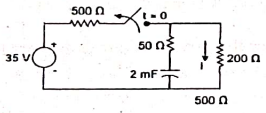

Figure 4

(b) Find the first and second Cauer form of the function. **[5][CO3]**

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

5(a) Find y-parameters for the circuit shown below **[5][CO4]**

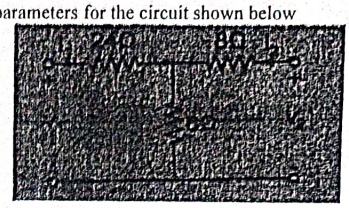

Figure 5

(b) Find z-parameters for the circuit shown below **[5][CO4]**

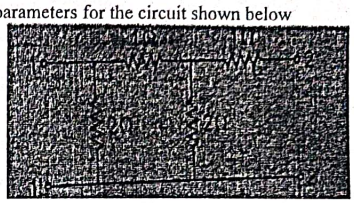

Figure 6

6(a) Describe the properties of Driving point impedance of an LC and RC network. **[5][CO2]**

(b) Find first and second Foster form of the given function. **[5][CO2]**

$$Z(s) = \frac{(s+2)}{(s+1)(s+3)}$$

7(a) Find the initial value of the transfer function **[5][CO2]**

$$X(s) = \frac{808}{s\cdot\left(s^2 + 2\cdot s + 101\right)}$$

(b) Find the final value of the transfer function X(s) above. **[5][CO3]**

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Total No of pages:2 Roll No:.....

FIRST SEMESTER B.TECH (Cont. Edu.)

END SEMESTER EXAMINATION November-2024

CEE-103 ENGINEERING ANALYSIS & DESIGN

TIME: 3:00 Hrs Max. Marks: 40

NOTE: Attempt Any FIVE questions. Assume suitable missing data, if any.

1. (a) Find the unit-step response $c(t)$ of an underdamped second order system which is represented by following transfer function.: - [4][CO2]

$$\frac{C(s)}{R(s)} = \frac{\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2}$$

Also mention its time-response specifications.

(b) What do you understand by Linear systems. Differentiate between Linear-time-invariant and Linear-time-varying mathematical models of systems. [4][CO1]

2. (a) Derive the overall transfer function of two identical RC circuits connected in cascade so that output of first circuit is fed as input to the second circuit. [4][CO2]

(b) Write MATLAB program to find the inverse of the following matrix: [2][CO2]

1 2 3
4 5 6
7 8 9

(c) Write MATLAB programs to plot the $\sin\theta$ and $\cos\theta$ on the interval [2][CO2]
$[0, 2\pi]$.

3. (a)When an inductor (L) in series with a resistor (R) is connected to a constant voltage source (V). Derive the expression of current in the circuit at any instant of time. Also explain the term time constant for this inductive circuit. [4][CO2]

(b) A coil of resistance 2 Ω and inductance 0.5 H is connected across a 50 V d. c. supply. Calculate the initial rate of growth of current; the time constant; the final current and the time required for the current to reach 20 A. [4][CO3]

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4. (a) A 10 μF capacitor in series with a 10 kΩ resistor is connected across a 500 V d.c. supply. The fully charged capacitor is disconnected from the supply and discharged by connecting a 1000 Ω resistor across its terminals. Calculate (i) the initial value of the charging current; (ii) the initial value of the discharge current. [4][CO4]

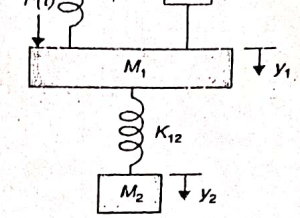
(b) Explain the step, ramp, impulse and parabolic standard test signals. [4][CO2]

5. (a) If the zeros and poles of a closed-loop control system having gain 100 are at -1, -4, -6 and -3, -7, -9, -11 respectively. Write a MATLAB program to find the transfer function of this system. [4][CO2]

(b) Draw the polar plots of $G(s) = \frac{1}{(1+s)(1+2s)}$. Determine whether this plot cross the real axis. If so, determine the frequency and corresponding magnitude $|G(j\omega)|$ at which this plot crosses the real axis. [4][CO5]

6. (a) Differentiate between Scripts and Functions which are used in MATLAB programs. [4][CO2]

(b) Write the differential equations governing the behaviour of the of the mechanical system shown in the figure below. Also obtain an analogous electrical circuit based on Force- current analogy. [4][CO3]



7. (a) Write a MATLAB program to plot the cosine functions, $Y_1 = 0.5\cos(x)$, $Y_2 = 2\cos(x)$, and $Y_3 = 5\cos(x)$ in the interval $0 \leq x \leq 2\pi$. [2][CO3]

(b) Explain both Newton-Raphson and Runge-Kutta methods with suitable example. [6][CO2]

Total No. of Pages 1 S-71 Roll No. .....

THIRD SEMESTER

END SEMESTER EXAMINATION (NOV.-2024)

CEE-201- Digital Circuit and Systems

Time: 3:00 Hours Max. Marks: 40

All questions carry equal marks. Attempt Any eight questions.

Q1 i) Subtract 14 from 46 using the 8 bit 2's complement arithmetic. [CO1]

ii) Add -75 to +26 using the 8 bit 2's complement arithmetic.

Q2 i) Convert 756.603_8 to hex. [CO1]

ii) Convert 49056_{10} to binary number.

Q3 i) Why are NAND and NOR gates called universal gates? [CO2]

ii) Show that $A\bar{B}C + B + B\bar{D} + AB\bar{D} + \bar{A}C = B + C$

Q 4 Reduce using mapping the expression $f=\sum m(0,1,2,3,5,7,8,9,10,12,13)$ and implement the real minimal expression in universal logic. [CO2]

Q5 Design a logic circuit with 4 inputs A,B,C,D that will produce output 1. Only whenever two adjacent input variables are 1's, A and D are also to be treated as adjacent. Implement it using universal. [CO2]

Q6 Realized full Subtractor using universal gate. [CO2]

Q7 Explain the integrated injection logic (IIL). [CO4]

Q8 Design of Synchronous 3-bit Up-counter using J-K Flip Flop. [CO3]

Q9 Explain the meaning of following types of memories i) Volatile memory ii) EPROM iii) Dynamic memory iv) Static memory v) Peripheral memory. [CO4]

Q10. Differentiate between combinational and sequential circuit. List of some applications. [CO4]

-END-

Total No. of Pages:2 572 Roll No.....

THIRD SEMESTER B.Tech. (CEE)

END TERM EXAMINATION NOV-2024

CEE-203 CONTROL SYSTEMS

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)** Define the common term used in Control Systems (CS).

[4M][CO1][BTL1]

(b) Draw and label the block diagram of a general feedback control system.

(c) What is a control system?

[2x2=4M][CO1][BTL2]

Q(2) **(a)** Obtain the transfer functions of a lead networks.

[4M][CO2][BTL2]

(b) Explain the different mechanical elements used in translational motion and illustrate them with the help of a free-body diagram.

[4M][CO2][BTL2]

Q(3) **(a)** State and explain Mason's gain formula with a suitable example. Discuss its application to systems with non-touching loops.

[4M][CO3][BTL3]

(b) Derive the transfer function $V_0(s)/V_i(s)$ for the electrical network depicted in Fig. 1.

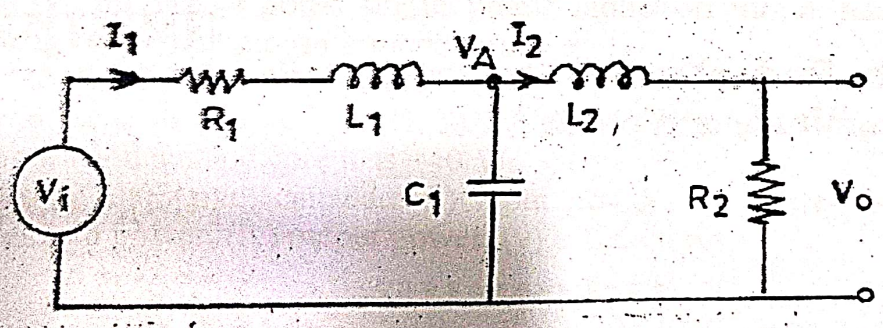


Fig. 1

[4M][CO3][BTL4]

Q(4) (a) What are typical test input signals used in control systems?

(b) Provide an example of a feedback control system with unity feedback and explain its Working.

[2x2=4M][CO4][BTL3]

(c) For the network shown in Fig.2 obtain $E_2(s)/E_1(s)$.

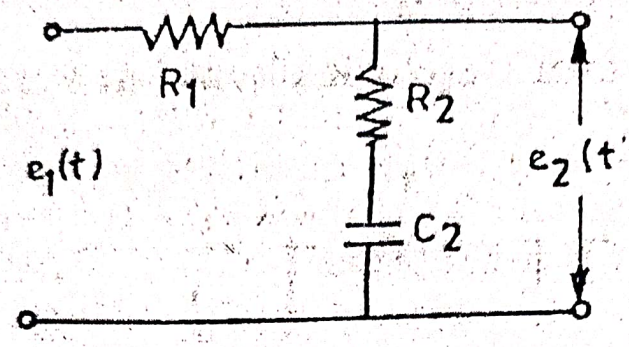


Fig. 2

[4M][CO4][BTL4]

Q(5) (a) Explain the Routh-Hurwitz (RH) criterion. State its advantages and disadvantages.

[4M][CO5][BTL3]

(b) A unity feedback control system has $G(s) = \frac{k(s+10)}{s(s+4)(s+1)}$. Find the value of k so that the system is stable.

[4M][CO5][BTL5]

Q(6) (a) Explain the working of a synchro transmitter and receiver pair with the help of a diagram.

[4M][CO5][BTL6]

(b) Explain the Bode plot for RC circuits. Derive the expressions and illustrate the magnitude and phase plots.

[4M][CO5][BTL6]

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Total No of pages:2 Roll No: .....

THIRD SEMESTER B. TECH (CEEE)

END SEMESTER EXAMINATION Nov.- Dec., 2024

CEE-205 ASYNCHRONOUS AND SYNCHRONOUS MACHINES

TIME: 3HRS MAX. MARKS: 40

NOTE: *ATTEMPT ANY FIVE QUESTIONS. ASSUME MISSING DATA IF ANY.*

1. (a) Define slip in Induction motor. [2] [CO1]
1. (b) Illustrate the need of starter for starting the induction motors. [2] [CO2]
1. (c) What are the different types of single-phase induction motors? [2] [CO3]
1. (d) What is armature reaction? Explain. [2] [CO4]

2. (a) Discuss the working principle of 3-phase induction motor. Also, with neat sketches, discuss the construction of squirrel cage and wound rotor 3-phase induction motor. [4] [CO1]

2. (b) A 6-pole, 50 Hz, 3-phase induction motor running on full load develops a useful torque of 150 Nm at a rotor frequency of 1.5 Hz. Calculate the shaft power output if the mechanical torque lost in friction be 10 Nm. Further, determine rotor copper loss, motor input, and motor efficiency. The total stator loss is given as 700 W. [4] [CO1]

3. (a) Explain the method of speed control of a 3-phase induction motor by varying the supply frequency. [4] [CO2]

3. (b) What is the purpose of using deep bar cage rotors. Also, describe the construction and working of deep bar cage rotors. [4] [CO2]

4. (a) A 230 V, 50 Hz, 4-poles single phase induction motor has the following equivalent circuit impedances: [4] [CO3]

   a. R_{1m} =2.2 Ω, R_2'=4.5 Ω

   b. X_{1m} =3.1 Ω, X_2'=2.6 Ω, X_m=80 Ω

   Friction, windage and core loss =40 W

   For a slip of 0.03 p.u., calculate (i) input power, (ii) power factor, (iii) developed power, (iv) output power, (v) efficiency.

4. (b) Using Double field revolving theory, explain why a single-phase induction motor is not self-starting. [4] [CO3]

5. (a) A 3-phase, 16 pole synchronous generator has a resultant air gap flux of 0.06 Wb per pole. The flux is distributed sinusoidally over the pole. The stator has 2 slots per pole per phase and 4 conductors per slot are accommodated in two layers. The coil span is 150^0 electrical. Calculate the phase and line induced voltages when the machine runs at 375 r.p.m. [4] [CO4]

5. (b) Sketch and explain the open circuit and short circuit characteristics of a synchronous machine. [4] [CO4]

6. (a) Draw and explain V-curves for Synchronous motor. [4] [CO5]

6. (b) Explain the terms synchronous impedance and voltage regulation of an alternator. Examine the synchronous impedance method of determining voltage regulation of an alternator. [4] [CO5]

7. (a) What is the necessity of parallel operation of alternators? State the conditions necessary for paralleling alternators. [4] [CO6]

7. (b) Explain hunting of a synchronous machine. What is the need of damper windings in a synchronous machine? [4] [CO6]

(b) A single-phase bridge inverter delivers power to a series connected RLC load with R = 2Ω and ωL = 10Ω. The periodic time T = 0.1msec. What value of C should the load have in order to obtain load commutation for the SCRs. The thyristor turn-off time is 10μsec. Take circuit turn off time as $1.5t_q$. Assume that the load current contains only fundamental component.

[5M][CO5][BTL4]

********** Best of Luck **********

Total no. of Pages:04 *Roll no.....*

VI SEMESTER **B.Tech. (Eve)**

END TERM EXAMINATION ***Nov-2024***

CEE301 POWER ELECTRONICS

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

Note : All questions carry equal marks.
Q.1 is compulsory for all.
Attempt any three questions amongst Q.2 to Q.5
Assume suitable missing data, if any.

Q.1 Find the suitable answers **[10M]**

i. What is the output of a 1-phase full-bridge inverter when provided with a square wave input?
a) Square Wave
b) Triangular Wave
c) Parabolic Wave
d) Sawtooth Wave **[CO5][BTL4]**

ii. In a single-phase half-wave circuit with RL load and a freewheeling diode, the freewheeling period is
a) 0 to π
b) α to π+α
c) π to 2π+α
d) π/2 to 2π-α **[CO2][BTL4]**

iii. Choose the incorrect statement with respect to the use of FD in half-wave circuits.
a) Input pf is improved
b) Load current waveform is improved
c) It prevents the load voltage from becoming negative
d) Reduces the reverse voltage (PIV) faced by the SCR
[CO2][BTL4]

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iv. Single phase half bridge inverters requires
a) two wire ac supply
b) two wire dc supply
c) three wire ac supply
d) three wire dc supply **[CO5][BTL4]**

v. In AC voltage controllers the **[CO4][BTL4]**
a) variable ac with fixed frequency is obtained
b) variable ac with variable frequency is obtained
c) variable dc with fixed frequency is obtained
d) variable dc with variable frequency is obtained

vi. The AC voltage controllers are used in _____ applications.
a) power generation
b) electric heating
c) conveyor belt motion
d) power transmission **[CO4][BTL4]**

vii. A single-phase half wave voltage controller consists of
a) one SCR is parallel with one diode
b) one SCR is anti-parallel with one diode
c) two SCRs in parallel
d) two SCRs in anti-parallel **[CO2][BTL4]**

viii. A chopper is a
a) Time ratio controller
b) AC to DC converter
c) DC transformer
d) High speed semiconductor switch **[CO3][BTL4]**

ix. If T is the time period for a chopper circuit and α is its duty cycle, then the chopping frequency is
a) Ton/α
b) Toff/α
c) α/Toff
d) α/Ton **[CO3][BTL4]**

x. Find the output voltage expression for a step down chopper with Vs as the input voltage and α as the duty cycle.
a) Vo = Vs/α
b) Vo = Vs x α
c) Vo = Vs2/α
d) Vo = 2Vs/απ **[CO3][BTL4]**

Q.2 (a) What are the triggering methods of an SCR, explain any two. **[5M][CO1][BTL2]**

(b) A single-phase full converter feeds power to RLE load with R = 6Ω, L = 6mH and E = 60V. The ac source voltage is 230V, 50Hz. For continuous conduction, find the average value of load current for a firing angle delay of 50°. **[5M][CO2][BTL4]**

Q.3 (a) Draw and explain the waveshapes of single-phase bridge rectifier with RL Load. **[5M][CO2][BTL4]**

(b) The speed of a separately excited dc motor is controlled below base speed by a Buck converter. The supply voltage is 220V dc. The armature circuit has a r_a = 0.5Ω and L_a = 10mH. The motor constant is k 0.1 V/rpm. The drives a constant torque load requiring an average armature current of 30A. On the assumption of continuous armature current, calculate (a) the range of speed control, and (b) the range of duty cycle. **[5M][CO3][BTL4]**

Q.4 (a) Explain the principle of operation of single phase cyclo-converter. **[5M][CO4][BTL4]**

(b) Explain the principle of operation of Buck Converter with proper waveshape. **[5M][CO3][BTL4]**

Q.5 (a) Explain 120° mode of operation of an inverter with suitable waveshapes. **[5M][CO5][BTL4]**

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Total no. of Pages:02

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V SEMESTER,

B.Tech. (Eve), EE

END TERM EXAMINATION

Nov-2024

CEE-303, POWER SYSTEM ANALYSIS

Time: 03:00 Hours

Max. Marks: 40

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

1. Discuss the method of representation of power system components in detail with equivalent circuit diagrams of synchronous machines, transformer and transmission lines [CO1]

2. A simple power system is shown in Fig.1. Redraw this system where the per unit impedances are represented on a common 5000 VA base and common base voltage of 250 V [CO1]

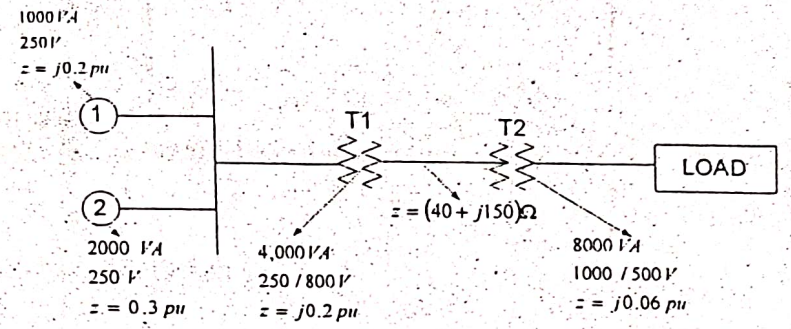

Fig.1

3. A generator supplying an unbalanced load measures the following phase to ground voltages:

$$V_a = 18.0\angle 0^0 kV$$
$$V_b = 13.3\angle -132^0 kV$$
$$V_c = 12.0\angle +110^0 kV$$

Find the symmetrical components of the set of phasor voltages [CO5]

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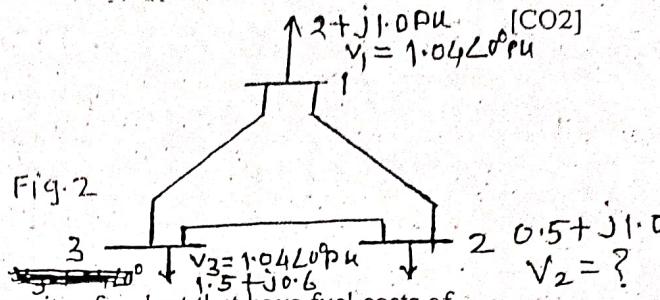
4. Three resistors of 50 ohms, 100 ohms and 200 ohms are connected in delta across the three phases of unbalanced 100 V supply. What are sequence components in the resistors and in supply lines [CO5]

5. A 3-bus system is shown in Fig. 2 has following series impedances and shunt admittances of each line are (0.0197+j0.0788) p.u. and j0.04 p.u. respectively, the bus specifications and power input etc. at the bus is as under

Bus	P_G	Q_G	P_L	Q_L	Bus voltage
1	-	-	2.0	1.0	$1.04\angle 0^{\circ}$ pu
2	0.5	1.0	-	-	-
3	-	-	1.5	0.6	$1.04\angle 0^{\circ}$ pu

Form Y_{bus} matrix, P_2^{sp}, Q_2^{sp}, P_2^{cal}, and voltage of the bus 2 by N.R. method [CO2]



6. Consider two units of a plant that have fuel costs of

$$F_1 = 0.2P_1^2 + 40P_1 + 120 \text{ Rs./h}$$
$$F_2 = 0.25P_2^2 + 30P_2 + 150 \text{ Rs/h}$$

(a) Determine the economic schedule and corresponding cost of generation for the demand of 180 MW

(b) If the load is equally shared by both units, determine the saving obtained by loading the units optimally [CO3]

7. The fuel cost functions of three thermal plants are:

$$F_1 = 0.4P_1^2 + 10P_1 + 25 \text{ Rs./h}$$
$$F_2 = 0.35P_2^2 + 5P_2 + 20 \text{ Rs./h}$$
$$F_3 = 0.47P_3^2 + 15P_3 + 35 \text{ Rs./h}$$

The generation limits of the units are

$30MW \le P_1 \le 500MW$
$30MW \le P_2 \le 500MW$
$30MW \le P_3 \le 250MW$

Find the optimum schedule for the load of 1000 MW

Total No. of Pages 02 Roll No. .....

FIFTH SEMESTER B.Tech. (CEEE)

END SEMESTER EXAMINATION (Nov-2024)

CEE-313 LINEAR INTEGRATED CIRCUITS

Time: 3:00 Hours Max. Marks : 40

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

1[a] Derive and explain the transfer chacteristics of differential amplifier. 3 [CO1]

1[b] Draw the circuit of basic integrator. What are the problems associated with this circuit? How these problems can be solved? Justify your answer with transfer function and frequency response? 5[CO1]

2[a] Find the output voltage v_o for the circuit shown in Fig.2(a). 4[CO1]

2[b] Find the output voltage v_o for the circuit shown in Fig.2(b). What function perform by the circuit? 4[CO1]

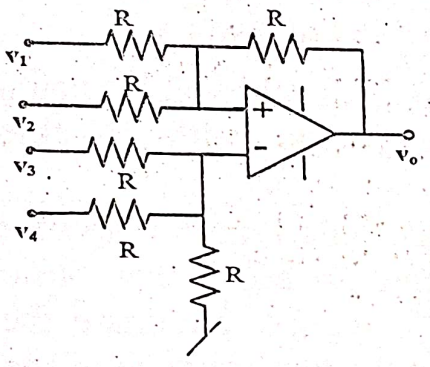


Fig.2(a)

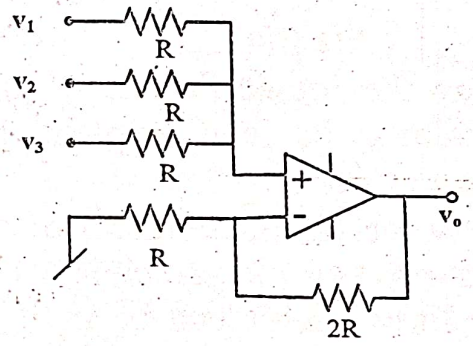


Fig.2(b)

3[a] Find the transfer function for the circuit shown in Fig.3(a) and identify the function performed by the circuit. 4[CO2]

3[b] Find the gain for the circuit of Fig.3(b) 4[CO2]

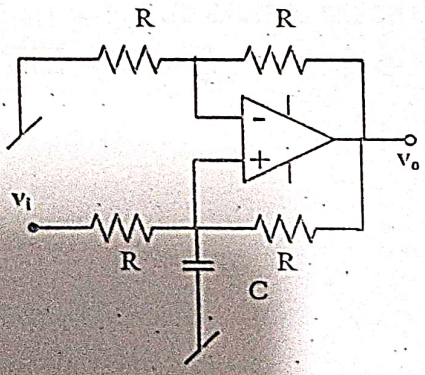


Fig.3(a)

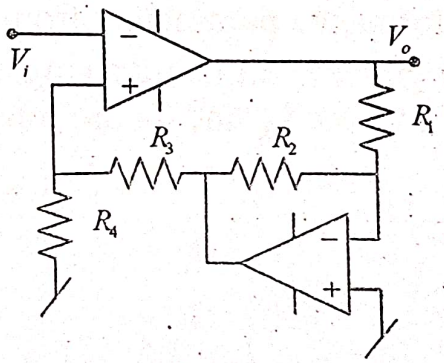


Fig.3(b)

4[a] With the help of waveform explain the operation of astable 4[CO3]

multivibrator using 741 IC. Find the frequency of oscillation?

4[b] Draw and explain the transfer characteristics of inverting Schmitt trigger. 4[CO3]

5[a] State Barkhausen criterion. Find the condition of oscillation and frequency of oscillation for the circuit of Fig.5(a) 4[CO4]

5[b] The circuit shown in Fig 5(b) supplies the load impedance Z with current proportional to V_i and independent of the value of Z. Find I_L as a function of V_i 4[CO4]

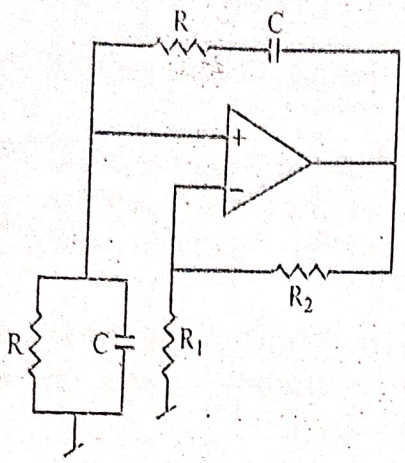


Fig.5(a)

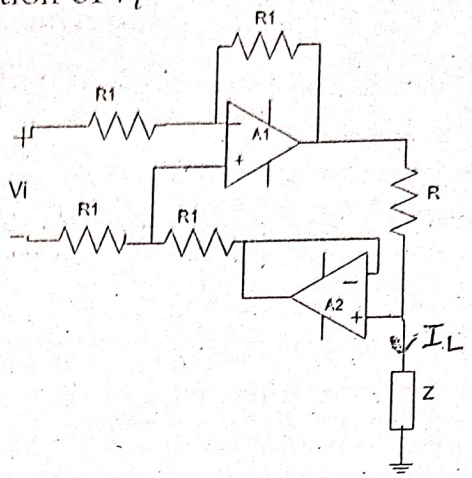


Fig.5(b)

6[a] Draw the circuit diagram of monostable multivibrator using 555timer IC and explain its operation with suitable waveforms 4[CO5]

6[b] Draw the circuit diagram of a basic logarithmic amplifier and explain its principle of operation. How this basic amplifier circuit can be modified to reduce /eliminate the effect of variation of temperature on the performance of the circuit? 4[CO5]

7[a] Draw second order high pass filter circuit using operational amplifier. Derive its transfer function. Also derive its performance parameters from the transfer function. 4[CO5]

[b] Design a circuit using a single op-amp that can find $V_o=2V_1 -3V_2$, where V_1 and V_2 are input voltage. 4[CO4]

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

V SEMESTER B.Tech. (Eve)

END TERM EXAMINATION **Nov-2024**

CEE355 INSTRUMENTATION

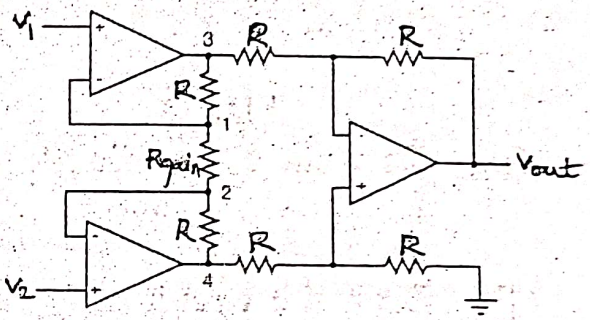
Time: 03:00 Hours *Max. Marks: 50*

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

Q.1 (a) Mention any five factors that affect the choice of transducers.
(b) Define LVDT and explain the working of LVDT with a neat circuit diagram. [5+5] [CO1] [BTL2]

Q.2 (a) Determine the value of R_{gain} of the instrumentation amplifier for the following specifications:

- Differential input voltage between V_1 and V_2: 10mV
- Desired output voltage, V_{out}: 1V
- Value of resistors, R: 10 ohm.



(b) Mention the purpose of the following transducers: Strain gauge, RTD, Gyroscope, Thermocouple, Ultrasonic flow meter, accelerometer, hall effect sensor. [3+7] [CO2] [BTL3,2]

Q.3 (a) Define the resolution and full-scale output voltage of a Digital to Analog Converter (DAC).

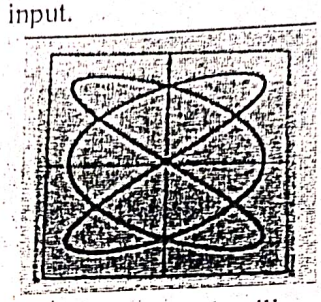
(b) Find the resolution and full-scale output voltage of a 4-bit DAC with a reference voltage of 3.3V. Also, mention the digital input at full-scale output voltage.

(c) Explain the steps in signal conditioning at the sender's end in a general telemetry system. [2+3+5] [CO3] [BTL2,3]

Q.4 With a neat diagram, explain the various parts of the cathode ray tube. [10] [CO4] [BTL4]

Q.5 (a) Differentiate between analog and digital voltmeters.

(b) The Lissajous pattern on an oscilloscope is shown in the below figure. Find the number of horizontal and vertical tangents. If the frequency of the vertical input is 2000 Hz, determine the frequency of the horizontal input.



(c) Name any four applications of intelligent instrumentation. [3+3+4] [CO4] [BTL1,3,5]

Q.6 (a) Describe amplitude modulation and frequency modulation.

(b) Explain how sequential PLC controllers work. Also, mention any example of a sequential PLC controller. [5+5] [CO5] [BTL2]

Total No. of Pages: 02 5804 Roll No. .....

7th SEMESTER

B. Tech. (Continuing Education)

END SEMESTER EXAMINATION **November-2024**

CEE 401 UTILIZATION OF ELECTRICAL ENERGY

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

Note: Answer *four* questions. Question No. 1 is compulsory. Each question carry equal marks. Assume the missing data suitably (if any).

1. Answer the following questions in brief. **(10x1=10)**

(a) A 220 V lamp takes a current of 1.2 A, it produces a total flux of 2860 lumens. Calculate the MSCP and efficiency of the lamp. [CO-1]

(b) A surface is inclined at an angle of 40° to the rays is kept 6 m away from 150 candle power lamp. Find the average intensity of illumination on the surface. [CO-1]

(c) What is the difference between spot welding and seam welding. [CO-2]

(d) What are the special features of MIG and TIG welding? [CO-2]

(e) Why the alloys of Ni-Cr are preferred in heating elements materials? [CO-3]

(f) What are the causes of failure of heating elements? [CO-3]

(g) What are the different types of electric traction system? [CO-4]

(h) Why three phase induction motor is preferred to drive the locomotive. [CO-4]

(i) Mention any four advantages of electric traction system. [CO-5]

(j) Justify, the AC traction system has become more popular nowadays. [CO-5]

2. (a) Two lamps are hung at a height of 6 m from the floor level. The distance between the lamps is 8 m. The candle power of lamp 1 is 500 CP and the illumination on the floor vertically below this lamp is 20 lux. Determine the candle power of the lamp 2.

[CO-1] [5]

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(b) A lamp has a uniform candle power of 300 in all directions, and is provided with a reflector which directs 60% of the total emitted light uniformly to a flat circular disc of 6 m diameter placed 6 m vertically below the lamp. Determine the illumination (a) at the centre (b) at the edge of the surface with and without reflector (c) the average illumination over the disc without reflector. [CO-1][5]

3. (a) With the help of neat diagram, explain the working principle of butt welding and mentions its applications. [CO-2][5]

(b) What are the advantages of electric heating? Describe briefly the requirements of a good heating element. [CO-3][5]

4. (a) A 40 kW, three phase and 400 V resistance oven is to employ Ni-Cr strip of 0.3 mm thickness. The heating elements are star connected. If the temperature of the wire is to be 1200°C and that of the charge is 700°C. Determine the length and width of the wire required. Take radiant efficiency = 0.5 and specific resistance of the wire is 1.03×10^{-6} Ω-m, emissivity = 0.9. [CO-3][5]

(b) With the help of neat block diagram, briefly describe the various components of an AC locomotive. [CO-4][5]

5. (a) How the movement of trains and their energy consumption is studied? Explain with the help of suitable speed-time and speed-distance curves. [CO-5][5]

(b) A train runs between two stations 1.6 km apart at an average speed of 36 km/h. If the maximum speed is to be limited to 72 km/h, acceleration to 2.7 km/h/s, coasting retardation to 0.18 km/h/s and braking retardation to 3.2 km/h/s, determine the duration of acceleration, coasting and braking periods. Assume a simplified speed/time curve. [CO-5][5]

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

B.Tech. (EE)

7th *Semester* END SEMESTER EXAMINATION *(NOV-2024)*

CEE -403 Electric Drives

Time: 3 Hours *Max. Marks: 40*

Note: 1. Attempt any FIVE questions.
2. Assume suitable missing data, if any.

Q.1 Answer the following: [2 Marks each]

a) What are advantages of electric drive? [CO 1, L1]

b) What are the two main difficulties of variable frequency system? [CO 1,5, L1,2]

c) While controlling the speed of a dc shunt motor, what should be done to achieve a constant torque drive? [CO1,3, L1,2]

d) When varying speed by field flux control, flux must be varied in small steps only. Why? [CO1,3, L1,2]

Q.2 (a) What are the main factors which decide the choice of electrical drive for a given application? [CO 1,2, L1,2]

(b) Draw the block diagram of Electric Drive. Explain functions of each block. [4+4][CO1, L1]

Q.3 Derive expression for critical speed (speed separating the continuous and discontinuous mode of operation) of a 1-ϕ fully controlled rectifier-fed separately excited DC motor drive with R_a, L_a, E_b and ω_m as armature resistance, armature inductance, back EMF and motor speed parameters respectively. Draw torque speed characteristics for continuous and discontinuous mode of operation. [8][CO3, L3-6]

Q.4 (a) Explain multi quadrant operation of electric drive with labelled diagrams. [CO 1, L2,3]

(b) What are the reasons for which load equalization has been done in electric drives? [4+4][CO2,L2,3]

Q.5 a) What is the difference between active and passive load torque? [CO1,L1]

b) Explain working principle of slip power recovery drive. Show that firing angle of controlled converter is greater than 90 degrees for motoring operation. Why power factor of this drive is very poor? [4+4][CO5,L1-5]

Q.6 A separately excited dc motor is fed by class A chopper. Draw its torque speed characteristics for different values of duty cycle. Show that speed is controlled by varying the duty cycle for different type of loads. [8][CO3,L1-5]

Q.7 (a) What is the difference between VSI and CSI fed induction motor drive? [CO5,L1,2]

(b) Compare stator voltage control and variable frequency control methods used for induction motor drives. [4+4][CO5,L1,2]

Q.8 Write short notes (any two): [4 marks each]

(a) Frequency of operation of motor subjected to intermittent loads [CO2,L1]

(b) Closed loop control of DC motor drive [CO4,L1,4]

(c) Slip speed control of induction motor drive [CO5,L1,4]

Total no. of Pages:02 S 88 Roll no.....

VII SEMESTER **B.Tech. (Eve), EE**

END TERM EXAMINATION *Nov-2024*

CEE-411: POWER SYSTEM RELIABILITY

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

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

1. A machine cuts extruded copper into lengths of approximately 6 m. Using random sampling, a quality control engineer measures 20 of these cut lengths as 5.97, 5.97, 5.98, 5.98, 5.98, 5.99, 5.99, 5.99, 5.99, 5.99, 6.00, 6.00, 6.00, 6.00, 6.00, 6.01, 6.01, 6.02, 6.02, 6.02. Plot frequency distribution curve as separate data and grouped data; determine probability of occurrence of each length. Also plot cumulative probability distribution curve as separate data and grouped data [CO1]

2. A simple electronic circuit consists of 6 transistors each having a failure rate of $1x10^{-6}$ f/hr, 4 diodes each having a failure rate of $0.5x10^{-6}$ f/hr, 3 capacitors each having a failure rate of $0.2x10^{-6}$ f/hr, 10 resistors each having a failure rate of $5x10^{-6}$ f/hr and 2 switches each having a failure rate of $2x10^{-6}$ f/hr. Assuming connectors and wiring are 100% reliable, evaluate the equivalent failure rate of the system and the probability of the system surviving 1000 hr and also 10000 hr if all components must operate success. [CO2]

3. A control system consists of 3 separate subsystems, all components of which have reliabilities that are exponentially distributed. The subsystems are (i) a single component having a failure rate of $1x10^{-6}$ f/hr, (ii) two components each having failure rate of $8x10^{-6}$ f/hr and for which 1 component must operate for success (iii) 3 components having failure rate of $5x10^{-6}$ f/hr, $2x10^{-6}$ f/hr and $10x10^{-6}$ f/hr, for which 2 components must operate for success. If all subsystems must be successful for satisfactory system operation, evaluate the probability of surviving for a period of 5000 hrs. [CO3]

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4. If there are three good insulators in a string of four, for 72 kV line, the probability of flashover is quite small (0.02%). On a 72 kV line salvaged insulators with 10% defectives are used. What is the probability that a string will have fewer than three good insulators? The engineering manager decides to add one unit to each string. How does that help? [CO3]

5. The failure of power transformers is assumed to follow a Poisson probability distribution. Suppose on average, a transformer fails once every 5 years. What is the probability that it will not fail in the next 12 months? That it will fail once in the next 24 months? [CO4]

6. What is the reliability of the system if each component has reliability of 0.7 as shown in following Fig.1 [CO4]

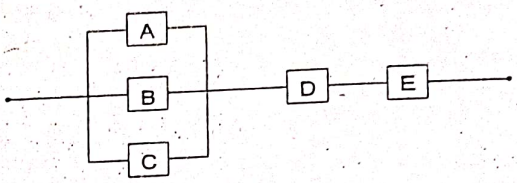

Fig.1

7. (i) We have three spare transformers supporting 100 single-bank stations. If the failure rate of a transformer in service is 0.1 failures per year, what is the probability of having no spares available in a year? [CO5]

(ii) An aircraft engine consists of three modules having constant failure rates of $\lambda_1 = 0.002$, $\lambda_2 = 0.015$ and $\lambda_3 = 0.0025$ failures per operating hour. What is the reliability function for the engine and what is the MTTF? [CO5]

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SEVENTH SEMESTER B.TECH (CEEE)

END SEMESTER EXAMINATION NOV/DEC.-2024

CEE-421 HVDC TRANSMISSION

Time:-3:00 Hrs Max. Marks: 50

NOTE: ATTEMPT ANY FIVE QUESTIONS. All symbols are having their usual meaning. Assume suitable missing data, if any.

1.(a) (a) Differentiate between LCC and VSC techniques of HVDC transmission. [5][CO2]

(b) A bridge connected rectifier is fed from 220 kV/110kV transformer with primary connected to 220 kV supply. Calculate the d.c. output voltage when the the commutation angle is 15° and the delay angle (i) 0°, (ii) 30° and (c) 45° . [5][CO4]

2. (a) It is required to obtain a d.c. voltage of 100 kV from a bridge-connected rectifier operating with α=30° and $\gamma = 15°$. (i) Calculate the necessary line secondary voltage of the rectifier transformer which is normally rated at 220/110kV. (ii) Calculate the tap ratio required. (iii) If the rectifier delivers a current of 800 amps, determine the effective reactance per phase. [5][CO4]

(b) Show that in a 3-phase rectifier operating with no delay and with 60° overlap, the direct current is half of the crest value of the line short circuit current on the valve side of the transformer bank. [5][CO3]

3. (a) Compare the advantages and disadvantages of a HVDC transmission over HVAC transmission. [5][CO2]

(b) A d.c. link has a loop resistance of 5 Ω and is connected to transformers giving secondary voltage of 110 kV at each end. The bridge connected converters operate as follows:

Rectifier: $\alpha = 15°$, X= 10 Ω.

Inverter: δ_0= 10° , $\gamma = 15°$, X= 10Ω,

Allow 5° margin on δ_0 for δ .

determine the direct current delivered if the inverter operates on constant β. [5][CO4]

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FIRST SEMESTER B.Tech (Evening)

END TERM EXAMINATION Nov/Dec-2024

CCE103: Engineering Analysis and Design

Time: 3Hours Max. Marks:50

Answer any five questions All question carry equal marks Assume suitable data if any

1(a) Explain obligatory points. With sketches, Discuss how these control the alignment.

(B) Explain the role of transportation in rural development in India.

[5+5][CO1]

2(a) Write and explains equilibrium equations for two and three dimensional force system

(b) Define

(i) poison ratio, (ii) elastic limit, (iii) characteristic strength (iv) working stress method of concrete design (v) limit state method of concrete design.

[5+5][CO1]

3(a) explain different types of foundations with neat sketches.

(b) Explain different types pf retaining wall with neat sketches.

[5+5}[CO2]

4 (a) Explain different types purposes to construct a dam. Also write different type of dam based on material of construction.

(B) Explain different types of dam based on structure.

[5+5][CO3]

5994

5.The following angles were observed in clockwise direction in an open traverse. <ABC =124°05'. Angle BCD equals 156 °30',< BCD equals 156°, 30 minutes. <CDE equals 102°, 0 minutes. < DEF equals 95°, 5 minutes. <EFG equals 215°, 45'. Magnetic bearing of the line AB was 24°, 30'. What would be the bearing of line FG?

[[10][CO3]

6. (a)Discuss in brief various sources of water also explain hydrological cycle with neat sketch.

(b)describe with help of diagram various elements of a water supply system.

[5+5][CO4]

S 95

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

3RD SEMESTER **B.Tech. (Eve) CIVIL ENGINEERING**

END TERM EXAMINATION *Nov-2024*

COURSE CODE: CCE201 **MECHANICS OF SOLIDS**

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

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

Q.1(a) Draw a neat sketch of stress strain curve for Mild steel and discuss its characteristics. M5/CO1/BTL1

(b) What is Shear Modulus? Describe with the help of a sketch and give an expression. M5/CO1/BTL1

Q.2(a) Describe Stress tensor with a sketch showing positive directions of various types of stresses. M5/CO2/BTL2

(b) What is Young's Modulus? How can it be determined in a laboratory? M5/CO2/BTL2

Q.3 A simply supported beam of 6m span is loaded with two point loads of 10 KN which are applied at 2m from both end points of the beam. Draw shear force and bending moment diagrams for the beam. M5/CO2/BTL3

Q.4 Write a derivation of equation of pure bending. Draw a neat sketch and discuss what is meant by pure bending. M5/CO2/BTL2

Q.5(a) Describe various types of supports. Draw their neat sketches and show what types of reactions can develop in them. M5/CO3/BTL3

(b) What do you understand by static indeterminacy? Give any two examples and calculate it for them. M5/CO4/BTL3

Q.6 Write notes on any five of the following topics.

a. Ductility
b. Poisson's ratio
c. Temperature stresses
d. Types of loads
e. Moment of inertia
f. Torsion of shafts

M5/CO5/BTL4

S~96

Roll no .....

Total no of Pages: 02

End Semester Examination

November -2024

B.Tech (Evening)

Third semester

CCE 203- Engineering Survey

Max Marks: 40

Time duration: 3hours

Note:

1. Attempt all the questions
2. Assume missing data, if any

1) a) Define the following: 2 marks

i) Parallax
ii) Diaphragm
iii) Line of collimation
iv) Vertical Line

b) The following staff readings were observed successfully with level, the instrument having been moved forward after the second, fourth and eight readings: 6 marks

0.875, 1.235, 2.310, 1.385, 2.930, 3.125, 4.125, 0.120, 1.875, 2.030, 3.765

2) a) Define the following: 2 marks

i) Benchmark
ii) Dip of the Horizon
iii) Bubble Line
iv) Backsight

b) The first reading was taken with the staff help upon a benchmark of elevation 132.135. Enter the readings in level book-form and reduce the levels. Apply the usual checks. Find also the difference in level between the first and the last points.

6 marks

3) a) Describe various methods of contouring. 2marks
b) Describe with the help of sketches the characteristics of contouring. 2 marks
c) What is grade contour? How will you locate it?
i. on the ground
ii. on the map 2 marks
d) Explain, with sketches, the uses of contour maps. 2marks

4) a) What is three-point problem? 3 marks
b) Describe the method of orienting plane table by back sighting. 2 marks
c) Distinguish between 'resection' and 'intersection' methods as applied to plane table surveying. 3 marks

5. At every 100 ft along a piece of ground, level were taken as follows: 8 marks

Feet	G.L.
0	210.00
100	220.22
200	231.49
300	237.90
400	240.53
500	235.00

A cutting is to be made for a line of uniform gradient passing through th first and last gradients. What is the gradient? Calculate the volume cutting on the assumption that the ground at right angles to the centre lir is levelled.

Given: Breadth of formation 30 feet: slope of the cutting in each side 1 to 1. Use prismoidal formula.

Total no of Pages: 03- *ROLL No.....*

B. TECH IVTH SEMESTER
CIVIL ENGINEERING (EVENING)
END EXAMINATION **Nov-2024**
CCE-205 SOIL MECHANICS

TIME: 03 Hr **MAX MARKS: 40**

NOTE: QUESTION NO 1 IS COMPULSURY. ATTEMPT REST OF THE QUESTIONS AS PER INSTRUCTION GIVEN.ASSUME THE MISSING DATA IF ANY.

1. Check the validity of following questions with reason.
a. In a standard Proctor's test the maximum dry density is achieved at a lower optimum moisture content, as compared to that of modified Proctor's test. (2) CO-3
b. The coarse gained soil can be classified by plasticity chart. (2) CO-4
c. A soil with high value of shrinkage limit will shrink more. (2) CO-5
d. In Boussinesq's analysis the load is assumed to be act at a certain depth below the ground surface. (2) CO-5

2. Attempt any **two** questions.
a. Define specific gravity of the soil. The following data are obtained from a pycnometer test on a soil sample:
Mass of moist soil =315.5 g
Mass of pycnometer full of water = 2770.6 g
Mass of pycnometer with soil and water = 2948.8
Find the water content of the soil, if G = 2.67 (4) CO-1
b. With the neat sketches explains the structures of clay mineral. (4) CO-1
c. In a falling head permeability test, the water level in the stand-pipe dropped from 40 cm to 20 cm in 1 hour. The diameter of the sample and the stand-pipe were 8 cm and 0.5 cm respectively, while the height of the sample was 9.5 cm. Find out the co-efficient of permeability of the soil. (4) CO-2

3. Attempt any **two** questions.

a. What is quick sand phenomena? How critical gradient is obtained?
(4) CO-3

b. An earth dam is of trapezoidal section having following dimensions-

The length of filter is 25 m, top width of dam is 5 m, Water level in upstream is 22 m above the base, Free board is 2 m, U/S slope = 4 :1 and D/S slope = 3: 1. Total base of dam = 146 m. If K = 0.06 m/sec. Find seepage discharge per metre length of dam. Draw the phreatic line also.
(4) CO-3

c. A flag pole is producing a concentrated load 100 kN which acts on the surface of a soil mass. Using Boussinesq's analysis find the vertical stress at points 2 m and 4 m below the surface and on the axis of loading.
(4) CO-4

4. Attempt any **two** questions.

a. With the help of piston cylinder and spring, explain the concept of one- dimensional theory of consolidation.
(4) CO-5

b. What is time factor. How it is calculated on the basis of degree of consolidation.
(4) CO-5

c. A homogeneous clay layer 1ayer 8 m thick is expected to have an ultimate settlement of 350 mm. After a time, span of 3.0 years, the average settlement was measured to be 150 mm. How much longer will it take for the average settlement to attain 230 mm.
(4) CO-5

5. Attempt any **two** questions.

a. What is shear strength of the soil. Explain Mohr- Coulomb failure theory. Discuss the application of shear strength.
(4) CO-4

b. The results of consolidated undrained test conducted on a saturated clay sample are as follows-

Cell pressure (kN/m^2)	200	400	600
Deviator stress at failure (kN/m^2)	120	242	354
Pore water pressure at failure (kN/m^2)	110	220	320

Determine the shear strength parameters with respect to total stresses and effective stresses.
(4) CO-4

c. Explain how direct shear test is conducted in the laboratory. What are the drawbacks of the test.
(4) CO-4

Total No. of Pages:03

Roll No.....

VSEMESTER **B.Tech. (Eve.)**

END SEMESTER EXAMINATION ***Nov./Dec.-2024***

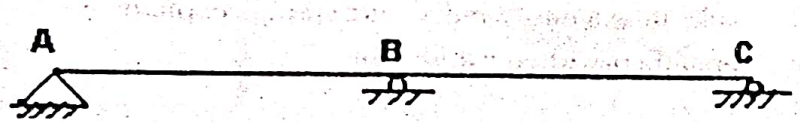
CCE-301: Analysis of Indeterminate Structures

Time: 3.00 Hours ***Max. Marks:50***

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

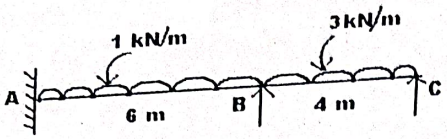
Q.1 (a) Explain Advantages and Disadvantages of fixed beams. [2][CO1][BTL2]

(b) The beam shown in figure is to be analyzed by slope deflection method. What are the unknowns and to determine them, what are the conditions used? [2][CO1][BTL3]



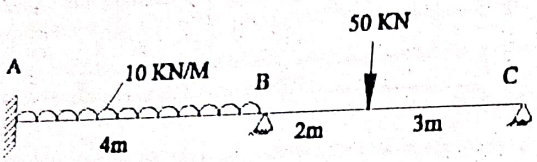
(c) A cantilever AB of span 6m is fixed at the end and propped at the end B. it carries a point load of 50kN at mid span. level of the prop is the same as that of the fixed end. (i) Determine The Reaction at the Prop. (ii) Draw SFD &BMD. [6][CO1] [BTL4]

Q.2 Analyze the continuous beam ABC shown in figure by slope deflection method and sketch the bending moment diagram. Take EI=constant. [10][CO2][BTL4]



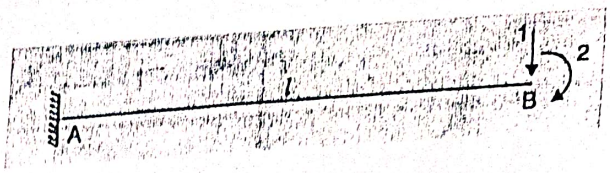
Q.3 (a) What is the stiffness for a far end fixed beam? Explain. [3][CO5][BTL5]

(b)Analyze the continuous beam by the moment distribution method. Draw the bending moment diagram. [7][CO2][BTL4]



4 (a) What is the stiffness for a far end fixed beam? Explain [4] [CO5][BTL2]

(b) Develop the flexibility matrix for the cantilever with coordinates as shown in Figure. [6] [CO5][BTL6]



Q.5(a) What is difference between plastic hinge and mechanical hinge? [3][CO3][BTL2]

(b) Determine the shape factor of a T-section beam of flange dimension 100 x 12 mm and web dimension 138 x 12 mm thick. [7][CO3][BTL5]

Q.6(a)Define Stiffness and Flexibility. [2.5][CO3][BTL1]

(b) What is the difference between three hinge and two hinge Arch? [2.5][CO4][BTL1]

(c)A two -hinged parabolic arch of span 36m and central rise 6m, has the moment of inertia varying as the secant of slope of rib axis. Find the horizontal thrust on the arch, if a point load of 100 kN acts at a distance of 9m from the left end support. [5][CO1][BTL3]

Total no. of Pages: 01 602 Roll no.....

END SEMESTER

B.Tech.

END TERM EXAMINATION

November-2024

CCE303 Geotechnical Engineering

Time: 3:00 Hours Max. Marks: 40

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

Q.1 a) List the differences between shallow foundations and deep foundations with neat diagram? [4][CO1]

b) Discuss bearing capacity of layered soil. How ground water table affects the bearing capacity of soil? [4][CO2]

Q.2 a) Define the term "bearing capacity" of soil. List the factors that affect the bearing capacity of a shallow foundation. [4][CO3]

b) What is soil compaction? Describe the objective of compaction in geotechnical engineering. [4][CO3]

Q.3 a) What is retaining wall? Explain the types of retaining wall with neat sketches. [4][CO4]

b) Explain the different types of deep foundations and their uses with neat sketches? [4][CO4]

Q.4 a) What is expansive soil? What are the characteristics of expansive soil? How expansive soil stabilized? [4][CO5]

b) List out the situations where well foundation is suitable than other type of foundations. [4][CO5]

Q.5 a) What is slope Stability? Mention two factors that influence the stability of a natural slope or embankment. [4][CO6]

b) List the difference between stability of infinite slopes and stability of finite slopes? [4][CO6]

Q.6 Write notes (any two): [4x2] [CO1][CO2]

a) Coulomb's earth pressure theory
b) Subsurface exploration
c) Machine foundation

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Total No. of Pages 02 Roll No. .....

FIFTH SEMESTER B.Tech. (Civil)

END SEMESTER EXAMINATION November-2024

CCE-309 Environmental Engineering & Design

Time:3 Hours Max. Marks: 50

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

1.(a) What is meant by the variations in the rate of demand? What are the effects of these variations on the design of various units of a water supply scheme? (CO 1) (BTL 2)

(b) Design a bell mouth canal intake for a city of 75000 persons drawing water from a canal which runs only for 10 hours a day with a depth of 1.5 m. Also calculate the head loss in the intake conduit if the treatment works are ¼ km away. Draw a neat sketch of the canal Intake. Given average consumption per person = 150 l/d. Assume the velocity through the screens and bell mouth to be less than 16 cm/s and 32 cm/s respectively. (CO 2) (BTL 3)

2.(a) A 300 mm dia sewer is to flow at 0.3 depth on a grade ensuring a degree of self-cleansing equivalent to that obtained at full depth at a velocity of 0.90 m/sec. Find the required grade and associated velocity and rate of discharge at this depth. Assume Manning's rugosity coefficient n as 0.013. The variations of n with depth may be neglected. (CO 4) (BTL 3)

(b) A 30 cm dia. sewer with a invert slope of 1 in 400 is flowing 1/3rd of the full depth. Calculate the velocity and the rate of flow in the sewer. Is it self-cleansing velocity? Use n=0.015. (CO 4) (BTL 3)

3(a) Two million litres of water per day is passing through a sedimentation tank which is 6 m wide, 15 m long and having a water depth of 3 m. (a) Find the detention time for the tank. (b) What is the average flow velocity through the tank? (c) If 60 ppm is the concentration of suspended solids present in turbid raw water, how much dry solids will be deposited per day in the tank, assuming 70% removal in the basin, and average specific gravity of the deposit as 2. (d) Compute the overflow rate (CO 5) (BTL 4)

(b) A pipe line 0.6 m diameter is 1.5 km long. To augment the discharge, another pipe line of the same diameter is introduced parallel to the first in the second half of its length. Find the increase in discharge if f = 0.04 and head at the inlet is 30 m. (CO 3) (BTL 4)

Q. 4

4(a) Prove theoretically that the surface loading and not the depth is a measure of effective removal of particles in an ideal sedimentation tank. Mention the assumptions made in theory. (CO 2) (BTL 2)

(b) The construction costs for certain possible heights of a dam at a given site have been estimated and are tabulated below in table The storage capacity for these dam heights are also given. Determine the most economical height of the dam from purely construction point of view. (CO 3) (BTL 4)

S. No. (1)	Height of the dam in metres (2)	Construction cost in million (3)	Storage in million cubic metres (m.c.m.) (4)
1	10	4	50
2	20	8	110
3	30	12	180
4	40	18	250
5	50	27	350
6	60	39	500
7	65	50	600

5(a) Illustrate with sketches the different types of layouts of pipe systems in distributing water, and compare their comparative merits and demerits. (CO 3) (BTL 2)

(b) Water has to be supplied to a town with one lakh population at the rate of 1 litres per capita per day from a river 2000 m away. The difference in elevation between the lowest water level in the sump and the reservoir is 36 m. If the demand has to be supplied in 8 hours, determine the size of the main and the brake horse power of the pumps required. Assume maximum demand as 1 times the average demand. Assume f=0.0075 velocity in the pipe 2.4 m/sec, and efficiency of pump 80 per cent. (CO 5) (BTL 3)

6(a) A centrifugal pump driven by an electric motor lifts water through a total height of 50 metres from the reservoir to the discharge end. The pump efficien is 77 per cent and the motor efficiency is 85 per cent. The lift is through 300 metres length of 10 cm diameter pipe and the pumping rate is 1500 litres p minute. If 4f = 0.025, and power costs 2.25 p per kilowatt hour, what is the cost of power for pumping four million litres of water? (CO 4) (BTL 3)

(b)Explain the application of Flow mass curves and their use in determining storage capacity of a dam reservoir. (CO 1) (BTL 2)

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Roll No. .....

Total No. of Pages 01

B.Tech [Civil] Evening

Fifth Semester

Nov-Dec2024

End Semester Examination

CCE-351: GEO-INFORMATICS AND ITS APPLICATION

Time: 1:30 Hours

Max. Marks: 50

Note: All Questions. are **compulsory and** carry equal marks. Answer in point and in brief. Assume suitable missing data, if any.

Q1. Answer in brief-

(a) What is an EM Wave. Write various charecteristics of wave? [5]

(b) Organise Geoinformatics/ Geospatial Sciences and Technologies in Core disciplines, supporting disciplines and applications ?. [5]

Q2. (a) Differentiate between Active and passive remote sensing . Write importance of SAR/Microwave remote sensing [5]

(b) What is quantum theory ? Explain briefly particle nature and wave nature of light. [5]

Q3. (a) Give a schematic representation of remote sensing techniques. Compare ideal and real remote sensing systems [5]

(b) What is spectral reflectance. Take an example of four bands of 4x4 image and make a spectral reflectance curve [5]

Q4. (a) Name different remote sensing platforms and indicate indicate relevant bands for different applications. [5]

(b) Differentiate between PAN, multispectral, hyperspectral, ultraspectral data [5]

Q5. (a) Give the names of various atmospheric layers and composition of the atmosphere [5]

(b) What is scattering, explain different types of scattering. [5]

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Total no. of Pages: 02

Roll no.....

7th SEMESTER

B.Tech. (Eve) (Civil Engg.)

END TERM EXAMINATION

Nov-2024

CCE-401: Design of Steel Structures

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 Design and detail a double plate web connection for the end of beam ISLB350 of 8 m span carrying a total uniformly distributed load of 300 kN, with the flange of column ISHB200 @ 40 kg/m. Thicknesses of web of the beam and column flanges are 7.4 mm and 9 mm respectively. [8] [CO1] [BTL: L_1-L_6]

Q.2 Using a lug angle, design and detail a suitable bolted end connection for an angle ISA 100100, 12 mm thick to get maximum efficiency of the joint in tension. Use 22 mm nominal diameter bolt of property class 4.6. [8] [CO2] [BTL: L_1-L_6]

Q.3 An ISMB550 has been used to transmit an axial load of 3000 kN to a foundation with 100 kN/m^2 bearing capacity. Design and detail a suitable grillage foundation for it. The base plate may also be designed. [8] [CO3] [BTL: L_1-L_6]

Q.4 Design and detail, web splice using separate moment and shear plates for a plate girder having moment of inertia as 635000 cm^4 and web plate of 1000 x 10 mm size. Working moment and shear force at the point of web splice are 1500 kNm and 100 kN respectively. Use 20 mm diameter bolts of property class 4.6 for the connection. [8] [CO4] [BTL: L_1-L_6]

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Q.5 Design and detail minor slings of a truss, which are subjected to maximum factored tension of 11.15 kN and maximum factored compression of 20.57 kN due to wind. The slings are connected by 16 mm diameter bolts. Centre to centre distance between connections is 281 cm. [8] [CO5] [BTL: L_1-L_6]

Q.6 A theatre balcony welded plate girder receive loads from lateral beams and transmits them to the column on which it is supported. The spacing of lateral beams is 2 meter centre to centre and these beams transfers a dead load of 55 kN and a live load of 82.5 kN at every 2 m on the girder. The span of the girder is 20 m and depth of the girder is limited to 1.1 m. The lateral beams along with slab provided lateral support to the girder. Design and detail flanges of the girder and their curtailments. [8] [CO4] [BTL: L_1-L_6]

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

VII SEMESTER

B.Tech.

END TERM EXAMINATION *Nov 2024*

CCE 403 WATER RESOURCES ENGINEERING

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

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

Q.1 (a) Design an irrigation channel to carry 40. Cumecs. of discharge, with B/D ratio, i.e. base width to depth ratio as 2.5. The critical velocity ratio is 1.0. Assume a suitable value of Kutter's rugosity coefficient and use Kennedy's method.

(b) Design a regime channel for a discharge of 50 cumecs and silt factor = 1.1, using Lacey's Theory. [CO2]

Q.2 (a) What is meant by "piping" in a hydraulic structure? What are ill-effects of piping? What are the precautionary methods to avoid the ill effect of piping?

(b) What is meant by "Hydraulic jump" and how does help in designing irrigation structures? What are the types of the hydraulic jump? [CO3]

Q.3 (a) What is canal lining and what is objective of canal lining, advantages and disadvantages of canal lining and also describe in detail different types of lining?

(b) Differentiate between alluvial and non-alluvial canal? What are the different ways in which the irrigation canal can be aligned? [CO1]

Q.4 (a) How the rainfall measures? How to measure rainfall through rain gauge?

(b) Precipitation station X was inoperative for part of a month during which a storm occurred. The respective storm totals at three surrounding station A, B and C were 107, 89 and 122 mm. The normal annual precipitation amounts of station X, A, B and C are respectively, 978, 1120, 935 and 1200 mm. Estimate the storm precipitation for station X. [CO4]

Q.5 (a) What is spillway and what is their necessity?

(b) Write short note on:

(i) Volute siphon

(ii) Chute spillway

(iii) Ogee spillway

(iv) Priming devices for siphon spillways [CO4]

Q.6 (a) What is meant by a "dam and a reservoir"? What are the different materials that are commonly used for dam construction and what are their comparative advantages and disadvantages?

(b) The head regulator of a canal has 3 openings each 3 m wide. The water is flowing between the upper and lower gates. The vertical opening of the gate is 1.0 m. The head on the regulator is 0.45 m (Afflux). If the upstream water level rises by 0.20 m, find how much the upper gates must be lowered to maintain the canal discharge unaltered. [CO3]

Q.7 (a) Describe briefly two recognized silt theory? Explain how one theory is an improvement over the other?

(b) Define water logging and outline its causes and its effects on crop and soil? Describe two methods used to prevent water logging in agriculture fields. [CO5]

Number of pages TWO *Roll Number* .....

B.TECH. [EVE] (CIVIL) VII SEMESTER
END TERM EXAMINATION **Nov/Dec-2024**
CCE411: TRANSPORTATION SAFETY AND ENVIRONMENT
Duration: 3:00 Hr ***Max. Marks: 50***

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

Q.1(a) Explain the importance of road safety audit. [CO2][**5**]

(b) Write the objectives of road safety audit. [CO2][**5**]

Q.2(a) Determine the concentration of pollutants at a location 1 km away from a highway in windward direction. The wind is blowing perpendicular to the highway at speed of 10 km/h. The traffic flow is 2000 vehicles per hour. The average emission rate and average speed of vehicles is 0.2 g/km and 40 km/h respectively. As per stability condition, constants are given as c = 33.2, d = 0.725 and f = -1.7. [CO4][**10**]

Q.3(a) Explain the process of environmental impact assessment. [CO2][**5**]

(b) Discuss major elements of EMP [CO2][**5**]

Q.4 Peak noise level 87 dB, background noise level 56 dB and mean noise level 65 dB were obtained from the analysis of noise level data collected on the side of the highway. Determine Traffic Noise Index, Equivalent Noise Level and Noise Pressure Level. [CO4][**10**]

P.T.O.

Q.5 Answer **ANY TWO** of the following: [CO1][**5+5**]

(a) Describe measures for reduction of accidents

(b) Mention noise level standards in residential areas

(c) Discuss the objectives of EIA.

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

End Semester Examination **November-2024**

CCE419: Advanced Transportation Engineering

Time 3 Hours **Max Marks 50**

Note : Attempt any five questions. Draw neat and labeled diagrams wherever necessary. Assume suitable missing data.

Q.1(a) Discuss Principles of Pavement Design. [5, CO1]

q.1(b) Describe surface and sub-surface drainage systems in pavements. [5, CO2]

Q.2(a) Explain CBR test and its importance for design of flexible pavements. [5, CO1, CO2]

Q.2(b)Discuss the functions of medians in urban roads. [5, CO2]

Q.3(a) Discuss various types of joints used in rigid pavement construction. [5, CO1, CO2]

Q.3(b) What is mud pumping ? What are the causes of mud pumping? How it can be prevented. [5, CO1, CO2, CO3]

Q.4(a). Discuss recommended procedure for design of rigid pavements. [5, CO3]

Q.4(b) Explain (i) Lane distribution factor, and (ii) Vehicle damage factor, with regard to flexible pavement design. [5, CO1, CO2]

Q.5(a) Explain, what is meant by Equivalent Single Wheel Load ? [5, CO1, CO2]

Q.5(b) Discuss requirements of a ideal pavement. [5, CO1. CO2, CO3]

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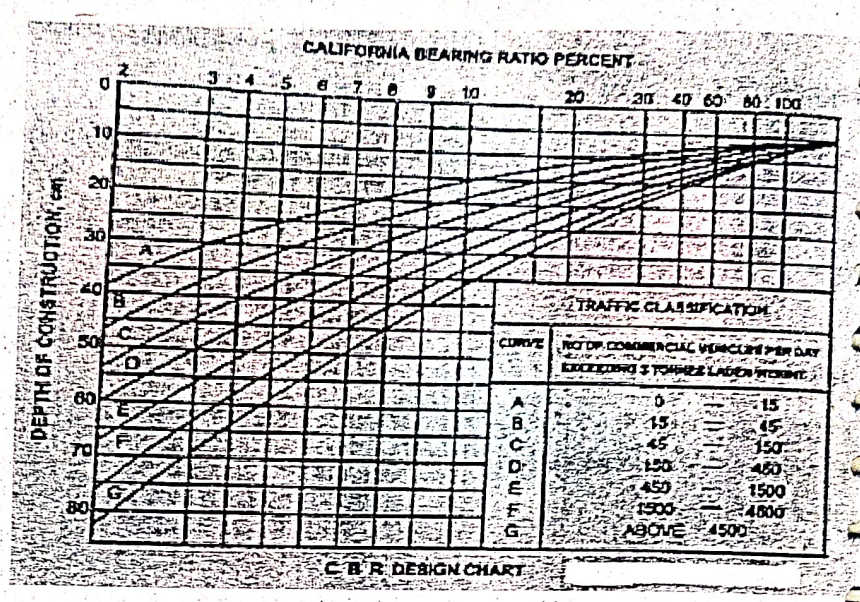
Q.6(a) Design the pavement for construction of new bypass with following da
(i) Two lane carriage way (iii) Initial traffic in the year of completion of construction = 400 CVPD (iii) Traffic growth rate 7.5% (iv) Design life 20 yea
(v) vehicle damage factor based on axle load survey =2.5 standard axle per commercial vehicle (vi)Design CBR of subgrade soil 4% [6, CO4]

Q.6(b) What is radius of resisting section [4, CO1, CO2]

Q.7(a) Calculate the stresses at interior, edge and corner regions of a cement concrete pavement using Westergards stress equations for given data Wheel loa = 5000 Kg, Modulus of elasticity of cement concrete, E = 3.0 x 10% kg/cm2, pavement thickness = 18 cm, Possion's ratio of concrete = 0.15, Modulus o subgrade reaction, K = 6.0 Kg/cm2, radius of contact area = 15 cm [6, CO4]

q.7(b) What are dowel bars ? [4, CO1]



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Total no. of Pages: 01

Roll no.....

FIRST SEMESTER

B.Tech. (Eve)

END TERM EXAMINATION Nov-2024

CEC-105 Basic Electronics & Instrumentation

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

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

Q.1(a) Define drift current. [1][CO 1][BTL 1]
(b) Write the example of active and passive devices. [1][CO 1][BTL 1]
(c) Write the modes of operation of BJT. [1][CO 2][BTL 1]
(d) Give two difference between BJT and FET. [1][CO 2][BTL2]
(e) Write the characteristics of ideal op-amp. [1][CO 3][BTL 1]
(f) State the condition of principle of operation. [1][CO3][BTL1]
(g) Differentiate combinational and sequential circuits. [1][CO 4][BTL 3]
(h) Define transducer. [1][CO 5][BTL 1]

Q.2 (a) Explain the operation of Zener diode with proper diagram and also write the applications of it. [5][CO 1][BTL 2]
(b) Explain conductor, insulator and semiconductor with proper energy band diagram. [3][CO 1][BTL 2]

Q.3 (a) Explain the working principle of RC coupled amplifier with suitable diagram. [5][CO 2][BTL 2]
(b) Write the characteristics of BJT and draw the symbol of NPN and PNP transistor. [3][CO 2][BTL 3]

Q.4 (a) Explain inverting amplifier using op-amp. [5][CO 3][BTL 2]
(b) Solve using K-map $F(A,B,C)=\sum(0,2,3,4,6,7)$. [3][CO 4][BTL 3]

Q.5 (a) Write short notes on photodiode. [4][CO 5][BTL 3]
(b) Write short notes on digital voltmeter. [4][CO 5][BTL 3]

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

SEVENTH SEMESTER

B.Tech. - Evening (ECE)

END SEMESTER EXAMINATION **NOV-2024**

CEC-401 INFORMATION THEORY AND CODING

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) Find the minimum distance of an even-parity (3, 2) block code. **[2] [CO4][BTL1]**

Q.1 (b) State that the sum of any 2 codewords from the (4, 3) odd-parity code fails to give a codeword. **[2] [CO4][BTL1]**

Q.1 (c) Determine the code words for 1011, 1100, 0001, 0110 and 1111 for the (7, 4) code when (a) rows 2 and 3 of its generator matrix (given below) are interchanged and (b) columns 5 and 6 are interchanged. **[4] [CO4][BTL3]**

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$

Q.2 (a) Consider the third extension (S^3) of a binary source with p(0) = 0.25 and p(1) = 0.75 for the primary source. Determine the relation between entropy of the source without extension and with 3rd extension. **[2] [CO2][BTL3]**

Q.2 (b) Consider a source with 8 alphabets (A to H) with respective probability (0.2, 0.15, 0.1, 0.12, 0.3, 0.07, 0.04, 0.02). Categorize the code for each alphabet using Huffman coding technique and find the efficiency of code, p(0) and p(1). **[4] [CO2][BTL2]**

Q.2 (c) Describe the systematic and nonsystematic codewords for $i = (0\ 1\ 1\ 1)$ for the (7, 4) cyclic code with $g(x) = x^3 + x + 1$. [2] [CO5][BTL2]

Q.3 (a) Design the generator matrix, parity check matrix and syndrome versus error patterns for (6,3) block code. Also prove that this code is a linear block code. [4] [CO5][BTL6]

Q.3 (b) Find the parity check matrix for (5, 2) single error correcting code. [2] [CO4][BTL1]

Q.3 (c) Define the circuit arrangement for code word generation (at transmitter) and error checking (at receiver) for (4, 3) odd parity code. [2] [CO1][BTL1]

Q.4 (a) Demonstrate the convolutional code for five bits input sequence **10110**. Also show the change of state for every input. Consider the initial state as "00". [4] [CO5][BTL3]

Q.4 (b) Evaluate the error, if any in the received sequence **"100101"** through Viterbi decoding method. Correct the sequence and find the correct input bits for which the code was generated and transmitted. [4] [CO5][BTL5]

Q.5 (a) Find the values for a, b, c, and d in each matric. Also, identify each matrix with reason. [4] [CO3][BTL1]

$$\begin{bmatrix} 0.24 & a & 0 \\ 0 & b & 0 \\ c & 0.09 & 0.21 \end{bmatrix} \begin{bmatrix} 0.1 & 0.3 & 0.2 & a \\ b & 0.1 & 0.1 & 0.5 \\ 0.2 & 0.4 & 0.1 & c \\ 0.2 & d & 0.1 & 0.5 \end{bmatrix} \begin{bmatrix} 0.67 & a & 0.37 \\ 0 & 0.727 & b \\ c & 0.164 & 0.20 \end{bmatrix}$$

Q.5 (b) Analyze the channel capacity for the given cascaded channel shown in Fig. 1. Also, compare the channel capacity of cascaded channel with channel capacity of first channel. [4] [CO3][BTL4]

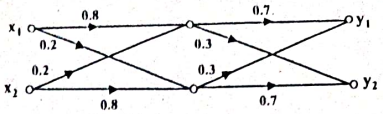

Fig. 1

Q.6 (a) Analyze the given channel in Fig. 2 and find all the entropies and mutual information. [4] [CO1][BTL4]

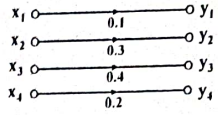

Fig. 2

Q.6 (b) Recognize the error and correct the sequence, if a receiver receives the following bit sequence "00000000110110010101011000011010110" wherein error is in the form of a burst with length 5 bits.. The codes are generated through (7, 4) Hamming code technique. [4] [CO4][BTL2]

-End-

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____SEMESTER

B.Tech. (Eve)

END TERM EXAMINATION *Nov-Dec-2024*

COURSE CODE: CEC403 COURSE TITLE: Wireless Communication

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

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

Q.1 Answer all the following questions:

a) Define Trunking and Grade of Service? [2] [CO2]

b) Define the term Multiple Access. [2] [CO3]

c) What is diversity? Why it is employed? [2] [CO5]

d) Write an IEEE standard name for Wi-Fi &Bluetooth? [2] [CO6]

Q.2 a) Explain the different techniques to improve the coverage and capacity of cellular systems?. [4][CO2]

b) Write short note on GSM and GPRS? [4][CO3]

Q.3 a) For a seven-cell reuse system with a 1% blocking probability and an average call length of two minutes, find the traffic capacity loss due to trunking for 57 channels when going from Omni-directional antennas to 60° antennas. Assume the blocked calls are cleared and the average request rate is 1 call per hour. [4][CO3]

b) Write a short note on Fresnel zone geometry and Knife edge diffraction model [4][CO4]

Q.4 a) Explain any two indoor propagation models. [4][CO4]

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b) Under the free-space path-loss model, find the transmit power required to obtain a received power of 1 dBm for a wireless system with isotropic antennas (Gt = Gr = 1) and a carrier frequency f = 5 GHz, assuming a distance d = 10m. Repeat for d = 100m. [04][CO4]

Q.5 a) Generalize the effect of fading in wireless channel due to Doppler Spread. [04][CO5]

b) Derive the expression for Maximal Ratio Combining technique. [04][CO5]

Q.6 a) Consider a 3*2 MIMO system with zero-forcing (ZF) receiver having SNR equals 30dB. Calculate the average approximated BER and also mention the dimension of channel matrix? [04][CO5]

b) Differentiate between WiMAX and LTE. [04][CO6]

Total No. of Pages _02__ 618 Roll no.....

VII SEMESTER

B.Tech. (Evening)

END TERM EXAMINATION ***November-2024***

CEC-409: Computer Vision

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

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

Q1. Attempt any five question from the following

a. Assess the advantages and limitations of frequency domain filtering compared to spatial domain filtering for image enhancement. [2M][L5][CO3]

b. Explain the role of the lower and upper thresholds in canny edge detector [2M][L2][CO1]

c. Explain the Harris corner detector algorithm in context of (i) No feature of interest (ii) edge found (iii) corner found [2M][L2][CO1]

d. What is a Gaussian Mixture Model (GMM)? How is it different from a single Gaussian distribution? [2M][L2][CO1]

e. What are intrinsic and extrinsic parameter for camera calibration [2M][L2][CO1]

f. What are the key parameters that influence the effectiveness of frame differencing in motion detection? [2M][L4][CO3]

Q2.

a. Suppose you are working on a problem of extracting the foreground from background using Histogram for the below data.

Intensity Range	0-50	51-100	101-150	151-200	201-255
Frequency	200	150	600	900	150

Identify a suitable **threshold value** to segment the image into foreground and background regions based on the histogram. Assign the foreground as 1 and background to be 0. Plot the histogram of binary image as well. [5M][L3][CO3]

b. You are given the following 5x5 grayscale image matrix:

$$I = \begin{bmatrix} 100 & 100 & 100 & 100 & 100 \\ 100 & 200 & 200 & 200 & 100 \\ 100 & 200 & 255 & 200 & 100 \\ 100 & 200 & 200 & 200 & 100 \\ 100 & 100 & 100 & 100 & 100 \end{bmatrix}$$

Compute the horizontal and vertical gradient. Apply a suitable threshold to find the edge. Also, Discuss the role of the Sobel operator in highlighting edges in the matrix. [5M][L3][CO3]

Q3.

a. For the given data:
X1={(5, 3, 2), (4, 6, 0), (3, -7, 14)}
X2={(-2 -5 17), (3 -13 10), (-4 -2 16)}
perform the LDA and get the optimum direction. [5M][L3][CO2]

b. Data : {(5, 3, 2), (4, 6, 0), (3, -7, 14), (2, 5, 3),(3, 13, -6)} Perform PCA and if applicable, reduce the dimension of data. [5M][L3][CO2]

Q4. Attempt any two questions out of following

a. Given an image, describe the steps you would take to extract keypoints and descriptors using the SIFT algorithm. Highlight how these features can be used for object recognition. Enlighten the scale and rotation invariance property for SIFT. [5M][L3][CO3]

b. Explain the Lucas-Kanade method for optical flow computation using mathematical equations. What are the key assumptions and the key issues in this approach? Also discuss the solution for large motion [5M][L4][CO3]

c. Explain the Kalman Filter algorithm. Describe the steps involved in the prediction and update phases, and discuss the limitations or constraints that might arise during these processes. [5M][L5][CO3]

Q5.

a. Explain the concept of Independent Component Analysis and describe how it differs from Principal Component Analysis [4M][L2][CO3]

b. Explain the numpy library [3M][L2][CO5]

c. Explain the opencv library [3M][L2][CO5]

Total no. of Pages:02 620 Roll no.....

_____SEMESTER

B.Tech. (Eve)

END TERM EXAMINATION *Dec-2024*

COURSE CODE: CEC-427 **COURSE TITLE: Optical Communication**

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

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

Q.1 Answer all the following questions:

a) Define Numerical aperture of the fiber. Why it can't be made very large? [2] [CO1]

b) Draw the plot of material, waveguide and total dispersion as a function of wavelength. [2] [CO2]

c) Define Population Inversion. [2] [CO3]

d) What is WDM and compare it with TDM? [2] [CO4]

e) Define power penalty. [2] [CO5]

Q.2 a) Explain ray theory transmission in optical fibers with necessary expressions. [5][CO1]

b) Give a detailed illustration of Modes, Mode coupling, Step and Graded index fibers in cylindrical fiber. [5][CO1]

Q.3 a) Explain the primary approaches of intermodal and intramodal dispersion in optical fiber. [5][CO2]

b) What are nonlinear scaterring losses in optical fiber. [5][CO2]

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Q.4 a) What is the requirement for optical sources to feed into a fibe
Enlist the advantage & Disadvantages of LASER & LED.
[5][CO3]

b) The radiative and non radiative recombination lifetimes of
minority carriers in the active region of double heterostructure LE
are 50 ns and 100 ns respectively. Determine the total carr
recombination life time and the power internally generated within
device when the peak emission wavelength is 0.87 nm at a dr
current of 40 mA.? [05][CO3

Q.5 a) Explain about SONET/SDH transmission formats and spe
SONET/SDH rings and SONET/SDH Networks. [05][CO4

b) Distinguish between the amplification mechanisms in a Ram
fiber amplifier and an erbium-doped fiber Amplifier with suita
diagram. [05][CO4

Q.6 a) How nonlinear dispersion compensation is utilized for soliton-bas
optic communication? [05][CO5

b) Explain about Link power budget and rise time budget.
[05][CO5

Total No. of Pages -1

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IIIrd SEMESTER

B.Tech. (Cont Edu.)

END TERM EXAMINATION

NOV 2024

CME 201 THERMAL ENGINEERING I

Time: 3 Hours

Max. Marks: 40

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

Steam table and Mollier chart permitted

1(a)Explain briefly the following: (i) Thermodynamic system (ii) property (iii) path function (iv) point function.

(b) Air flows steadily at the rate of 0.4 kg/s through an air compressor entering at 6 m/s with a pressure of 1 bar and a specific volume of 0.85 m^3/kg and leaving at 4.5 m/s with a pressure of 7 bar and a specific volume of 0.15 m^3/kg. The internal energy of air leaving is 90 kJ / kg greater than that of air entering. Heat loss to surrounding is at the rate of 59 J/s. Determine power required to drive compressor and the inlet and outlet cross sectional areas. (3,5) [CO1]

2(a) A reversible heat Engine receives heat from two thermal reservoirs maintained at constant temperatures of 750 K and 500 K. The engine develops 100 kW and rejects 3600 kJ/min of heat to a sink at 250 K. Determine thermal efficiency of the engine and heat supplied by each thermal reservoirs.

(b) Explain briefly the following: (i) saturation temperature (ii) saturation pressure (iii) critical point (iv) dryness fraction of steam. (5,3) [CO2]

3(a) Explain the working principle of rankine reheat steam power cycle with neat sketch. Draw Ts diagram and writedown the expression for efficiency of cycle and steam consumption.

(b) In a rankine steam power cycle, Steam at 70 bar and 450^0 C is supplied to a turbine plant and steam expands to 0.1 bar in steam turbine. Determine the quality of steam leaving turbine and thermal efficiency of the cycle. (4,4) [CO3]

4(a) Sketch and describe the working of a modern high pressure boiler.

(b) Why mountings are essential in a boiler? Name the different boiler mountings and accessories and state function of each. (4,4) [CO4]

5(a) Dry saturated Steam at 15 bar expands in a nozzle to a exit pressure of 1 bar and the nozzle is required to discharge 2 kg of steam / s. Determine (i) the velocity of steam at exit (ii) C.S. area of nozzle at exit.

(b) Derive the expression for discharge of steam through steam nozzle and condition for maximum discharge of steam through nozzle. (4,4) [CO5]

6(a) What is a steam condenser? State advantages of steam condenser.

(b) Define blade efficiency of a steam turbine. Derive the expression for blade efficiency, condition for maximum blade efficiency and maximum blade efficiency of reaction steam turbine. (3,5) [CO6]

7 Explain the following : (a) regenerative feed water heating (b) compounding of steam turbine (4,4) [CO3,CO6]

Total No. of Pages _2_ 623 Roll No.....

7th SEMESTER **B.Tech. [Evel Mechanical**

END TERM EXAMINATION *Nov-2024*

CME 401 Flexible Manufacturing System

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

Note : Attempt any FIVE full question.
Assume suitably missing data, if any.

Q.1.a. Explain with diagram the motion and axis designation system used in CNC systems [04][CO1,2]

b. How do you classify CNC system used in FMS industries? Explain punched tape used in NC system. [04][CO1,2]

Q.2.a Define Robot as per RIA. Explain with neat figure, 3-d.o.f. of a robot associated with body and arm assembly. [06][CO2,5]

b. Write a note on G and M codes used in CNC part programming. [02][CO2,5]

Q.3.Explain with neat diagrams:
(i)Link actuated grippers
(ii) Magnetic gripper
(iii)Heating Torch as end effector
(iv) Spray Painting gun as end effector [08][CO2,5,6]

Cont.... Page 2

Q.4.a. Explain with neat diagram following types FMS layouts used in automated industry:
(i) Ladder Type [06][CO4,5,6]
(ii) Loop Type
b. Write a note on Reverse Engineering concept used in automated industries. [02][CO5,6]

Q.5.a. Define Group Technology.List different coding systems used in GT. [02][CO5,6]
b. Explain with example the syntax and use of any TWO methods of defining (i) CIRCLE (ii) LINE using APT Language [06][CO2,3]

Q.6.a. Explain with diagram the Automated Storage and Retrieval System (AS/RS) used in FMS. [04][CO5,6]
b. With diagrams explain any two types of material handling system used in FMS industries. [04][CO5,6]

Q.7.Write short notes on:
i. Cylindrical Coordinate Robot
ii. Concurrent Engineering
iii. CIM
iv. OPITZ coding system. [08][CO 1,3,4,5]

Total No. of Pages: 02 625 *Roll No. ... .*

B. Tech. (ME) *Seventh Semester*

End Semester Examination *(Nov-2024)*

CME-403 MACHINE DESIGN

Time: 3 hrs *Max. Marks: 40*

Note: Attempt **any FIVE** questions. Assume suitable missing data, if any. Use of Design data hand book is permitted.

(1) (a) What are factors that govern selection of materials while designing a machine component. [2] [CO2] [BTL1,2]

(b) Define preferred numbers. [2] [CO2] [BTL1,2]

(c) What are unilateral and bilateral tolerances? [2] [CO2] [BTL31,2]

(d) Write and explain different parts of screw Jack. [2] [CO4] [BTL1,2]

(2)(a) Explain the failure of cotter in bending. Also, write related equations. [2] [CO1] [BTL1,3,4]

(b) Draw Goodman diagram, Soderberg line, and Gerber parabola. Explain briefly and write related equations. [2] [CO3] [BTL1,2]

(c) A shaft of diameter d is subjected to a torque T and a bending moment M. Find expressions for an equivalent bending moment and equivalent torque. [2] [CO3] [BTL3]

(d) Explain failure of square key in shear and crushing. Also, write related equations. [2] [CO3] [BTL3]

(3) Design a spigot-socket cotter joint for an axial load of 80kN in tension and compression. It is assumed that all parts are made of the same material with the permissible stress of 70MPa,50MPa, and 90Mpa in tension, shear and compression respectively. Also, sketch the joints. [8] [CO1] [BTL1,2,3]

(4) Design a triple riveted double strap butt joint with unequal covers for, longitudinal joint. The boiler shell having a 1.25m internal diameter to withstand maximum pressure 2.5N/mm^2. Assume that shell plate and rivets are made of C20 steel having following allowable stresses, σ_t=86N/mm^2 ,τ=52 N/mm^2 and σ_c=129N/mm^2 . Also, sketch the joints. [8] [CO4] [BTL2,3,5]

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(5) A solid shaft is subjected to a twisting moment of 800N-m, a bending mome of 200N-m. If the maximum allowable values of normal and shear stresses a 140N/mm^2 and 80N/mm^2 respectively, determine the diameter of the shaft. [8] [CO4] [BTL2,3,

(6) A motor shaft rotating at1500 rpm to transmit 15kw power to a low-speed sha rotating at 500rpm. A 20^0 pressure angle involute tooth gear pinion is use The pinion has 25 teeth. Both gear and pinion are made of cast iron having t allowable strength of 55N/mm^2.Design a spur gear on static strength and che it on wear criteria. The allowable surface endurance strength is 500N/mm [8] [CO5] [BTL2,3,

(7) Design and draw a cast iron protected type flange coupling to connect t shafts of 36mm diameter (made of steel 40C8, FOS=2.5) transmitting 15k at 720rpm. The overload capacity is 1.25 times average torque. The bolts a keys are made of 30C8 steel (Yield strength=400N/mm^2, FOS=2.5) and flange is made of FG200(ultimate strength=200N/mm^2, FOS=6). [8] [CO5] [BTL2,3,

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Total No of Pages...Two... *Roll No.....*

Seventh Semester [B Tech Mech. Engg. (Evening)]

END SEMESTER EXAMINATION *(November-2024)*

CME - 407 Mechatronics

Paper Code Title of the Subject

Time: 3.00 Hrs. Max Marks. 50

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 1 Differentiate between. (2x4=08) CO 01

(a) – Amplification and Filter.

(b) – Plug Gauges and Ring Gauges.

(c) – Finite and Infinite position valves.

(d) – First order and Second order systems.

Q No 2(a) What do you understand by Systematic errors? Discuss its various types in brief. (4) CO 02

Q No 2(b) Differentiating between Repeatability and Reproducibility, also discuss their significance in brief. (4) CO 04

Q No 3(a) Differentiate between Open and Closed loop control systems, with examples in brief. (4) CO 03

Q No 3(b) What is Electrical Actuation system? Also discuss various Electrical drives (Motors) used in Electrical Actuation system in brief. (4) CO 02

Q No 4(a) Explain Hydraulic Actuation system along with its various components in brief. (4) CO 04

Q No 4(b) What do you understand by Valve symbols? How a 2/2 valve will be shown? (4) CO 03

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Q No 5(a) What is Signal Conditioning? Explain various functions under it, in brief. (4) CO

Q No 5(b) Describe various types of Electrical switches used in Electrical actuation systems, in brief. (4) CO

Q No 6(a) What do you understand by Drift? Also explain its types in brief. (4) CO

Q No 6(b) A Platinum resistance thermometer is calibrated in an environment at a temperature of 15°C and has the following Resistance/Temperature characteristic. (4) CO

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 7(a) What do you understand by Dynamic characteristics of the Instruments? How it is important for Mechatronic systems. (4) CO

Q No 7(b) Explain Case study of any Mechatronic system in brief. (4) CO

Q No 8 Write short note on any two of the following. (2x4=08) CO 03

(a) – Shape Memory alloys (b) – Hydraulic Valves

(c) – Microprocessors and Microcontrollers (d) – PLC

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Total no. of Pages: 02

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VII SEMESTER

B.Tech. (Eve)

END TERM EXAMINATION *Nov/Dec-2024*

CME 411 Combustion Generated Pollution

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

Note: Q.No. 2 and 7 are compulsory
Attempt any 3 questions from rest of the question paper, in total attempt 5 questions
All questions carry equal marks.
Assume suitable missing data, if any.

Q.1 (a) Illustrate the role of fuel injection systems in improving the performance of SI engines. [4][CO1][BTL3]

(b) Assess the influence of road performance characteristics on the overall fuel economy of vehicles. [4][CO1][BTL5]

Q.2 (a) Explain the variation in CO, HC, and NOx emissions for an SI engine using appropriate graphs. Interpret the patterns shown. [4][CO2][BTL2]

(b) Examine the formation mechanisms of incomplete combustion products such as hydrocarbons and carbon monoxide. [4][CO2][BTL4]

OR

Q.2 An SI engine has bore x stroke = 76 × 76 mm and compression ratio equal to 9.0:1. Top piston land height is 7 mm and clearance between piston and cylinder liner is 0.35 mm. At the end of intake stroke the stoichiometric mixture of gasoline (C8H18) is at 0.09 MPa and 330 K. Peak cylinder pressure during combustion reaches 3.0 MPa. The temperature of gas in the piston crevice region due to heat transfer to the cylinder walls is 400 K. Calculate the amount of charge stored in the top land crevice at the instant of maximum cylinder pressure. What fraction of the charge inducted is stored in this crevice? [8][CO2][BTL4]

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Q.3 (a) List the design variables and explain briefly influencing gasoline engine emissions. [4][CO3][BTL1]

(b) Explain the working of evaporative emission control systems like canisters. [4][CO3][BTL2]

Q.4 (a) Identify the methods used to reduce smoke emissions in diesel engines. [4][CO6][BTL1]

(b) Explain the working principles of the exhaust gas recirculation system. [4][CO6][BTL2]

Q.5 (a)Explain the working principle of catalytic converters in emission reduction. [4][CO5][BTL2]

(b) Assess the environmental benefits of using exhaust treatment devices in automobiles. [4][CO5][BTL2]

Q.6 Propose a design modification to minimize evaporative hydrocarbon emissions in gasoline engines [8][CO3][BTL6]

Q.7 Compare the roles of different emission analyzers, such as Non-dispersive Infrared analyzer, Gas chromatograph, flame ionization detector, chemiluminescent analyser. [8][CO5][BTL5]

OR

Q.7 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. [8][CO2][BTL5]

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Total no. of pages: 02

Roll No.....

End Term Examination

December: 2024

Course Code: CHU 101

Time: 3 Hours

Course Title: Communication Skills

Max. Marks: 50

Note: Read instructions carefully and answer accordingly.

Q No 1 – Attempt any two short notes: 10 [CO1]

a. Grapevine

b. Importance of communication

c. Upward communication

Q No 2 – Do as directed: 10 [CO2]

a. The students were asked to ..... (cite/sight) examples in their essays.

b. She accepted the ..... (compliment/complement) with a smile.

c. Does she..... (like/likes) chocolate ice cream?

d. Did he ..... (call/called) you earlier?

e. I..... (want/wants) to learn a new language.

f. I and my friend went out to buy new furnitures. (Rectify the error)

g. The man is mortal. (Rectify the error)

h. The shirt is good but I don't like it's colour. (Rectify the error)

i. Frame sentences using the pair of words 'Adapt' and 'Adept' to convey their meanings.

j. Give two examples of word formation through the 'Compounding method'.

Q No 3 – (a) Give two examples of words that include each of the following sounds: /ʊ/, /ɑ:/, / i:/, /ʌ/, /θ/ 10 [CO3]

(b) What are the essentials of an effective presentation?

Q No 4 – Examine the significant themes deployed by George Orwell in his novella *Animal Farm*. 10 [CO5]

Q No 5 – Read the following passage and answer the questions given below:

The Central Government has guided Education Policies in India right from the inception of the Republic. It has provided a blue print to modernise education and bring it at par with global standards; the first attempts were via National Policy in Education (NPE, 1986) and then through the New Education Policy (NEP), implemented recently. The policy lays emphasis on skill-based learning, providing a plethora of choices for students and widening their knowledge base. Attention has also been focused on continuing adult education; a special focus is on encouraging holistic education by promoting yoga, sports and physical education.

a. Explain the phrase 'blue print' in the context used here. (2)
b. Which is the latest policy on education in India? (2)
c. What are the features of this new policy? (2)
d. What do you understand by the term 'holistic education'? (2)
e. How is holistic education achieved under this new policy? (2)
[CO4]

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

B.Tech. (Eve.)

III Semester

CHU-201 Professional Ethics & Human Values

END TERM EXAMINATION November/December- 2024

Maximum Marks: 50 marks Total Time: 3 hrs

NOTE: ATTEMPT ANY FIVE QUESTIONS.

1. "Value Education helps in fulfilling one's aspirations in life" Discuss the quote.

2. What are the core values? Write a note on the need of Professional Ethics in modern life style.

3. How can *Values & Morals* contribute in growth of prosperity and harmony in society and country?

4. Define the concept of social experimentation with suitable examples.

5. Describe the global issues and ethical challenges for upcoming engineers.

6. Explain the basic principles of Environmental Ethics. How environmental issues are affecting our life in modern era?

7. How ***Eco Friendly Production System*** can be helpful for environmental issues in present scenario in India?

Total no. of Pages:2 684 Roll no.....

FIRST SEMESTER B.Tech.(Eve)

END TERM EXAMINATION Nov -2024

COURSE CODE: CMA 101

COURSE TITLE: ENGINEERING MATHEMATICS

Time: 03:00 Hours Max. Marks: 40

Note: Assume suitable missing data, if any.

Q.1 (i) Find the inverse Laplace Transform of

$$L^{-1}\left\{\frac{s^2+2s-3}{s(s-3)(s+2)}\right\}$$ [4][CO1]

(ii) Find the Fourier series expansion of the function $f(x)=x-x^2$ in the interval $-\pi \le x \le \pi$. [4][CO1]

Q.2 (i) Find the rank of a matrix using elementary row operations:

$$\begin{bmatrix} 1 & -1 & 3 \\ 2 & 3 & 5 \\ 5 & 0 & 14 \end{bmatrix}$$ [4][CO2]

(ii) Find the eigenvalues of the matrix

$$\begin{bmatrix} 2 & 1 & 1 \\ 1 & 3 & 2 \\ -1 & 1 & 2 \end{bmatrix}$$ [4][CO2]

Q.3 (i) Solve: $\frac{d^4y}{dx^4}+y=0$ [4][CO3]

OR

If $u=\sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, then prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\tan u$. [4][CO3]

(ii) Find the area enclosed between the curve $x^2=4y$ and the straight line $x=4y-2$. [4][CO3]

OR 635

Solve the initial value problem:

$$\frac{d^2y}{dx^2} + 3\frac{dy}{dx} - 18y = 0, \quad y(0) = 6, \quad y'(0) = 0. \qquad [4][CO3]$$

Q.4 (i) Solve the following system of linear equations by Gauss Elimination Method correct upto three decimal places.

$$2x_1 + 3x_2 + x_3 = 9$$
$$x_1 + 2x_2 + 3x_3 = 6$$
$$3x_1 + x_2 + 2x_3 = 8 \qquad [4][CO4]$$

(ii) Calculate the value of $\int_0^1 \frac{x}{1+x}dx$ correct upto three decimal places, taking six intervals by Simpson's $1/3^{rd}$ rule. [4][CO4]

Q.5 (i) Find a positive root of $x^2 - 2x - 2 = 0$, by Newton-Raphson Method, correct upto two decimal places. [4][CO5]

(ii) Compute y(0.2) from the differential equation :

$$\frac{dy}{dx} = x - y, \quad y(0) = 1$$

taking h=0.1, by Runge-Kutta method correct upto five decimal places. [4][CO5]

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Total no. of Pages:02

Roll no.....

SEMESTER

B.Tech.

END TERM EXAMINATION *Nov-2024*

VAC3/FEC6 : Corporate Social Responsibility

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

Note: All questions carry equal marks.
Question 1 is mandatory
Attempt any 4 questions out of remaining 6 questions

Q.1 A global retail chain, *DiverseRetail Inc.*, faced criticism for failing to provide equal opportunities for women in leadership roles. In response, the company launched a global CSR campaign to promote gender equality in the workplace. They introduced mentorship programs, flexible work policies, and gender-sensitivity training across their branches in India, the USA, and Europe.

1. Why is addressing gender issues important for a global company? [3]
2. Suggest additional CSR activities DiverseRetail could implement to address gender inequality in their supply chain? [3]
3. Assess the potential business benefits of DiverseRetail's gender equality initiatives? [4]

[10M][BTL 6]

Q.2 Explain the key legislative measures that govern CSR activities in India?

[10M][BTL2]

Q.3 Elaborate SA8000 principles and analyze how compliance with SA8000 enhances a company's reputation?

[10M][BTL4]

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Q.4 Explain the concept of business ethics and describe the factors that influence ethical decision-making in organizations? [10M][BTL 3]

Q.5 Define social auditing and its importance in monitoring and measuring the impact of CSR initiatives? [10M][BTL 1]

Q.6 Explain the concept of corporate social reporting and evaluate its role in promoting transparency and accountability in business operations. [10M][BTL 3]

Q.7 Explain the role of sustainability reporting tools, such as GRI, SASB, and TCFD, in promoting transparency and accountability in CSR? [10M][BTL1]

Total No. of pages: 01 Roll No: _____

I/II/III/IV SEMESTER B.Tech./B.Des.

END-TERM EXAMINATION 638 December / 2024

VAC27/FEC7 INTRODUCTION TO ENVIRONMENTAL SCIENCES

Duration: 2 Hours Maximum Marks: 50

Note: All questions are compulsory and carry equal marks.

	Marks	CO#	BTL#
Q. 1 Attempt the following questions			
a. Explain natural resourse and equitable distribution of natural resources.	5	CO1	BTL2
b. Explain products, overuse, threats, and remedies for threats to forest resources.	5	CO1	BTL2
Q. 2 Attempt the following questions			
a. Apply environmental management in reducing the risks and consequences of industrial discharges.	5	CO2	BTL3
b. Examine the risks posed by oxides of sulphur on the ecosystem.	5	CO2	BTL3
Q. 3 Attempt the following questions			
a. Analyse climate change.	5	CO3	BTL4
b. Analyse the causes, effects, and control measures of soil pollution.	5	CO3	BTL4
Q. 4 Evaluate benefits and problems associated with agriculture and their impact on ecosystems and society.	10	CO4	BTL5
Q.5 Attempt ANY ONE of the following questions:			
a. Develop a strategy for achieving a lifestyle that promotes social and environmental sustainability and environmental justice.	10	CO5	BTL6
b. Develop a methodology to enhance waste segregation and recycling at household levels.	10	CO5	BTL6

Total No. of Pages: 01 639 Roll No.....

SEMESTER-1& 3 B.TECH.

END-TERM EXAMINATION NOV/DEC-2024

AEC-18/ FEC-9 SPOKEN SKILLS IN ENGLISH

Time: 2:00 Hours Max. Marks: 50

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

Q.1. What do you understand by Communication? Explain the 7 Cs of communication in detail. (10) (CO2)

Q.2. Write a paragraph on "Effects of advertising on society" (250-300 words). (10) (CO1)

Q.3. Imagine you are appearing for the post of Assistant Development Officer in XYZ company. Prepare your CV mentioning relevant details, your skills and experiences. (10) (CO3)

Q.4 Suppose you are preparing to give a power point presentation on "Stress Management". Mention any 5 do's and 5 don'ts that you should keep in mind for an effective presentation. (10) (CO4)

Q.5 Discuss the important points that you should keep in your mind while appearing for an interview. (10) (CO2)

Q.6 Write short notes on the following: (5+5) (CO3)

A) Interview Skills

B) Oral Vs Written Communication

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

B.Tech- 1st &3rd Semester

End Term Exam **November-2024**

FEC 11/AEC 11: Course Title: Soft Skills and Personality Development

Time: 2 hours Max marks:50

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

1. Write a short note on the following. CO1 BTL 2 Marks (10)
   a) Barriers to communication
   b) Types of Handshakes

2. Explain how to make presentation skills effective. CO2 BTL 3 Marks (10)

3. Write a paragraph on how Goal setting is important for a successful life. CO3 BTL 4 Marks (10)

4. Explain how "Ghumantu Pathshala" has transformed your personality. CO4 BTL 5 Marks (10)

5. Explain the major skills you need to acquire for Personality Development. CO5 BTL 6 Marks (10)

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

I & III SEMESTER

B.Tech

END SEMESTER EXAMINATION

November 2024

COURSE CODE: AEC 4/FEC12

COURSE TITLE: BUSINESS COMMUNICATION AND PRESENTATION SKILLS

Time: 2 Hours *Max. Marks: 50*

Note: Attempt any 5 questions. 1st Question is compulsory.
Assume suitable missing data, if any.

Q1. You are the team lead of a marketing project in a medium-sized company. During a quarterly review meeting, a senior manager criticizes your team for not meeting the campaign's projected results. The criticism is delivered bluntly, highlighting issues such as poor communication with stakeholders and ineffective allocation of resources.

As the leader, you need to respond to the feedback in a professional and constructive manner while ensuring your team's morale is not affected

Questions:

1. **How should you respond to the senior manager's criticism to demonstrate professionalism and accountability?** (5)
2. **What strategies can you use to ensure your response focuses on finding solutions rather becoming defensive?** (5)

(10 Marks) (BTL 3, 4)

Q2. What strategies can a presenter use to maintain the audience's attention throughout the presentation? **(10 Marks) (BTL 4, 6)**

Q3. What strategies can participants use to ensure that their arguments are both logical and impactful in a group discussion? **(10 Marks) (BTL 4, 6)**

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Q4. What are the key dos and don'ts you follow during an interview to en professional and confident presentation? **(10 Marks) (BTL**

Q5. Imagine you are preparing your resume for a competitive positi multinational company. The job requires a combination of technical ex leadership skills, and experience in managing cross-functional teams. H you have a career gap of one year due to personal reasons, and your previ involved responsibilities that were not entirely aligned with this ne requirements.

Question:
How would you structure your resume to highlight your strengths, address career gap effectively, and position yourself as a strong candidate for the r
(10 Marks) (BTL 3, 4

Q6. What are the causes of communication inhibition, how to address it th targeted strategies? **(10 Marks) (BTL**

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Total No. of Pages: 01

Roll no.....

I/III Semester
B.Tech

END TERM EXAMINATION *December-2024*

AEC-3/FEC14 **APPRECIATION OF SHORT STORIES**

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

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

Q.1 What are the necessary elements of a short story? Elaborate. [CO1][BTL 1] .[10]

Q.2 Critically comment on the title of the story "The Use of Force".
[CO2][BTL 4] [10]

Q3. Elucidate how John Collier's representation of a dysfunctional family in "Wet Saturday" is a commentary on family as an institution. [CO3][BTL 5] [10]

Q4. Comment on power dynamics between Mr Martin and Mrs Barrows in "The Catbird Seat". [CO4][BTL 4] [10]

Q5. "Ernest Hemingway's personal experience during World War-1 shapes up his criticism on the senseless glory of war "In Another Country" ". Analyze the statement critically. [CO4] [BTL 4] [10]

Q6. Comment on the conflict of religious faith in the text "The Enemies".
[CO4][BTL 4] [10]

Q7.Do you believe that writers act as catalysts aiming to create change in the world through their literary creations? Comment with respect to any two texts prescribed in the course. [CO5][BTL 6] [10]

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6. Symbolize the following statements using suggested notations: [4x1=4 marks] [CO#3 &CO#4]

(i) I sat on the chair but my cat sits on the floor. (C, P)
(ii) He was annoyed, still he kept quiet. (A,K)
(iii) Sahil will go to college if and only if Karan also goes to college. (S,K)
(iv) It is not true that Sheela goes to market but does not buy anything. (S, B)

7. Give converse and obverse of the following : [2x2=4 marks] [CO#2 &CO#3]

(a) All scientists are logicians.
(b) Some artists are professionals.

8. Explain the following concepts: [2x2=4 marks] [CO#1 &CO#6]

(a) Contraries and subcontraries with examples
(b) Sentence and proposition

Total No. of Pages 3

Roll no.....

I / III SEMESTER

B.Tech.

ENDTERM EXAMINATION *November -2024*

FEC-39/AEC-12 JAPANESE

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

Note: All questionsare compulsory.

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

Example: nihon-にほん

(1) kyōjaku

(2) kyūzō

(3) senmonsho

(4) jankenpon

(5) ryokucha

(6) chūgakkō

(7) shokuseikatsu

(8) jinmyaku

(9) sekkyaku

(10) geijūtsuteki

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

Example: aisu-アイス

(1) chokorētto

(2) pasupōto

(3) resutoran

(4) sukejūru

(5) purasuchikku

(6) enjinia

(7) handobaggu

(8) shingapōru

(9) mirimētoru

(10) puroguramu

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

Example: 25- にじゅうご

(1) 257
(2) 341
(3) 695
(4) 833
(5) 1346
(6) 1989
(7) 2024
(8) 3776
(9) 8791
(10) 54321

Q.4 Find the correct Adjective for English word. [10][CO-5]

(あかい、あかるい、ちいさい、くろい、あたらしい、くらい、
ふるい、やすい、たかい、おおきい)

(1) Big
(2) Expensive
(3) Cheap
(4) Small
(5) New
(6) Old
(7) Black
(8) Dark
(9) Red
(10) Bright

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

Example: 木 (ki) 

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

Q.6 Write the following sentences in Hiragana and Underlined words in Katakana. [5][CO-2]

Example: kore wa* rajio desu (wa-Subject particle)
→ これは ラジオ です。

1) kono kamera ni sawatte wa ikemasen.
2) haikingu no basho wa kyonen to onaji desu
3) tekisuto no ju pēji wo akenasai.
4) sono hito wa indoneshia kara kita ryuugakusei desu.
5) watashi wa raigetsu mekishiko de shigoto wo shimasu.

Q.7 Find the correct Katakana word. [5][CO-2]

1) bijinesu (business)
ⓐ ビジナス ⓑ ビゼネス ⓒ ビジネス ⓓ ビジメス

2) pointo (point)
ⓐ ポイント ⓑ ポイソト ⓒ ポエント ⓓ ポエソト

3) komento (comment)
ⓐ コメンテ ⓑ コメント ⓒ コナント ⓓ コメソト

4) sutairu (style)
ⓐ ステイル ⓑ スタエル ⓒ スタイレ ⓓ スタイル

5) sandaru (sandal)
ⓐ サンダル ⓑ センダル ⓒサソダル ⓓ センタル

b)Ergänzen Sie die Pronomen: CO4 (6)

du, ich, mich, sie ,ihn, es,

1. Das Haus ist sehr schön und gross, aber ___ kostet auch viel.
2. Mein Bruder ist in Amerika. Ich spreche _____ am Telefon .
3. Darf _____ herein kommen?
4. Studenten, können Sie _____ hören?
5. Rolf, wo arbeitest ____?
6. Heute kommt die neue Professorin. _____ ist sehr freundlich.

9) Ergänzen Sie die Präpositionen: (Fill the prepositions) CO4 (4)

mit, für, ohne, bis

1. Ich habe die Klassen _____2 Uhr.
2. Ich kaufe ein Buch _____ meine Freundin.
3. Wir fahren _____ dem Bus nach Agra.
4. _____ das Internet können wir keine online Klasse haben

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

oder

b) Stellen Sie Ihre Familie vor? Schreiben Sie 10 Sätze darüber?

.....

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

B.Tech

END SEMESTER EXAMINATION Nov-2024

AEC10/FEC40: GERMAN

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

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

1) Ergänzen Sie das richtige Wort?Fill the right word? CO3(3)

i. Das Fest Diwali ist ____
- aus Berlin
- in Paris
- im November

ii. Deutsch ist _____
- heiss
- interessant
- klein

iii. Delhi ist _____
- lang
- gross
- kurz

iv.Paul studiert _____
- Flughafen
- B.Tech
- Universität

v.Unsere Klasse ist _____
- hell
- teuer
- gross

vi. Mein Bruder ist Arzt. Er arbeitet
- in einem Krankenhaus
- in der Bank
- In der Kantine

2) Lesen Sie den Text und markieren Sie die Sätze richtig oder falsch? CO3 (3).

Hallo, ich heisse Martin. Ich bin 28 Jahre alt. Ich bin Ingenieur und arbeite bei Mercedes. Wir produzieren Autos. Ich arbeite von 9 Uhr bis 17 Uhr. Ich liebe meine Arbeit. Am Abend gehe ich ins Fitnesszentrum oder treffe meine Freunde. Ich bin verheiratet. Meine Frau ist Professorin und arbeitet an der Universität. Ich habe ein Kleines Haus.

	Richtig	Falsch
1. Martin ist dreissig Jahre alt.		
2. Martin ist Techniker von Beruf.		
3. Martin arbeitet 8 Stunden pro Tag		
4. Er findet seine Arbeit interessant.		
5. Seine Frau ist auch Ingenieurin.		
6. Sein Haus ist gross.		

3) Complete the sentences: CO3(5)

1. Martina kommt	a. gross und populär.
2. Unsere Universität ist	b. antike Uhr.
3. Meine Studenten sind	c. seine Firma heisst ABB.
4. Moris arbeitet bei einer Firma.	d. aus der Schweiz
5. Mein Opa hat eine	e. intelligent und smart

4)Ergänzen Sie die geeigneten Verben in der richtigen Form. CO3(6)
lieben, sehen, haben, es geht, helfen, danken

1. Heute _____ wir einen Film.
2. Ich _____ die Atmosphäre an der DTU.
3. Ich spreche kein Englisch. Können Sie mir _____.
4. _____ mir sehr gut.
5. Wir_____ Ihnen für die Information.
6. Morgen _____ wir eine Presentation.

5). Welches Wort passt nicht?(Which word is not fitting here) CO2 (5)

Universität	Klassenzimmer – Bibliothek – Theater - Kantine
Hotel	Das Restaurant – Museum - Kellner - Gast
Das Engifest	schön – gross – hoch- interessant
Das Auto BMW	teuer – super –kalt – gross
Smartphone	chatten – surfen – skypen - fahren

6)Bilden Sie Sätze? (Form sentences) (3)

1) Name / ist / Olivia / mein.
2) wohnt / Frankfurt/ Freund / in / mein.
3) deutsche Musik / Paul / hört .
4) sind / an der DTU/ wir / Studenten.
5) Paul / alt / achtzehn / ist / Jahre.
6) Paul / Manager/ arbeitet/ im / und/ Hotel/ ist.

7a) Possessiv Pronomen: CO4 (2)

ihr, sein,meine, unsere

1. Ich bin in Delhi, und _____ Haus ist in Rohini
2. Der neue Professor kommt hier. _____ Name ist PeterThomsen.
3. Wir studieren an der DTU. _____ Universität ist gross.
4. Meine Direktorin und _____ Mann fahren nach Amerika.

7b) Übersetzen Sie ins Englische? (Translate in English) CO4(4)

1. Mein Direktor und seine Frau kommen in die Party.
2. Am Montag haben wir ein Seminar.
3. Unsere Klasse dauert zwei Stunden
4. Ich trinke morgens einen Kaffee
5. Ich muss in die Klasse gehen.
6. Mein Vater arbeitet bei Bosch Firma.
7. Mein Chef kommt aus der Türkei.
8. Wie geht es Ihnen?

8a)Lesen Sie den Text und beantworten Sie die Fragen. CO4 (4)

Paul ist Student an der Universität in Berlin. Paul studiert Informatik. . Am Samstag und am Sonntag arbeitet er im Cafe. Er hat eine Freundin. Seine Freundin Rosina studiert Hotel Management in Zürich und ist im zweiten Semester. Rosina kommt aus der Schweiz und spricht Deutsch, Französisch und ein bisschen Englisch. Paul spricht Deutsch und Englisch.

1. Was studiert Paul?
2. Was macht er am Wochenende?
3. Woher kommt Rosina?
4. Wie viele Sprachen spricht Rosina?

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

End Term Examination November: 2024

FEC 46/AEC19 Technical Communication

Time: 2 Hour Max. Marks: 50

Note: Read instructions carefully and answer accordingly.

Q1. Attempt any *two* Short note. **(100-150 words)** [CO3,4]10M

a. Communication in 'global' context.
b. Difference between formal and informal Communication.
c. Importance of body language in an Interview.

Q2. As a part of *Group Discussion* present your views on the following topic (200-250 words):

AI will lead to mass unemployment in future

[CO1,3]10M

Q3. Explain 7C's of effective communication Process (200-250 words).

[CO1,5]10M

Q4. You are Arun Roy, working for Hindustan Electricals, Ltd. Write an inspection report on the suitability of the proposed venue for the upcoming company's Annual Event. Suggest some recommendations if any. (Imagine the details) [CO1,2]10M

Q5. Mention the key points you will keep in mind while: [CO2,3]10 M

a) Making a PowerPoint presentation
b) Delivering a PowerPoint Presentation

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

_____SEMESTER B.Tech./B.Des.

END TERM EXAMINATION Nov-2024

FEC50: Tinkering & Element of Design

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

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

Q.1 What is tinkering and the purpose of tinkering in product design and engineering? Describe the "fuzzy front end", "fuzzy back end" and "core" of a product. **[10]**

Q.2 Describe the different types of polymers and explain the processes commonly used in shaping and forming these polymers. **[5]**

Q.3 List and describe the main elements of design, explaining how each contributes to the effectiveness of a product's design. **[5]**

Q.4 Discuss four principles of design and provide examples of how each principle could be applied to create a balanced, functional, and aesthetically pleasing product. **[10]**

Q.5 Observe the provided image of the product, describe its purpose. List the components and materials used, also identify the front end, the back end, and the inner core of the product. **[10]**

P.T.O

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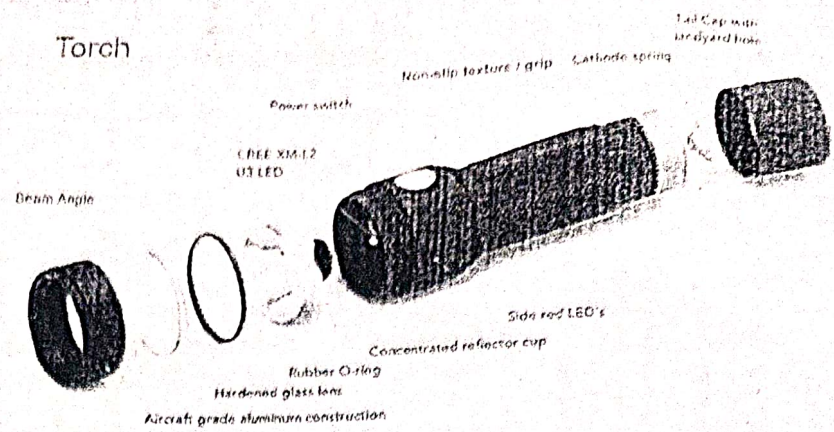
Torch


Tail Cap with lanyard hole
Non-slip texture / grip
Cathode spring
Power switch
CREE XM-L2
U3 LED
Beam Angle
Side red LED's
Concentrated reflector cup
Rubber O-ring
Hardened glass lens
Aircraft grade aluminum construction

Total no. of Pages: 3 *Roll no.....*

B.Tech./B.Des./BBA/BAE/MAE/M.Sc./M.Des./M.Tech./MBA/EMBA/MBA(BA)Ph.D/ B.Tech. (Eve)

END TERM EXAMINATION *Nov-2024*

COURSE CODE: AEC-6/ FEC-53

COURSE TITLE: COMMUNICATIVE HINDI

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

Note : All questions carry equal marks.

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

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

Q.2 अपना परिचय दीजिए। (Write your introduction in 5 lines in hindi)

[5][CO-3]

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

a) दिन-

b) सुबह-

c) मीठा-

d) नया-

e) अमीर-

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

a) व, ल, अ, च

b) न, आ, क, ग

c) च, छ, ऊ, र

d) प, ई, ज, न

e) फ, घ, ए, स

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

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

a) Apple

b) Pea

c) Banana

d) Potato

e) Mango

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

a) महात्मा गांधी का पूरा _____ मोहनदास करमचंद गांधी था।

b) इनका _____ गुजरात में हुआ था।

c) महात्मा गांधी _____ और अहिंसा के पुजारी थे।

d) महात्मा गांधी ने _____ की पढ़ाई इंग्लैंड से की थी।

e) इन्हें भारत के _____ के नाम से जाना जाता है।

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

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

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

a) Red

b) Blue

c) Green

d) Yellow

e) Black

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

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

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

1st /3rd Semester
B.Tech/B.Des.

Final Term Examination Nov-2024

(VAC-13/FEC-54) -Negotiation & Leadership

Total Marks-50 Time-2Hrs

Total five Questions(All are compulsory), Marks indicated in the questions

1 a. Each difficult conversation has three conversations explain. [5]- CO1
b.What are Hofstede cultural dimensions explain in detail? [5]- CO1

2 a.What is collaborative strategy for negotiation?. What are the four major Steps in carrying out a collaborative strategy?.- [6] -CO1
b. Explain how you can be successful with collaborative negotiation?. [4] –CO2

3. a.What are the common negotiation mistakes & how can you overcome them?. [4]- CO1

b. Hiten had a car Maruti Desire Vxi . The car got an accident. How Hiten should negotiate with insurance person to get the best deal. Explain in detail with steps. [6]-CO2

4. a. What is BATNA? How to work out your BATNA? What are the factors by which you can develop a good BATNA?. When other side is powerful , how can you negotiate with them? [6] - CO1

b. Explain following statements . [2X2=4] – CO3
i Why negotiations are difficult?
ii Why we need negotiations?.

5. Write notes on the followings:- [5x2=10] -CO2
a) Seven Myths of effective negotiation
b) Seven elements of effective negotiation

————00000————

Section C: Long Answer Questions (5 marks each) (80-120 Words)

(Answer any 5 questions. Each question carries 5 marks.)

1. What is time management? Discuss practical techniques to manage time effectively and achieve peak performance. (CO2)
2. Explain the "Science of Meditation" in relation to habits and change. How can meditation help in forming positive habits? (CO3)
3. Define "Transmission" in Heartfulness practices. Explain how it contributes to spiritual and personal development. (CO4)
4. How does silence serve as the "Language of the Heart"? Discuss its role in self-reflection and communication. (CO4)
5. Describe the process of relaxation, meditation, and cleaning in Heartfulness. How do these practices complement each other? (CO2)
6. What is the "Power of Suggestion"? Provide examples of how it influences personal growth and mindset. (CO4)

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

FIRST/THIRD SEMESTER **B.Tech./B.Des**

END SEMESTER EXAMINATION **November 2024**

VAC-11/FEC-57: Leadership Mastery through Self Management

Time: 2 hours ***Max. Mark : 50***

Section A: Multiple Choice Questions (1 mark each)

(Answer all questions. Each question carries 1 mark.)

1. "Discovering oneself" focuses on: (CO1)
   a) Imitating others' habits
   b) Understanding personal strengths, weaknesses, and purpose
   c) Avoiding self-reflection
   d) Criticizing past decisions
2. A healthy lifestyle primarily includes: (CO1)
   a) Balanced diet, exercise, and emotional well-being
   b) Working non-stop for success
   c) Taking challenges , competing & Chasing life
   d) Focusing only on physical fitness
3. Time management is essential because it: (CO2)
   a) Reduces stress and increases productivity
   b) Forces rigid schedules on others
   c) Leads to complete elimination of work pressure
   d) Only applies to professional tasks
4. Situational awareness involves: (CO2)
   a) Ignoring your surroundings to focus on one task
   b) Understanding and responding effectively to the environment

c) Relying on intuition without facts
d) Acting without analyzing the situation

5. Relaxation in Heartfulness practice aims to: (CO2)
   a) Increase physical energy only
   b) Quiet the mind and prepare for deeper meditation
   c) Eliminate all thoughts permanently
   d) Focus only on external surroundings

6. What is considered the most ideal time for meditation? (CO3)
   a) Before sunrise
   b) Late night
   c) Afternoon
   d) Evening

7. Meditation is effective in its true sense, when there is focus and _____. (CO3)
   a) Effortlessness
   b) Concentration
   c) imagination
   d) Effort

8. Peak performers are _____ (CO2)
   a) resilient
   b) restless
   c) strongly emotional
   d) aggressive

9. Yerks and Dodson Law Explains (CO 2)
   a) Stress and Attention
   b) Response and Reaction
   c) State of Flow and outcome
   d) Focus and effort

10. Meditation and Cleaning (CO2)
    a) Meditation means concentrating and cleaning means thinking
    b) Meditation is a passive process and cleaning is an active process
    c) Meditation is done in the evening and cleaning is done in the morning
    d) meditation is brooding and cleaning is contemplating

Section B: Short Answer Questions (3 marks each) (30-50 words)

(Answer any 5 questions. Each question carries 3 marks.)

1. Define "Befriending Stress" and describe how it contributes to overall well-being. (CO2)
2. Explain the concept of "Heartful Conversation" and its significance in personal relationships. (CO3)
3. What is the role of observation and diary writing in the art of meditation? (CO4)
4. Differentiate between character and personality in the context of "Understand Live Light." (CO4)
5. Discuss the importance of "Power of Pause" in daily life and decision-making. (CO4)
6. What are the benefits of spot cleaning as part of Heartfulness practices? (CO2)

6. Emotions are intense and short-lived as compared to Moods (True/False)

7. Happiness cannot be learnt (True/False)

8. Three areas in which Optimism benefits a person are
   1._____2._____3._____

9. Overly positive and optimistic people are always able to recognize and judge the potential risk (True/ False)

10. State any 3 types of Internet Addiction:
    1._____2._____3._____

Section B: Long and Short Answer Questions.

Q1. Buddhism concept of happiness (mention about the cycle of suffering, 4 noble truths and the 8 fold path). *[M 10]* (CO2)

Q2. Describe and explain the concept of the Japanese philosophy of the Ikigai with examples. *[M 10]* (CO3)

Q3. Write Short note on the following *[M 20, 5 M each]* (CO4)

a. Internet Addiction
b. Learned Optimism (concept by Martin Seligman)
c. Describe the 6 components of Ryff's Psychological Well-being model
d. Any one theory of Emotion

Total Number of Pages: 02- *Roll No.....*

1st/3rd Semester

B.Tech

END TERM EXAMINATION **November-2024**

VAC19/FEC–58 Course Title: Science and Practice of Happiness

Time: 2 hours Max. Marks 50

Note: All Questions are Compulsory.

Section A: MCQ *[M 10, 1 M each]* (CO1)

1. Write the full form of PERMA model (what each letter stands for)

2. 3 fundamental mental states that lead to suffering within the cycle of existence according to Buddhism philo. are
   1._____2._____3._____

3. Technique of practicing mindfulness is/are :
   a. Meditation
   b. Focusing on the Present Moment
   c. Focus attention on breathing
   d. All of the above

4. Hedonic Happiness refers to:
   a. Long-lasting and meaningful happiness
   b. Experience of Pleasure and Avoidance of Pain
   c. Personal Fulfillment and Growth
   d. All of the above

5. According to Carl Rogers, Empathy includes:
   a. Judgemental Attitude
   b. Reflective Skillful Listening
   c. Ranting about your own problems

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Roll no.....

Total no. of Pages:1

1st/3rd SEMESTER B.Tech.

END TERM EXAMINATION *Dec-2024*

COURSE CODE- VAC16

COURSE TITLE- professional Ethics and Human Values

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

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

Q.1 What do you mean by the term profession "Professional" and professionalism? Explain the characteristics of Professionalism. [10][CO#2]

Q.2 What are codes of ethics? Explain the functions and needs of codes of ethics. [10][CO#8]

OR

Explain and Compare major ethical theories (Utilitarianism ,Deontology and Virtue Ethics. [10][CO#3]

Q.3 What is environmental ethics? State the major challenges and problems in environmental ethics. Discuss the approaches to resolve these environmental problems. [10][CO#7]

OR

Explain the various segments(personal, social, family, nature) of harmony in life .[10][C1#11]

Q.4 Explain the term Safety and Risk ,and Describe in detail the concept of 'Risk-Benefit Analysis' and what is the use of Risk-Benefit Analysis? [10][CO#5]

Q.5 Explain the term ' Whistle Blowing ', and what are the procedures to be followed for 'Whistle Blowing '? How can this be avoided?[10] [CO # 5]

OR

What are 'Engineering Ethics,' the roles played by engineers, and the ethical issues associated with each role?10][CO#4]

**** END ****

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Roll no.....

I & III SEMESTER

B.Tech

END SEMESTER EXAMINATION November 2024

COURSE CODE: VAC25

COURSE TITLE: VALUE DRIVEN LEADERSHIP

Time: 2 Hours *Max. Marks: 50*

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

Q1. QuantumX, a private company aims to instill a culture of ethical decision-making and teamwork among its employees. The management uses both financial incentives (such as performance bonuses and ESOP plans) and informal mechanisms (like mentorship programs and team-building activities) to promote these values. Answer the following questions:

1. How do formal incentives contribute to reinforcing the company's values of ethical decision-making and teamwork? (5)
2. In what ways do informal mechanisms, such as mentorship programs and team-building activities, support or enhance organizational culture and employee behavior. (5)

(CO 3)(10 MARKS)(BTL 3, 5)

Q2. A popular brand recently launched a new advertising campaign for one of its products, targeting a younger audience. The campaign includes exaggerated claims about the product's effectiveness, with visuals that may potentially mislead viewers about its benefits. Additionally, some ads appear to exploit societal pressures around body image, causing public backlash and concern from consumer advocacy groups. . Answer the following questions:

1. What specific ethical norms and guidelines have been violated? (5)
2. Discuss the potential long-term benefits of conducting ethical marketing on the brand's reputation, consumer trust, and overall brand value. (5)

(CO 1, 4)(10 MARKS)(BTL 3, 4)

Q3. Identify situations where being completely truthful might harm an organization, and how can businesses manage such scenarios while maintaining ethical standards? Use suitable examples to support your answers? **(CO 4)(10 MARKS)(BTL 4)**

Q4. Bistro Delights, a small local restaurant, struggles to attract customers. The owner builds relationships with the community, collaborating with nearby businesses and offering referral discounts. As a result, the restaurant gains new customers and better supplier deals. Answer the following:

1. Explain social capital and its constituents? (5)
2. How does social capital contribute to the growth and success of Bistro Delights? (5)

(CO 5)(10 MARKS)(BTL 5)

Q5. How does a company's CSR initiative align with the provisions of the Companies Act 2013? Why is CSR important for the company's reputation and long-term growth? (10)

(CO 2)(10 MARKS)(BTL 3, 4)

-----End-----

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Total Number of Pages: 02- *Roll No.....*

1st/3rd Semester **B.Tech**

END TERM EXAMINATION **November-2024**

VAC-28 Course Title: Meditation and Conscious Living

Time: 2 hours Max. Marks 50

Note: All Questions are Compulsory.

Section A: MCQ *[M 10, 1 M each]* (CO1)

1. Feeling of kindness and respect for all, makes our personality universal. (True/False)

2. The two fundamental quotients commonly discussed in personal and social development are:

   1._____ 2._____

3. What is the supreme benefit of Meditation?
   a. Emotional stability
   b. Improved focus
   c. Self-discovery
   d. All of the above

4. What is at the root of our character?
   a. Our actions
   b. Our words
   c. Our thoughts
   d. All of the above

5. True selflessness is an expression of
   a. Pride
   b. Love
   c. Pity
   d. Self-esteem

6. Anger affects the person most in whom it is generated. (True/False)

7. Adrenaline is the "fight or flight" hormone. (True/False)

8. Emotional Quotient (EQ) is important in daily life. (True/False)

9. Empathy involves putting yourself in someone else's shoes and feeling their emotions as if they were your own. (True/ False)

10. In meditation we befriend our mind rather fighting with it. (Ture/False)

Section B: Long and Short Answer Questions.

Q1. What is the science behind meditation, and how does it impact th brain, body, and emotional well-being. *[M 10]* (CO2

Q2. What is selfless service, and what are the key qualities that defi it? Additionally, what are the different types or forms of selfless serv that people can practice in their daily lives. *[M 10]* (CO

Q3. Write Short note on the following *[M 20, 5 M each]* (C

a. Importance of attitude of gratitude.
b. Relevance of communication with compassion.
c. Different brain wave frequencies, and their influence on mental states and activities.
d. 90:10 rule for a more peaceful and positive life.

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Total no. of Pages: 01

Roll no.....

B.Tech.

END TERM EXAMINATION **December-2024**

AEC 5 COMMUNICATION SKILLS

TIME: 2 HOURS **MAX. MARKS: 50**

Attempt **any five** of the following questions: All questions carry equal marks.

1. "Communication is a cyclic process." Explain with example.
(CO 1) (BTL 2) (10)
2. What are the major types of communication? Explain. (CO 1) (BTL 2) (10)
3. Explain mechanical and psychological barriers to communication. Illustrate your answer. (CO 2) (BTL 3) (10)
4. Rectify the following sentences: (CO 2) (BTL 3) (10)
   a) He prevented me to go there.
   b) I am familiar to this place.
   c) I have received your letter yesterday.
   d) He does not know to swim.
   e) He has been working since four hours.
5. Analyse the relationship among language, technology and communication.
(CO 2) (BTL 4, 5) (10)
6. Present the phonetic transcription of the following words:
(CO 3) (BTL 3) (10)
   Nature, Democracy, Teacher, Class, Gather
7. What is an expository writing? What are its features? (CO 4) (BTL 2) (10)
8. "Critically evaluate the thematic aspects of *Animal Farm* by George Orwell.
(CO 5) (BTL 6) (10)

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Total no. of Pages - 1

Roll no.....

I SEMESTER

M.Tech

END TERM EXAMINATION *Nov-2024*

COURSE CODE: AEC-25

COURSE TITLE: ENTREPRENEURSHIP DEVELOPMENT

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

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

Q.1 A company wants to enter the luxury menswear market. Outline a potential STP strategy for this company, including target segments, positioning, and how it could differentiate its product. [CO4][BTL5]

Q.2 Piyush is the owner of a D2C brand. What are some ethical considerations that he must be aware of? What practices can he undertake to ensure they are followed? [CO2][BTL4]

Q.3 Select a well-known company (e.g., Airbnb, Uber, or Amazon) and break down its business model using the Business Model Canvas. Describe how each component contributes to the company's overall strategy and success. [CO4][BTL6]

Q.4 Write brief notes on the following: (any 2) [CO3,4][BTL1]

1. Unique Value Proposition
2. New Product Development
3. Identifying and Evaluating Business Opportunities

Q.5 Entrepreneurship plays a critical role in the Indian economy. What are some ways in which it helps? [CO1][BTL2]

Q.6 What is feasibility analysis? How is it different from viability analysis? [CO3][BTL3]

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Total no. of Pages:2 *Roll no.....1*

1st SEMESTER

Integrated B.Sc.- M.Sc

END TERM EXAMINATION ***Dec-2024***

AEC 5:Commuinication Skills

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

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

Q.1. Define communication and explain its principles.

[10][CO1]

Q.2 Read the following passage carefully and answer the following questions

Climate change refers to long-term alterations in temperature, precipitation, and other atmospheric patterns. These changes, primarily driven by human activities such as deforestation and the burning of fossil fuels, have far-reaching consequences. The greenhouse effect, caused by excessive emissions of carbon dioxide, methane, and other gases, traps heat in the Earth's atmosphere, leading to global warming.

Rising temperatures result in melting polar ice caps and glaciers, causing sea levels to rise. Coastal areas face increased risks of flooding, while extreme weather events like hurricanes and droughts become more frequent. These changes also impact biodiversity, as many species struggle to adapt to shifting ecosystems. Humans face challenges such as food insecurity, health risks from heatwaves, and economic losses due to natural disasters.

Addressing climate change requires collective action. Nations must reduce greenhouse gas emissions by transitioning to renewable energy sources like solar and wind. Reforestation, sustainable agriculture, and international cooperation are also crucial in mitigating its effects. Education plays a vital role in raising awareness about this global crisis, encouraging individuals and communities to adopt environmentally friendly practices.

[2*5=10][CO2]

i)Give the antonym from the passage – Lowering, Frees

ii) What is a homonym ? Identify two homonyms (mention its meaning as well) from the above passage.

iii) Find Synonyms for – Rain, Worldwide – in the above passage

iv) Suggest two ways to mitigate climate change.

v) List two impacts of rising temperatures.

Q.3. Write an essay discussing the statement - "Should governments prioritize funding for space exploration over addressing issues like poverty and climate change? Argue for or against this idea, providing strong reasons for your stance."

[10][CO3]

Q.4. What are barriers to communication, explain with examples.

[10][CO1]

Q.5. i) What is International Phonetic Alphabet (IPA) analyse its function and relevance.

iii) Give the IPA transcription of - melt, cut , sip, disk , mud

[2*5=10][CO4]

Q.6. Identify and correct the errors in the following passage

humans looked up into the knight sky and dreamed about space.

In the latter halve of the 20th century, rockets is developed that were powerful enough to overcome the force off gravity to reach orbital velocities, paving the way for space exploration to become a reality.

On October 4.1957. the Soviets launched the first artificial satellite, Sputnik 1, intwo space. Four years later on April 12, 1961, Russian Lt. Yuri Gagarin became the first human to orbit Earth in Vostok 1. His flight lasted 108 minutes, and Gagarin reached a altitude of 327 kilometres (about 202 miles.)

The first U.S. satellite, Explorer 1, went into orbit on January, 31, 1958. In 1961, Alan Shepard became the first american to fly into space?

[10][CO4]

Q.7. Explain the Phonetic Definition of Vowels and Consonants in English language. Define and elaborate on Monophthongs, Diphthongs, Triphthongs vowels.

[10][CO2]

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Total No. of Pages: 01 ODD SEMESTER- __ Roll no.....

DELHI TECHNOLOGICAL UNIVERSITY

Integrated B.sc+M.sc

END-TERM EXAMINATION December-2024

AEC-19: TECHNICAL COMMUNICAT

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

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

Q.1 What are 7 C's of communication? [CO1][BTL 1][10]

Q.2 Explain any 3 types of barriers to communication. [CO4][BTL 2][10]

Q3. Define and explain any two types of technical communication.

[CO1][BTL 2][10]

Q4 .You are an Inventory manager working for Microsoft Inc,Delhi.
Write a business letter for placing a bulk order of electronic equipment for your new office space to Havells Company,Noida.(Imagine the details like equipments, delivery details,addresses etc). [CO3][BTL 6][10]

Q5. You are Christopher Evans working for the Art Heritage Gallery. Write an inspection report on the suitability of the proposed venue for the company's upcoming Art Exhibition. Suggest some recommendations if any.(Imagine the details) [CO5][BTL 6][10]