B.L.D.E.A's V.P.Dr.P.G.HALAKATTI COLLEGE OF ENGINERING AND TECHNOLOGY VIJYAPUR 586103

QUESTION PAPERS INDEX JUN/JUL 2023

M.TECH

18-20-1Sem. M.Tech. CV

CBCS SCHEME

USN | | | | | | | | | | |

18CSE11

First Semester M.Tech. Degree Examination, June/July 2023
Computational Structural Mechanics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the types of framed structures. **(10 Marks)**

b. Solve the following equation by Gauss-Seidal method.

$4x_1 + x_2 - 0.75x_3 = -8000$

$x_1 + 4x_2 - 0.75x_3 = 4000$

$x_1 + x_2 - x_3 = 0$ **(10 Marks)**

OR

2 a. Solve the following set of simultaneous equations by Gauss elimination method.

$2x_1 - x_2 + x_3 = 7$; $x_1 + 2x_2 + x_3 = 0$; $3x_1 + x_2 - 2x_3 = -2$. **(10 Marks)**

b. Explain briefly the following:

i) Principal of superposition

ii) Equivalent joint load. **(10 Marks)**

Module-2

3 a. Prove that the product of element flexibility and stiffness matrix is an identity matrix. **(10 Marks)**

b. Using the transformation approach, develop the global flexibility matrix for the portal frame with respect to the system coordinates shown in Fig.Q.3(b).

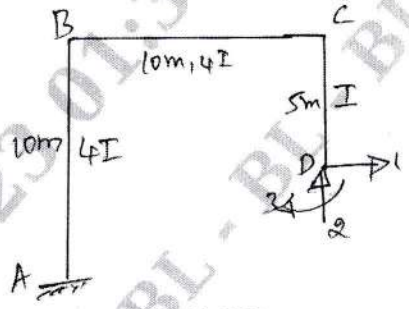

Fig.Q.3(b)

(10 Marks)

OR

4 a. Develop the stiffness matrix for the continuous beam with respect to the coordinates shown in Fig.Q.4(a). EI = constant. Use transformation approach.

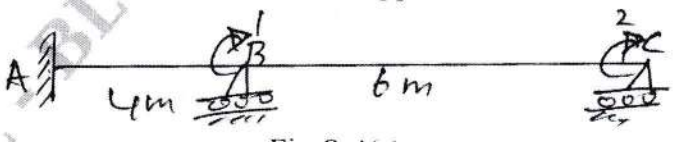

Fig.Q.4(a)

(10 Marks)

b. Derive the flexibility matrix for the pin joined frame shown in Fig.Q.4(b). Assume rigidity is same for both members.

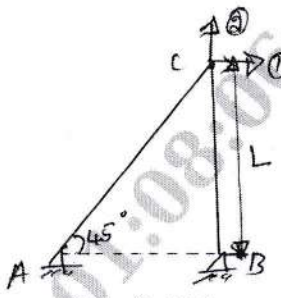

Fig.Q.4(b)

(10 Marks)

Module-3

5 Analyse the continuous beam shown in Fig.Q.5 by the matrix flexibility method and draw the BMD. Adopt transformation approach.

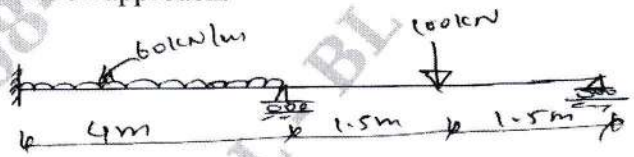

Fig.Q.5

(20 Marks)

OR

6 In a pin jointed frame shown in Fig.Q.6, the member AC found to have lack of fit by 1.5mm. Determine the forces in all members when AC is forced into position. The cross sectional area of diagonal members is $1000mm^2$ and $200mm^2$ for remaining members. Take $E = 2 \times 10^5$ N/mm^2.

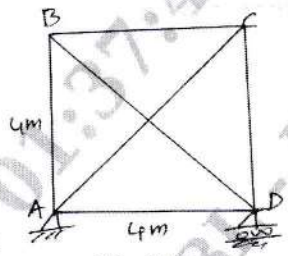

Fig.Q.6

(20 Marks)

Module-4

7 Analyze the frame shown in Fig.Q.7 by the matrix stiffness method. Adopt transformation approach.

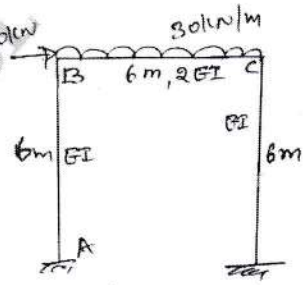

Fig.Q.7

(20 Marks)

OR

8 A pin jointed frame consists of four members connected as shown in Fig.Q.8. Compute the forces in members using matrix stiffness method. Adopt transformation approach. Take $E = 2 \times 10^5 N/mm^2$ for all members. $A = 1000mm^2$ for all members.

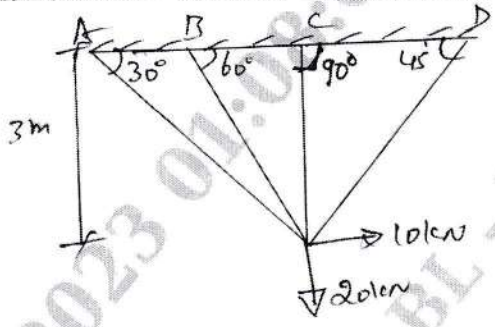

Fig.Q.8

(20 Marks)

Module-5

9 Analyze the continuous beam shown in Fig.Q.9 by direct stiffness method. Draw BMD.

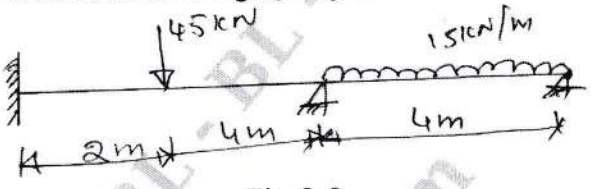

Fig.Q.9

(20 Marks)

OR

10 Analyze the pin jointed frame shown in Fig.Q.10 by direct stiffness method.
Area $A_1 = 1000mm^2$
Area $A_2 = 750mm^2$
Area $A_3 = 500mm^2$.

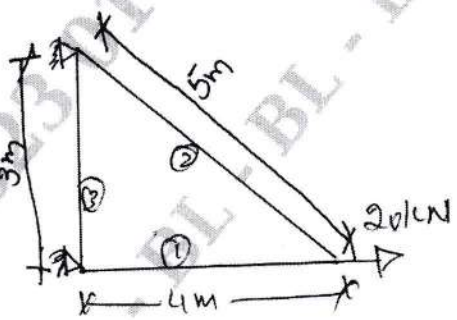

Fig.Q.10

(20 Marks)

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CBCS SCHEME

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18CSE14

First Semester M.Tech. Degree Examination, June/July 2023
Structural Dynamics

Time: 3 hrs. Max. Marks: 100

Note: 1.Answer any FIVE full questions, choosing ONE full question from each module.
2.Missing data, if any, to be suitably assumed.

Module-1

1 a. State and explain D'Alembert's principle. **(04 Marks)**

b. Difference between static loading and dynamic loading. **(08 Marks)**

c. Determine the natural frequencies of the 200 kg block as shown in Fig.Q1(c).

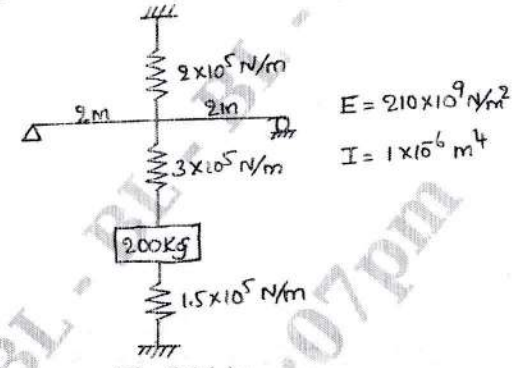

Fig.Q1(c) **(08 Marks)**

OR

2 a. Obtain the differential equation for a damped free vibration of an elastic SDOF system and hence obtain the expression for critically damped system only. **(10 Marks)**

b. Determine the natural frequency, natural cyclic frequency, period of oscillation for the spring mass system with the mass 30 kg and stiffness is 0.8 kN/m. It is the system given in initial displacement of 50mm with a initial velocity 0.75 m/s. Determine the displacement, velocity and acceleration after 0.3 sec. **(10 Marks)**

Module-2

3 a. Derive an expression for dynamic amplitude of undamped forced vibration of single degree freedom system subjected to harmonic loading. **(10 Marks)**

b. An electric motor is supported on a spring and dashpot. The stiffness is 6000 N/m and dashpot offers resistance of 600 N at 3.5 m/s. Unbalanced mass of 1 kg rotates at 40mm radius and total mass of vibration system is 25 kg and motor runs at 375 rpm. Determine
i) Damping factor ii) Amplitude of vibration iii) Resonant speed and resonant amplitude. **(10 Marks)**

OR

4 a. Explain the working principle of Seismometer and accelerometer. **(10 Marks)**

b. An automobile whose weight is 200N is mounted on 4 identical springs. Due to its weight it sags 200mm and each shock absorber has a damping co-efficient of 0.5 N for a velocity of 20 mm/sec. The car is placed on a platform which moves vertically at a resonant speed having amplitude 15mm. Find the amplitude of the vibration of the car. **(10 Marks)**

Module-3

5 Determine the natural frequency and mode shapes for the structure shown in Fig.Q5.

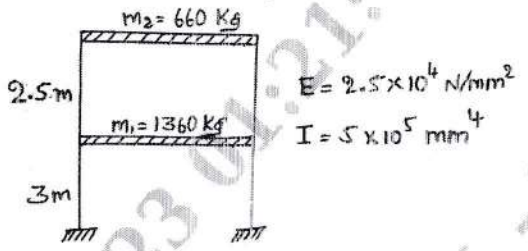

Fig.Q5

(20 Marks)

OR

6 Determine the natural frequency and modes of vibration for the system shown in Fig.Q6.
Given : $m_1 = 10000$ kg , $m_2 = 5000$ kg
$K_1 = 2\times10^6$ N/m , $K_2 = 1\times10^6$ N/m

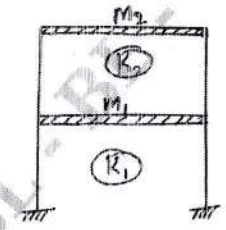

Fig.Q6

(20 Marks)

Module-4

7 Determine natural frequency and modes of vibration for the system shown in Fig.Q7. Also determine the steady state response.
Given : $m_1 = 4900$ kN , $m_2 = 3924$ kN
$K_1 = K_2 = 100$ kN/mm , $K_3 = 200$ kN/mm
$F_1(t) = 10{,}000 \sin 30t$ kN, $F_2(t) = 0$

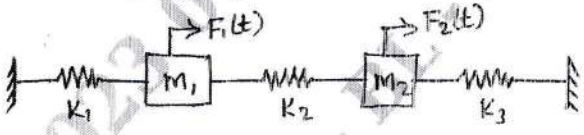

Fig.Q7

(20 Marks)

OR

8 Compute the response due to harmonic loading for the shear building shown in Fig.Q8.
Given : $K_1 = 2.5\times10^6$ N/m , $K_2 = 5\times10^6$ N/m
$m_1 = 25000$ kg , $m_2 = 15000$ kg
$F_1(t) = (50000 \sin 20t)$N, $F_2(t) = 0$

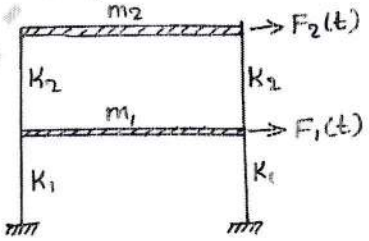

Fig.Q8

(20 Marks)

Module-5

9 a. Explain normal mode approach for damping uncoupling? **(10 Marks)**

b. Write a note on : (i) Rayleigh's method
(ii) Dunkerley's method. **(10 Marks)**

OR

10 Derive differential equation of motion for free vibration of a bar, considering the bar as a continuous beam. **(20 Marks)**

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CBCS SCHEME

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20CSE14

First Semester M.Tech. Degree Examination, June/July 2023
Mechanics of Deformable Bodies

Time: 3 hrs. Max. Marks: 100

Note: 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *Assume suitable data if missing wherever necessary.*

Module-1

1 a. Derive Cauchy's stress relations for the resultant normal and shear stresses on an arbitrary plane. **(10 Marks)**

b. Derive the differential equations of equilibrium in 3D problem Cartesian coordinate. **(10 Marks)**

OR

2 a. List the assumptions made in the linear elasticity. **(05 Marks)**

b. The state of stress at a point is characterized by the components $\sigma_x = 100MPa$. $\sigma_y = -40MPa$, $\sigma_z = 80MPa$, $\tau_{xy} = \tau_{yz} = \tau_{zx} = 0$. Find the octahedral stresses at this point **(05 Marks)**

c. Derive the equilibrium equations in polar coordinate. **(10 Marks)**

Module-2

3 a. Explain : i) Principle stress and principal strain ii) Hydrastatic and deviatoric stress. **(08 Marks)**

b. The state of stress at a point is given by the following array of terms

$$\begin{bmatrix} 9 & 6 & 3 \\ 6 & 5 & 2 \\ 3 & 2 & 4 \end{bmatrix} MPa$$

Determine the principal stresses and principal directions. **(12 Marks)**

OR

4 a. Derive the expression for octahedral normal and octahedral shear stresses. **(08 Marks)**

b. The strain components at a point are given by $\varepsilon_x = 0.01$, $\varepsilon_y = -0.02$, $\varepsilon_z = 0.03$, $\gamma_{xy} = 0.015$, $\gamma_{yz} = 0.02$, $\gamma_{xz} = -0.01$. Determine the normal and shearing strains on the octahedral plane. **(12 Marks)**

Module-3

5 a. Derive expression for σ_r and σ_θ for a thick cylinder subjected to external pressure 'P_0' and internal pressure 'P_I'. If 'a' and 'b' are internal and external radii respectively. Show the variation of σ_θ and σ_r for a thick cylinder subjected to internal pressure only'P_0' = 0. **(16 Marks)**

b. Prove that the following are Airy's stress function and examine the stress distribution represented by it i) $\phi = A[x^4 - 3x^2y^2]$ **(04 Marks)**

OR

6 a. Given the stress function $\phi = -\left[\frac{F}{h^3}\right] xy^2 (3h - 2y)$. Determine the stress components and sketch their variation in a region included in y = 0, y = h, x = 0, on the side 'x' in positive. **(10 Marks)**

b. Derive compatibility equation in terms of plane stresses or derive

$$\left[\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right]\left[\sigma_x+\sigma_y\right]=-(1+\mu)\left[\frac{\partial Fx}{\partial x}+\frac{\partial Fy}{\partial y}\right]$$ **(10 Marks)**

Module-4

7 a. Derive an expression for torsion of a circular cross –section. **(10 Marks)**

b. A two cell tubular section shown below is formed by conventional air foil shape having an interior web twisting moment 10,000N-m. Determine the shear for distribution and shear stress area of cell 1 = 680cm^2 and area of cell 2 = 2000cm^2.

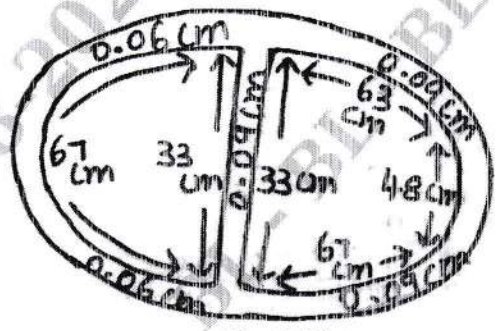

Fig Q7(b) **(10 Marks)**

OR

8 a. Explain the membrane analogy applied to a narrow rectangular section. **(06 Marks)**

b. Derive the differential equation $\nabla^2\phi = -2G\theta$ for torsional problem. **(14 Marks)**

Module-5

9 a. Sketch the ideal stress – strain diagrams for

i) Elastic strain hardening
ii) Rigid strain hardening
iii) Elastic perfectly plastic
iv) Rigid perfectly plastic
v) Elastic linear strain hardening and explain the same. **(10 Marks)**

b. Explain the theories of failures. **(10 Marks)**

OR

10 a. Write a note on Tresca's and Von-Mises yield criteria. **(10 Marks)**

b. A steel bolt is subjected to torsional moment of 0.12 kN-m and bending moment of 0.2 KN/m. If the yield stress of the materials in tension is 250N/mm^2. Determine the diameter of the bolt according to

i) Tresca yield criteria
ii) Von-mises yield criteria. **(10 Marks)**

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22-I sem, M.Tech. CY

CBCS SCHEME

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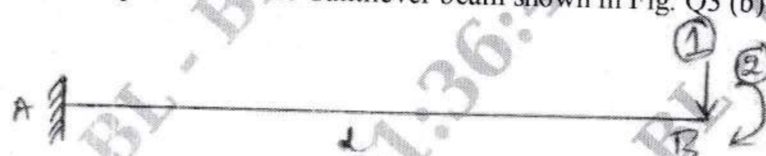
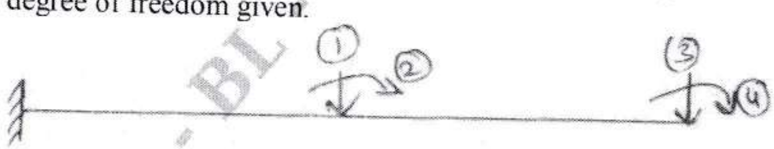
22CSE/USE12

First Semester M.Tech. Degree Examination, June/July 2023
Matrix Methods of Structural Analysis

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

			M	L	C
		Module – 1			
Q.1	**a.**	Explain briefly, (i) Static and kinematic indeterminacy. (ii) Linear and Non-linear structures.	**10**	**L2**	**CO1**
	b.	Solve the following equations by using Gauss-Elimination method : $x - y + z = 4$; $x - 4y + 2z = 8$; $x + 2y + 8z = 12$	**10**	**L3**	**CO1**
		OR			
Q.2	**a.**	Solve the following system of equations by Gauss-Seidel method, to obtain the final solution. Correct to three place of decimals. $x + y + 54z = 110$; $27x + 6y - z = 85$; $6x + 15y + 2z = 72$	**10**	**L3**	**CO1**
	b.	Solve the given linear simultaneous equation by Cholesky method. $3x + 2y - z = 4$; $2x + 4y + 2z = 8$; $-x + 2y + 4z = 5$	**10**	**L3**	**CO1**
		Module – 2			
Q.3	**a.**	Show the relationship between local and global coordinates and flexibility and stiffness matrix.	**12**	**L2**	**CO1**
	b.	Find the flexibility matrix of the Cantilever beam shown in Fig. Q3 (b).  Fig. Q3 (b)	**8**	**L3**	**CO1**
		OR			
Q.4	**a.**	Develop the flexibility matrix for the Cantilever beam given co-ordinates shown in Fig. Q4 (a).  Fig. Q4 (a)	**10**	**L3**	**CO1**
	b.	Develop the stiffness matrix of the beam shown in Fig. Q4 (b) with respect to the four degree of freedom given.  Fig. Q4 (b)	**10**	**L3**	**CO1**

		Module – 3			
Q.5		Analyze the continuous beam shown in Fig. Q5 by flexibility matrix. Draw SFD and BMD.	**20**	**L4**	**CO2**

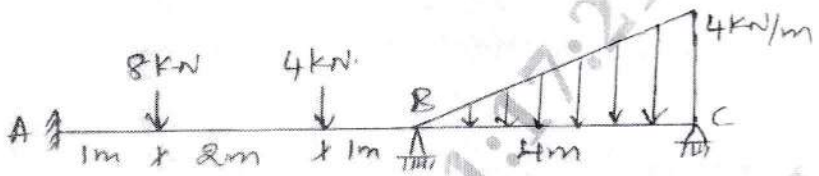


Fig. Q5

		OR			
Q.6		Analyze the frame shown in Fig. Q6 , by flexibility method. Draw SFD and BMD.	**20**	**L4**	**CO2**

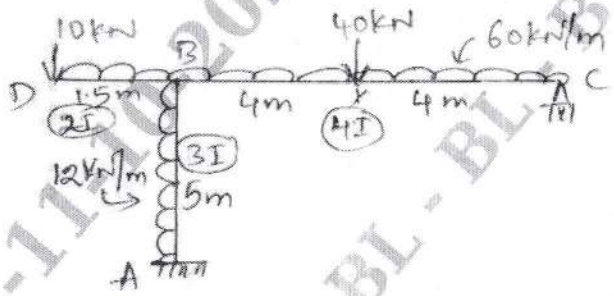


Fig. Q6

		Module – 4			
Q.7		Analyze the beam shown in Fig. Q7 , by stiffness method. Draw BMD and SFD.	**20**	**L4**	**CO2**

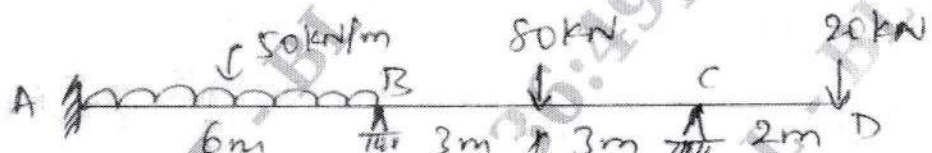


Fig. Q7

		OR			
Q.8		Analyze the rigid jointed plane frame using stiffness method. Draw BMD and SFD. Refer Fig. Q8.	**20**	**L4**	**CO2**

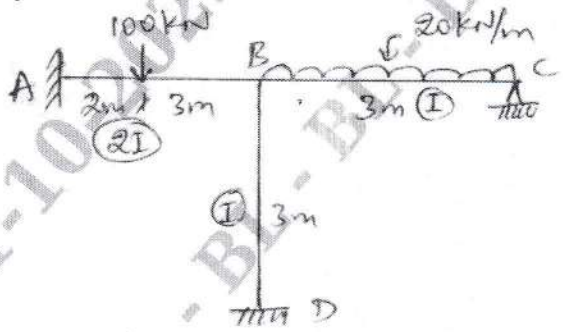
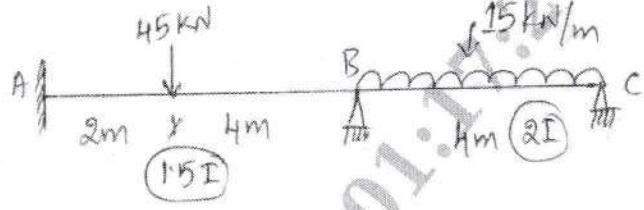
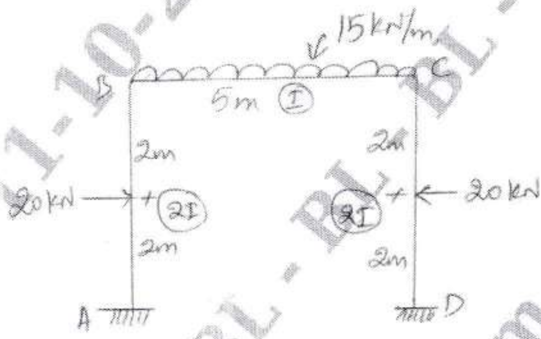


Fig. Q8

		Module – 5			
Q.9		Analyze the beam by direct stiffness method shown in Fig. Q9. Draw BMD and SFD.  Fig. Q9	**20**	**L4**	**CO3**
		OR			
Q.10		Analyze the frame using direct stiffness method shown in Fig. Q10. Draw BMD and SFD.  Fig. Q10	**20**	**L4**	**CO3**

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CBCS SCHEME

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22CEE13

First Semester M.Tech. Degree Examination, June/July 2023
Applied Environmental Chemistry and Microbiology

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

			M	L	C
		Module – 1			
Q.1	a.	Explain the significance of environmental chemistry in the field of environmental engineering.	10	L2	CO1
	b.	Explain the factors affecting the rate of reactions.	10	L2	CO1
		OR			
Q.2	a.	The half life of atrazine (a herbicide) is estimated to be approximately 14 days. What fractions of the initial atrazine will remain after 100 days?	10	L1	CO1
	b.	Derive the equations for zero order reaction half-life period.	10	L4	CO1
		Module – 2			
Q.3	a.	Discuss the classification of colloidal systems with suitable example.	10	L2	CO2
	b.	Explain the following: i) Zeta potential ii) Tyndal effect.	10	L2	CO2
		OR			
Q.4	a.	Write a note on adsorption isotherms.	10	L1	CO2
	b.	Differentiate between hydrophobic and hydrophilic colloids.	10	L1	CO2
		Module – 3			
Q.5	a.	Justify the statement with the help of equation when a ray of monochromatic light decreases exponentially as the concentration of absorbing medium increases.	10	L2	CO3
	b.	With the aid of neat schematic diagram explain the concepts of spectro photometer.	10	L2	CO3
		OR			
Q.6	a.	Discuss briefly how iron and manganese get into underground water supplies.	10	L2	CO3
	b.	Discuss the behavior of organics in the environment and in engineered systems.	10	L2	CO3

		Module – 4			
Q.7	a.	Explain the determination of COD in the laboratory.	10	L2	CO4
	b.	Calculate 1-day 37°C BOD of sewage sample whose 5 day 20°C BOD is 100mg/L. Assume Kd at 20°C as 0.1.	10	L3	CO4
		OR			
Q.8	a.	Explain the significance of fluoride levels in water supplies.	10	L2	CO4
	b.	The town of municipal corporation discharges 17360m^3/day of treated waste water into the river. The treated waste water has a BOD_5 of 12 mg/L and a BOD decay constant (K) of 0.12/day at 20°C. The river has a flow of 0.43 m^3/second and an ultimate BOD (Lo) of 5.0mg/L. The DO of the river is 6.5mg/L and DO of the waste water is 1.0mg/L. Compute the DO and initial ultimate BOD (Lo) after mixing.	10	L3	CO4
		Module – 5			
Q.9	a.	Explain the importance of micro organisms in the environment.	10	L2	CO5
	b.	Discuss the importance of algae in environment and its classification.	10	L2	CO5
		OR			
Q.10	a.	With the aid of diagram, explain the significance of growth phases of bacteria.	10	L2	CO5
	b.	Define virology and explain its types.	10	L1	CO5

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CBCS SCHEME

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22CSE/USE14

First Semester M.Tech. Degree Examination, June/July 2023
Mechanics of Deformable Bodies

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. Any missing data may be suitably assumed.

		Module – 1	M	L	C
Q.1	a.	Derive the differential equations of equilibrium in the case of three dimensional problems in Cartesian co-ordinate system.	10	L2	CO1
	b.	At a point 'P' in a body, σ_x = 100N/mm^2, σ_y = -50N/mm^2 and σ_z = -50N/mm^2, $\tau_{xy} = \tau_{yz} = \tau_{zx}$ = 100N/mm^2. Determine the normal, shearing and resultant stresses on a plane, i.e., equally inclined to all the three axes.	10	L3	CO1
		OR			
Q.2	a.	Obtain the compatibility equation for plane stress problems in Cartesian form.	10	L2	CO1
	b.	The state of stress at a point in a body are given by $\sigma_x = 6x^2yz$, $\sigma_y = 5xyz^3$, $\sigma_z = 2(x^3 + y^3 - 2yz)$ and $\tau_{xy} = -3xy^2z$, $\tau_{yz} = 1/4\ [(6y^2 - 5xz^2)\ z^2 + 8(x^2 + y^2)]$, $\tau_{zx} = -3xyz^2$. Does this satisfy the equations of equilibrium in the absence of forces (Body forces)?	10	L3	CO1
		Module – 2			
Q.3	a.	Explain strain invariants.	6	L2	CO2
	b.	The state of stress at a point is given by the following stress tensor, $\tau_{ij} = \begin{bmatrix} 50 & 50 & -40 \\ 50 & -30 & 30 \\ -40 & 30 & -100 \end{bmatrix}$. Calculate stress invariants, principal stresses and principal directions, spherical and deviator stress tensor.	14	L3	CO2
		OR			
Q.4	a.	Show that of the nine rectangular stress components the cross-shears are equal.	8	L2	CO2
	b.	The state of stress at a point with respect to x, y, z, system is given by $\begin{bmatrix} 4 & 1 & 2 \\ 1 & 6 & 0 \\ 2 & 0 & 8 \end{bmatrix}$ MPa. Show that by stress transformation of the axes by 45° about the Z-axis (anti clockwise direction), the stress invariants remains unchanged.	12	L3	CO2

		Module – 3			
Q.5	**a.**	Investigate whether $-\frac{P}{\pi}r\theta \sin\theta$ is a stress function.	**8**	**L3**	**CO3**
	b.	A thick cylinder of inner radius 10cm and outer radius 15cm is subjected to an internal pressure of 12MPa. Determine the radial and hoop stresses in the cylinder at inner and outer surface.	**12**	**L3**	**CO3**
		OR			
Q.6		Discuss the effect of a circular hole on the stress distribution on a rectangular plate subjected to tensile stress in X-direction and hence evaluate the stress concentration factor.	**20**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the membrane analogy, applied to a narrow rectangular section.	**8**	**L2**	**CO4**
	b.	Derive the differential equation $\frac{\partial^2\phi}{\partial x^2}+\frac{\partial^2\phi}{\partial y^2}=-2G\theta$ for a torsion problem in elasticity. When $\phi(x, y)$ is constant, along the boundary of the cross-section.	**12**	**L3**	**CO4**
		OR			
Q.8		Given the stress function $\phi=\left[\frac{H}{\pi}\right]Z\tan^{-1}\left(\frac{x}{z}\right)$. Determine whether stress function 'ϕ' is admissible. If so, determine the stresses.	**20**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the different theories of failure and mention its significance.	**12**	**L2**	**CO5**
	b.	A cylindrical bar of cast iron is subjected to BM of 2kN-m and TM of 4kN-m. Assuming that yield limit of cast iron σ_y = 210N/mm^2, E = 105kN/mm^2, μ = 0.25. Determine the diameter of the bar based on the factor of safety 3. Using: i) Maximum principal stress theory ii) Maximum principal strain theory.	**8**	**L3**	**CO5**
		OR			
Q.10	**a.**	Discuss the following: i) Factors affecting plastic deformation. ii) Strain Hardening.	**8**	**L2**	**CO5**
	b.	The state of stress at a point is given by σ_x = 70MPa, σ_y = 120MPa and τ_{xy} = 35MPa. If the yield strength for the material is 125MPa. Determine in a uniaxial tensile test, whether yielding will occur according to Trecca's and Van-misses yield conditions or not.	**12**	**L3**	**CO5**

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CBCS SCHEME

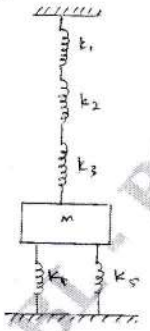
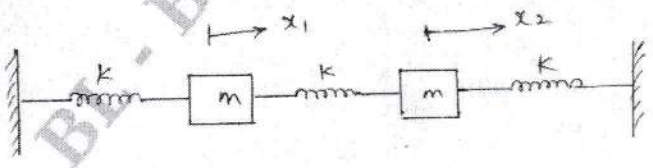
USN | | | | | | | | | | |

22CSE/USE15

First Semester M.Tech. Degree Examination, June/July 2023
Structural Dynamics

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Derive the differential equation of motion for the free vibration of a spring mass system. Obtain the solution of the differential equation. Sketch the motion of the system.	10	L2	CO1
	b.	Consider the system as shown in Fig. Q1 (b). If K_1 = 2000 N/m, K_2 = 1500 N/m, K_3 = 3000 N/m and $K_4 = K_5$ = 500 N/m, find the mass if the system has a natural frequency of 10 Hz.  Fig. Q1 (b)	10	L3	CO1
		OR			
Q.2	a.	Derive the equation of motion for the free vibration response of a spacing mass damper system. Explain (i) Underdamped system (ii) Overdamped system (iii) Critically damped system.	10	L2	CO1
	b.	Explain Coulomb Damping and derive the equation of motion and solution to the equation of motion.	10	L4	CO2
		Module – 2			
Q.3	a.	A spring mass dashpot system is subjected to harmonic loading of $F_0 \sin\omega_n +$. Derive the expression for displacement transmissibility.	10	L3	CO2
	b.	Explain Half-power Bandwidth method.	10	L1	CO2
		OR			
Q.4	a.	Derive the expression for Duhamel's integral for the response of single degree of freedom system subjected to excitation.	10	L4	CO2
	b.	Define vibration isolation. What are the different types of vibration isolation, explain any one.	10	L1	CO2
		Module – 3			
Q.5	a.	Explain the concept of shear building with a neat sketch.	10	L1	CO2
	b.	Determine the natural frequencies and mode shape of the given system as shown in Fig. Q5 (b).  Fig. Q5 (b)	10	L4	CO4

		OR			
Q.6	**a.**	Derive the expression for orthogonality of normal modes.	**12**	**L1**	**CO4**
	b.	Explain mode shape and natural frequency.	**8**	**L1**	**CO2**
		Module – 4			
Q.7	**a.**	Determine the natural frequencies and mode shape for the structure as shown in Fig.Q7 (a).	**20**	**L4**	**CO4**

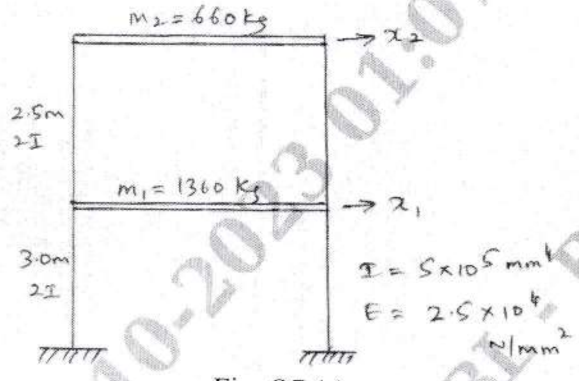


Fig. Q7 (a)

		OR			
Q.8	**a.**	Determine the natural frequencies and the mode shapes for the shear building as shown in Fig. Q8.	**20**	**L4**	**CO4**

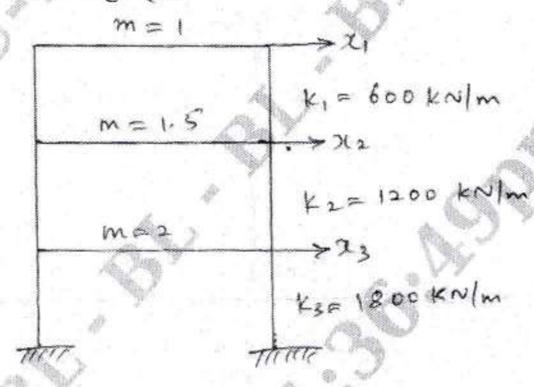


Fig. Q8

		Module – 5			
Q.9	**a.**	Explain Dunkarley's method.	**10**	**L1**	**CO5**
	b.	Derive differential equation of motion for free flexural vibration of beam considering beam to be simply supported.	**10**	**L4**	**CO5**
		OR			
Q.10	**a.**	Explain Stodola's method.	**10**	**L1**	**CO4**
	b.	Explain Rayleigh's method.	**10**	**L1**	**CO5**

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CBCS SCHEME

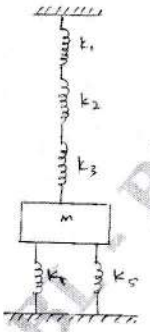
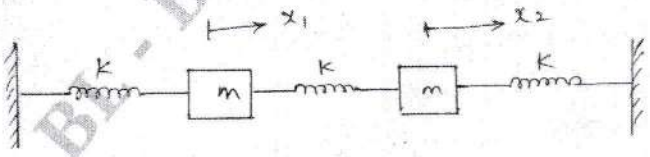
USN | | | | | | | | | | |

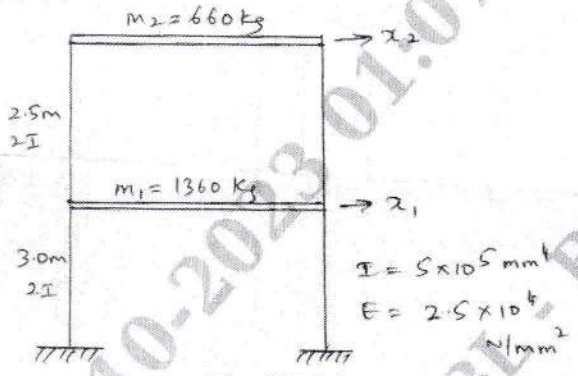
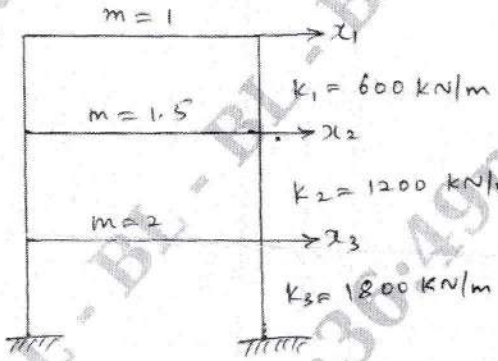
22CSE/USE15

First Semester M.Tech. Degree Examination, June/July 2023
Structural Dynamics

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Derive the differential equation of motion for the free vibration of a spring mass system. Obtain the solution of the differential equation. Sketch the motion of the system.	10	L2	CO1
	b.	Consider the system as shown in Fig. Q1 (b). If K_1 = 2000 N/m, K_2 = 1500 N/m, K_3 = 3000 N/m and $K_4 = K_5$ = 500 N/m, find the mass if the system has a natural frequency of 10 Hz.  Fig. Q1 (b)	10	L3	CO1
		OR			
Q.2	a.	Derive the equation of motion for the free vibration response of a spacing mass damper system. Explain (i) Underdamped system (ii) Overdamped system (iii) Critically damped system.	10	L2	CO1
	b.	Explain Coulomb Damping and derive the equation of motion and solution to the equation of motion.	10	L4	CO2
		Module – 2			
Q.3	a.	A spring mass dashpot system is subjected to harmonic loading of $F_0 \sin \omega_n +$. Derive the expression for displacement transmissibility.	10	L3	CO2
	b.	Explain Half-power Bandwidth method.	10	L1	CO2
		OR			
Q.4	a.	Derive the expression for Duhamel's integral for the response of single degree of freedom system subjected to excitation.	10	L4	CO2
	b.	Define vibration isolation. What are the different types of vibration isolation, explain any one.	10	L1	CO2
		Module – 3			
Q.5	a.	Explain the concept of shear building with a neat sketch.	10	L1	CO2
	b.	Determine the natural frequencies and mode shape of the given system as shown in Fig. Q5 (b).  Fig. Q5 (b)	10	L4	CO4

		OR			
Q.6	**a.**	Derive the expression for orthogonality of normal modes.	**12**	**L1**	**CO4**
	b.	Explain mode shape and natural frequency.	**8**	**L1**	**CO2**
		Module – 4			
Q.7	**a.**	Determine the natural frequencies and mode shape for the structure as shown in Fig.Q7 (a).  Fig. Q7 (a)	**20**	**L4**	**CO4**
		OR			
Q.8	**a.**	Determine the natural frequencies and the mode shapes for the shear building as shown in Fig. Q8.  Fig. Q8	**20**	**L4**	**CO4**
		Module – 5			
Q.9	**a.**	Explain Dunkarley's method.	**10**	**L1**	**CO5**
	b.	Derive differential equation of motion for free flexural vibration of beam considering beam to be simply supported.	**10**	**L4**	**CO5**
		OR			
Q.10	**a.**	Explain Stodola's method.	**10**	**L1**	**CO4**
	b.	Explain Rayleigh's method.	**10**	**L1**	**CO5**

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22-II sem. M.Tech. CV

CBCS SCHEME

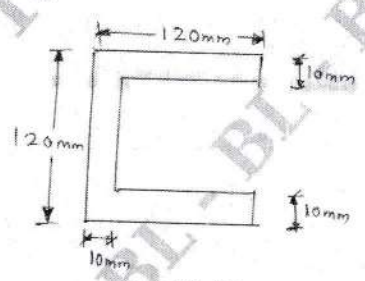
USN | | | | | | | | | | |

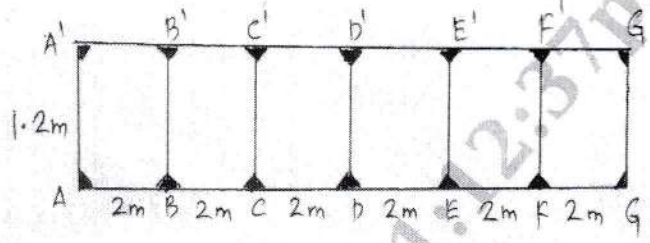
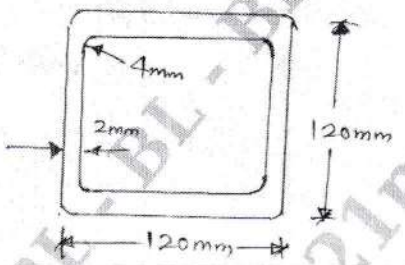
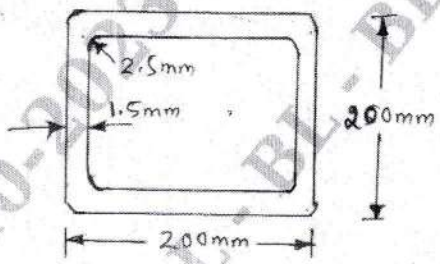
22CSE21

Second Semester M.Tech. Degree Examination, June/July 2023
Advanced Design of Steel Structures

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. Use of IS – 800-2007, IS-801-2010, IS-811-1987, BS 5950. Part-8 and steel table permitted.
4. Assume suitable data if any.

			M	L	C
		Module – 1			
Q.1	**a.**	Explain the different factors affecting lateral stability.	**10**	**L1**	**CO1**
	b.	Determine the position of shear centre for a channel section shown in Fig. Q1 (b).  Fig. Q1 (b)	**10**	**L2**	**CO1**
		OR			
Q.2	**a.**	Design a laterally unrestrained beam to carry uniformly distributed load of 50 kN/m. The beam is unsupported for a length of 1.5 m and is simply supported on longitudinal beams at its ends. Apply all necessary checks.	**20**	**L3**	**CO2**
		Module – 2			
Q.3	**a.**	Explain briefly beam-column under biaxial bending.	**10**	**L1**	**CO2**
	b.	Briefly describe elastic lateral-torsional buckling of beam-columns.	**10**	**L1**	**CO2**
		OR			
Q.4	**a.**	A non-sway column in a building frame with flexible joints is 4 m high and subjected to the following load and moment. Factored axial load = 500 kN Factored moment M_Z = At top of column = 27 kN-m At bottom of column = 45 kN-m. Design a suitable beam-column assuming $f_y = 250$ N/mm^2. Take effective length of the column as 0.81 along both the axes.	**20**	**L3**	**CO2**
		Module – 3			
Q.5	**a.**	Mention the different guidelines for the design of beams with openings.	**10**	**L1**	**CO2**
	b.	Explain force distribution and failure patterns of web openings.	**10**	**L1**	**CO2**
		OR			

Q.6	**a.**	Design the top chord members of a Vivendeel girder for the following data:  Fig. Q6 Factored moment = 35 kN-m Factored shear force = 30 kN Factored axial force = 150 kN f_u = 410 MPa and f_y = 240 MPa	**20**	**L3**	**CO2**
		Module – 4			
Q.7	**a.**	List out advantages of cold formed steel sections.	**5**	**L1**	**CO2**
	b.	Find the safe load carrying capacity of a column shown in Fig. Q7 (b). With an effective length of 3.2 m. Take $f_y = 250\,N/mm^2$.  Fig. Q7 (b)	**15**	**L2**	**CO2**
		OR			
Q.8	**a.**	Determine the permissible axial load on the column section shown in Fig. Q8. The effective length of the column is 4 m. Steel has yield stress of 235 N/mm^2. Take E = 2×10^5 N/mm^2.  Fig. Q8	**20**	**L2**	**CO2**
		Module – 5			
Q.9	**a.**	Explain briefly active and passive five protection methods.	**8**	**L1**	**CO3**
	b.	Briefly describe the following : (i) Five resistance level. (ii) Period of structural adequacy (iii) Limiting steel temperature.	**12**	**L1**	**CO3**

		OR			
Q.10	a.	For a ISMB500@86.9 kg/m beam supporting concrete floor, determine the following : (i) Heated Perimeter (Hp) (ii) Section factor (iii) Exposed surface area to mass ratio (ksm).	10	L2	CO3
	b.	For a beam ISMB500@86.9 kg/m, determine (i) Load ratio of five limit state. (ii) Limiting steel temperature. (iii) Time at which limiting steel temperature is attained for ratio of $\frac{LL}{DL} = \frac{0.67}{0.33}$. Assume $\gamma_m = 1.0$ for DL, and 0.8 for LL.	10	L2	CO3

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CBCS SCHEME

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22CEE22

Second Semester M.Tech. Degree Examination, June/July 2023
Advanced Wastewater Treatment Technology

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

<table>
<tr><th colspan="4">Module – 1</th><th>M</th><th>L</th><th>C</th></tr>
<tr><td>Q.1</td><td>a.</td><td colspan="1">Mention the significance of wastewater characteristics. Explain in detail.</td><td></td><td>10</td><td>L1</td><td>CO1</td></tr>
<tr><td></td><td>b.</td><td colspan="1">Determine the values of the bio – kinetic constants using the data given in the table derived from the laboratory experiments carried out on the CFSTR model of an activated sludge process without recycle.
<table>
<tr><th>Unit No</th><th>Influent substration Conc S_o (mg/L)</th><th>Reactor substrate Conc S (mg/L)</th><th>Detention time θ (days)</th><th>Reactor biomass CMC X(mg/L)</th></tr>
<tr><td>1</td><td>350</td><td>12</td><td>3.8</td><td>132</td></tr>
<tr><td>2</td><td>350</td><td>20</td><td>2.6</td><td>130</td></tr>
<tr><td>3</td><td>350</td><td>34</td><td>1.8</td><td>132</td></tr>
<tr><td>4</td><td>350</td><td>60</td><td>1.3</td><td>123</td></tr>
<tr><td>5</td><td>350</td><td>70</td><td>1.2</td><td>119</td></tr>
</table>
Compute the data for $(S_o - S)$, $(X\theta)$, $\left(\frac{X\theta}{S_o - S}\right)$ and 1/S with plot.</td><td></td><td>10</td><td>L2</td><td>CO1</td></tr>
<tr><td colspan="7">OR</td></tr>
<tr><td>Q.2</td><td>a.</td><td colspan="1">Indicate with the neat flow diagram of Wastewater treatment process with salient point.</td><td></td><td>10</td><td>L1</td><td>CO1</td></tr>
<tr><td></td><td>b.</td><td colspan="1">A 300mm diameter 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 0.9 m/sec. Find the required grade and associated velocity and rate of discharge at this depth. Assume Manning's rugosity co.efficient n as 0.013 the variations of n with depth may be neglected.</td><td></td><td>10</td><td>L2</td><td>CO1</td></tr>
<tr><td colspan="7">Module – 2</td></tr>
<tr><td>Q.3</td><td>a.</td><td colspan="1">Describe equalization. Under what circumstances this is provided? How the volume of the equalization basin is estimated?</td><td></td><td>10</td><td>L1</td><td>CO2</td></tr>
<tr><td></td><td>b.</td><td colspan="1">Assuming suitable design criteria, design a horizontal flow type grit chamber for a proposed sewage treatment plant expected to treat 60,000 m^3/day maximum flows. The estimated average and minimum sewage flow rates are 45,000m^3/day and 15,000 m^3/day respectively. The flow through velocity of 0.3m/sec is to be controlled by a proportional weir.</td><td></td><td>10</td><td>L2</td><td>CO2</td></tr>
<tr><td colspan="7">OR</td></tr>
<tr><td>Q.4</td><td>a.</td><td colspan="1">Point out the design criteria of screens and discuss the types of screens.</td><td></td><td>10</td><td>L1</td><td>CO2</td></tr>
</table>

	b.	The cumulative flow of wastewater reaching a treatment plant in a day varies as shown in table. Determine the capacity of an equalization basin for the given flow variation. Time (h): 0, 2, 4, 6, 8, 10, 12, 14 Cumulative flow (m^3): 0, 25, 50, 75, 100, 120, 130, 140 Time (h): 16, 18, 20, 22, 24 Cumulative flow (m^3): 150, 160, 170, 198, 225	10	L2	CO2
		Module – 3			
Q.5	a.	With the aid of neat flow diagram, explain the concept of Rotating biological contractors.	10	L1	CO3
	b.	The average operating data for a conventional activated sludge process plant as follows : * Sewage flow = 50,000 m^3/day * Volume of the aeration tank = 16,000m^3. * Influent BOD = 250 mg/L * Effluent BOD = 30mg/L * Mixed Liquor suspended solids = 2500mg/L (MLSS) * Effluent suspended solids = 40 mg/L. * Waste sludge suspended solids = 12,000 mg/L * Quantity of waste sludge = 250m^3/day. Based on the above information , determine i) Aeration period (hours) ii) Food to micro organisms ratio (F/M) iii) Percentage efficiency of BOD removal iv) Sludge age.	10	L2	CO3
		OR			
Q.6	a.	With the aid of schematic diagram, explain the concept of Bio – tower.	10	L1	CO3
	b.	Determine the size of a high rate trickling filter for the following data : * Sewage flow = 5 MLD ; Recirculation ratio = 1.5 * BOD of raw sewage = 250mg/L * BOD removal in primary clarifier = 30% * Final effluent BOD desired = 30mg/L.	10	L2	CO3
		Module – 4			
Q.7	a.	Explain the factors affecting nitrification process.	10	L1	CO4
	b.	Write a detailed note on wastewater disinfection.	10	L1	CO4
		OR			
Q.8	a.	Explain the concept of enhanced biological phosphorus removal process.	10	L1	CO4
	b.	Mention the application of electro oxidation process for effluent treatment.	10	L1	CO4
		Module – 5			
Q.9	a.	Explain the different types of sludge dewatering.	10	L1	CO5
	b.	Explain the concept of soak pits.	10	L1	CO5
		OR			
Q.10	a.	Explain the Alkaline stabilization sludge.	10	L1	CO5
	b.	Explain the concept of Septic tanks.	10	L1	CO5

CBCS SCHEME

USN | | | | | | | | | | |

22CEE21

Second Semester M.Tech. Degree Examination, June/July 2023
Industrial Wastewater Treatment

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. Assume any missing data.

		Module – 1	M	L	C
Q.1	a.	Explain the effect of any five industrial origin pollutant materials on stream quality.	10	L1	CO1
	b.	What is meant by "Effluent Standard" and "Stream Standard"? What are the salient features of them?	10	L1	CO1
		OR			
Q.2	a.	Discuss the effect of Industrial wastewater on sewage treatment plant.	10	L1	CO1
	b.	Explain the feasibility of combined treatment of Industrial raw waste with domestic waste water.	10	L1	CO1
		Module – 2			
Q.3	a.	Discuss the step by step procedure to conduct Industrial Waste survey.	10	L1	CO2
	b.	Explain the different methods of sampling and give its significance.	10	L1	CO2
		OR			
Q.4	a.	With neat sketch, explain the oxygen sag curve and explain Reoxygenation and Deoxygenation.	8	L1	CO2
	b.	A City discharges 100 cumecs of sewage into a river, which is fully saturated with oxygen and flowing at the rate of 1500 cumecs during its lean days with a velocity of 0.1m/sec. The 5 days BOD of sewage at the given temperature is 280mg/ℓ. Find when and where the critical DO deficit will occur in the downstream portion of the river and what is its amount. Assume coefficient of purification of the stream F as 4 and coefficient of deoxygenation (K_D) as 0.1. Also assume saturation DO as 9.2mg/ℓ.	12	L2	CO2
		Module – 3			
Q.5	a.	List the different methods of removal of organic dissolved solids from Industrial wastewater and explain any four methods in detail.	10	L1	CO3
	b.	Explain in brief, how volume reduction is brought about during handling of Industrial wastewater.	10	L1	CO3
		OR			
Q.6	a.	What is Neutralization? Explain the different methods of Neutralizing Alkaline waste.	10	L1	CO3
	b.	Explain Equalization and Proportioning of Industrial wastewater.	10	L1	CO3

		Module – 4			
Q.7	**a.**	With neat flow diagram, explain the treatment and the characteristics of cotton textile mill wastewater.	**12**	**L1**	**CO4**
	b.	Explain the massive lime treatment for pulp and paper mill waste with flow diagram.	**8**	**L1**	**CO4**
		OR			
Q.8	**a.**	Explain with a flow diagram, the treatment of Tannery wastewater.	**10**	**L1**	**CO4**
	b.	With the neat flow sheet, explain the wastewater treatment for large distillery Industry.	**10**	**L1**	**CO4**
		Module – 5			
Q.9	**a.**	Write an explanatory note on Bioremediation of contaminated soil.	**8**	**L1**	**CO5**
	b.	Explain Low activity and High activity radiation and also given the application of radioactive techniques for wastewater treatment.	**12**	**L1**	**CO5**
		OR			
Q.10	**a.**	Write a short note on : i) Biomonitoring ii) Criminal and Regulatory Liabilities.	**8**	**L1**	**CO5**
	b.	Define Environmental Audit. Explain briefly the objectives, benefits and methodology of Environmental Audit.	**12**	**L1**	**CO5**

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22CEE231

Second Semester M.Tech Degree Examination, June/July 2023
Environmental Geo-Technology

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain the environmental cycle and their interaction with geo-technology with sketch.	10	L2	CO1
	b.	Explain the geo-technical parameters governing soil-pollutant interaction.	10	L2	CO1
		OR			
Q.2	a.	Explain how failures of foundations occurs due to pollutants.	10	L2	CO1
	b.	Explain in detail the classification of wastes.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain the process of safe disposal of wastes.	10	L2	CO1
	b.	Explain inorganic and organic stabilization of contaminated soils.	10	L2	CO1
		OR			
Q.4	a.	Explain the following : i) Adsorption and Absorption ii) Precipitation and Detoxification.	10	L1	CO1
	b.	Explain current practices of waste disposal.	10	L2	CO1
		Module – 3			
Q.5	a.	Explain contaminant transport by advection and diffusion with the help of governing equations.	10	L2	CO3
	b.	Explain biodegradation process.	10	L2	CO2
		OR			
Q.6	a.	What are the preventive measures to be taken in protecting aquifers? Explain.	10	L2	CO2
	b.	What are the hydrological factors consideration to be taken in land fill design? Explain with detailed sketch.	10	L2	CO2
		Module – 4			
Q.7	a.	Explain the methodology to review current soil-testing concepts.	10	L2	CO2
	b.	Explain the Electrical resistivity box test.	10	L3	CO2
		OR			
Q.8	a.	Explain the guarded hotplate test to determine dielectric constant of soil.	10	L3	CO2
	b.	Explain various approaches of site characterization.	10	L2	CO2
		Module – 5			
Q.9	a.	Explain factors affecting bioremediation process.	10	L2	CO3
	b.	Explain the applications of soil wash process.	10	L2	CO3
		OR			
Q.10	a.	Explain the components of monitoring wells neat sketch.	10	L2	CO3
	b.	Explain the functions of geo synthetics in engineered landfills with a neat	10	L2	CO3

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22CSE233

Second Semester M.Tech. Degree Examination, June/July 2023
Earthquake Resistant Structures

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. Use of IS code 1893 is permitted IS code 13920 and relevant code's are permitted.

		Module – 1	M	L	C
Q.1	a.	Elaborate the elastic rebound theory and plate tectonic theory.	8	L1	CO1
	b.	Explain the characteristics of body waves and surface waves.	6	L1	CO1
	c.	Differentiate between magnitude and intensity of earthquake.	6	L1	CO1
		OR			
Q.2	a.	Differentiate between the structural behavior under gravity loads and under lateral loads such as earthquake.	8	L1	CO1
	b.	What are the requirements of efficient earthquake resistant structural system?	6	L1	CO1
	c.	Explain different damping devices used in building structures.	6	L1	CO1
		Module – 2			
Q.3	a.	Explain D-V-A response spectrum and significance of various regions.	12	L1	CO2
	b.	Explain strong motion characteristics of ground.	8	L1	CO2
		OR			
Q.4		The plan and elevation of a three-storey RCC school building is shown in Fig.Q.4. The building is located in seismic zone V. The type of soil encountered is medium stiff and it is proposed to design the building with a special moment resisting frame. The intensity of dead load is $10kN/m^2$ and floors are to cater to an imposed load of $3kN/m^2$. Determine the design seismic loads on the structure by static analysis.	20	L3	CO2

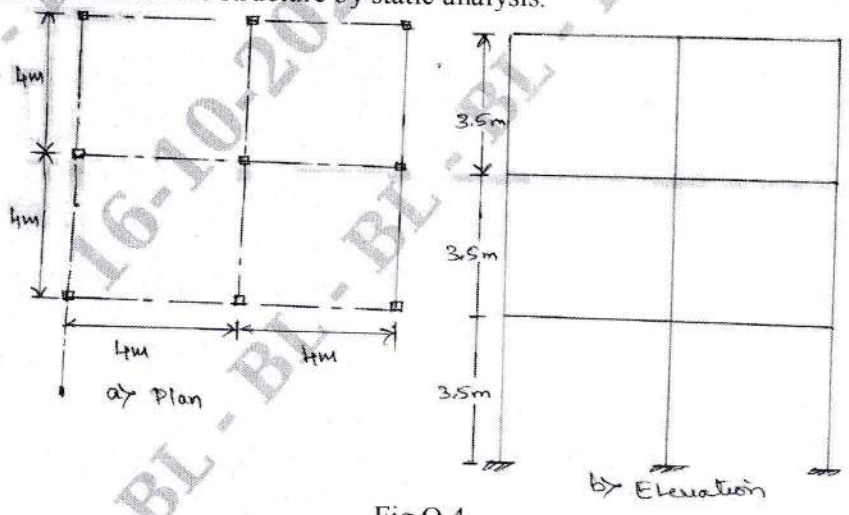

Fig.Q.4

		Module – 3			
Q.5	**a.**	Explain the structural configuration for earthquake resistant design.	**8**	**L2**	**CO3**
	b.	Illustrate plan irregularities and vertical irregularities with neat sketches.	**6**	**L2**	**CO3**
	c.	Explain between soft storey and weak storey.	**6**	**L2**	**CO3**
		OR			
Q.6	**a.**	Explain modeling concepts of infilled masonry walls.	**8**	**L2**	**CO3**
	b.	Explain the slenderness concept of masonry wall with neat sketches.	**6**	**L2**	**CO3**
	c.	Explain the failure pattern of masonry structures with neat sketches.	**6**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	What is ductility? Discuss the factors affecting ductility in RCC building.	**10**	**L2**	**CO4**
	b.	Explain in detail with sketches the ductile detailing of columns subjected to bending and axial load.	**10**	**L2**	**CO4**
		OR			
Q.8		Design the reinforcement for a column of size 450 × 450mm, subjected to the following forces. The column has an unsupported length of 3m and is braced against sidesway in both directions. Use M25 grade concrete and Fe-415 steel.	**20**	**L3**	**CO4**

	Dead load	Live load	Seismic load
Axial load (kN)	1000	800	550
Moment kN-m	50	40	100

		Module – 5			
Q.9	**a.**	Explain seismic demand and seismic capacity.	**10**	**L2**	**CO5**
	b.	Explain retro fitting techniques in enhancing the seismic capacity of existing structures any two.	**10**	**L2**	**CO5**
		OR			
Q.10		Write short note on: i) Shear wall ii) Concept of base isolation iii) Linear seismic analysis iv) Non-linear seismic analysis.	**20**	**L2**	**CO5**

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22CEE241

Second Semester M.Tech. Degree Examination, June/July 2023
Water Resources Engineering and Applied Hydraulics

Time: 3 hrs. Max. Marks: 100

Note: 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *M : Marks , L: Bloom's level , C: Course outcomes.*
3. *Assume suitable missing data if necessary.*

		Module – 1	M	L	C
Q.1	a.	Write a note on : i) Water resources of the world, India and Karnataka ii) National water policy	10	L2	CO1
	b.	Define Raingauge density. Explain how to determine optimum number of Raingauge stations.	10	L2	CO1
		OR			
Q.2	a.	Define and explain hydrologic cycle with a neat sketch.	10	L2	CO1
	b.	Explain the methods of find missing precipitation.	10	L2	CO1
		Module – 2			
Q.3	a.	Define unit hydrograph and mention its assumptions.	4	L2	CO2
	b.	Explain base flow separation methods.	6	L2	CO2
	c.	Define Hydrograph. Explain the components with a neat sketch.	10	L2	CO2
		OR			
Q.4	a.	Define flood Routing. Explain channel and Reservoir routing.	10	L2	CO2
	b.	Route the following flood hydrograph through a river reach for which K = 12.0hr and x : 0.20. At the start of the inflow flood, the outflow discharge is $10m^3/s$	10	L3	CO2

Time (h)	0	6	12	18	24	30	36	42	48	54
Inflow (m^3/s)	10	20	50	60	55	45	35	27	20	15

		Module – 3			
Q.5	a.	Define Water Hammer. Derive expression for pressure Rise due to gradual closure of valve.	10	L3	CO3
	b.	Write a note on surge tank.	5	L2	CO3
	c.	Water is flowing through a pipe of diameter 30cm and length 200m with a velocity of 2.5m/s. A valve is provided at the end of the pipe. If the valve is closed in 30 seconds, find the rise the pressure take the velocity of pressure wave as 1500m/s.	5	L3	CO3

		OR			
Q.6	**a.**	Explain Area-velocity method to measures the discharge.	**10**	**L2**	**CO3**
	b.	Derive an expression for discharge through venturiflume.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Define the following : i) aquifer ii) aquiclude iii) aquifuge iv) porosity v) specific yield.	**5**	**L2**	**CO4**
	b.	What are the points to be considered in selection of suitable site for a bore wells.	**5**	**L2**	**CO1**
	c.	What are the methods of artificial ground water recharge? List the sources of ground water pollution.	**10**	**L3**	**CO1**
		OR			
Q.8	**a.**	Explain confined and unconfined aquifer with a neat sketch.	**10**	**L2**	**CO4**
	b.	Explain the different types of open wells with a neat sketch.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Define Remote sensing. Explain different types of sensors used in remote sensing.	**10**	**L2**	**CO5**
	b.	Explain in detail on the different types of data utilize in GIS technologies.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	What is GIS? Describe the different components of GIS.	**10**	**L2**	**CO5**
	b.	Explain spectral properties of soil, water and vegetation with a neat sketch.	**10**	**L3**	**CO5**

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22CSE242

Second Semester M.Tech Degree Examination, June/July 2023
Design of High Rise Structures

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain design criteria of tall structures.	10	L1	CO1
	b.	Explain : i) Sequential loading ii) Construction load.	10	L1	CO1
		OR			
Q.2	a.	Explain : i) Fibre reinforced concrete ii) High performance concrete iii) Light weight concrete.	12	L1	CO1
	b.	Write a note on gravity loading of tall structures.	8	L2	CO1
		Module – 2			
Q.3	a.	Briefly explain the wind tunnel experiment method.	10	L2	CO2
	b.	Explain equivalent static method for calculating lateral force due to earthquake.	10	L2	CO2
		OR			
Q.4	a.	Explain briefly working stress design and limit state method.	8	L1	CO2
	b.	A 3 storey symmetrical RC school building situated at Bhuj with the following data : Plan dimensions = 7m Storey height = 3.5m Total weight of beam in storey = 130kN Total weight of slab in storey = 250kN Total weight of column in storey = 50kN Total weight of walls in storey = 530kN Live load = 130kN Weight of terrace floor = 655kN The structure is resting on hard rock. Determine the total base shear and lateral loads at each floor levels.	12	L2	CO2
		Module – 3			
Q.5	a.	What are the factors affecting growth, height and structural form of Tall buildings.	10	L2	CO3

		OR			
Q.6	**a.**	Explain In-filled frame structures.	**10**	**L2**	**CO3**
	b.	Explain Rigid frame structures.	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain assumptions in modeling of tall structures.	**10**	**L2**	**CO3**
	b.	Explain approximate modeling of slabs.	**10**	**L2**	**CO3**
		OR			
Q.8	**a.**	Explain approximate modeling and accurate modeling of tall structures.	**10**	**L2**	**CO4**
	b.	What do you mean by lumping? Briefly explain the types of lumping.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the approximate method of overall buckling analysis of frames.	**10**	**L3**	**CO5**
	b.	Explain out of plumb effects.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Explain creep and shrinkage effects in tall building.	**10**	**L3**	**CO5**
	b.	Explain : i) Effect of foundation rotation ii) Stability of tall buildings.	**10**	**L3**	**CO5**

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20 III sem. M.Tech. CV

CBCS SCHEME

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20CSE322

Third Semester M.Tech. Degree Examination, June/July 2023
Optimization Techniques

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. What is optimization? State six applications of optimization. **(08 Marks)**

b. State and prove the necessary condition for relative minimum of a function of a single variable. Also state the sufficient condition. **(12 Marks)**

OR

2 a. Find the extreme points of function, $f(x, y) = x^3+3y^3+3x^2+3y^2+24$ and determine their nature also. **(08 Marks)**

b. Find the dimensions of a cylindrical tin with top and bottom made up of sheet metal to maximize its volume such that the total surface area is equal to $A_0 = 24\pi$. Use Lagrange method. **(12 Marks)**

Module-2

3 a. List the applications of linear programming. **(05 Marks)**

b. Find all the basic solutions corresponding to system of equations :

$$2x_1 + 3x_2 - 2x_3 - 7x_4 = 1$$
$$x_1 + x_2 + x_3 + 3x_4 = 6$$
$$x_1 - x_2 + x_3 + 5x_4 = 4.$$

(15 Marks)

OR

4 a. Write the dual of the following linear programming problem :

Maximize $f = 50x_1 + 100x_2$

Subjected to $2x_1 + x_2 \le 1250$

$2x_1 + 5x_2 \le 1000$

$2x_1 + 3x_2 \le 900$

$x_2 \le 150$

Where $x_1 \ge 0$ and $x_2 \ge 0$. **(05 Marks)**

b. Show that the following problem has infinite number of solution by simplex method.

Minimize $f(x) = -40x_1 - 100x_2$

Subjected to constraints

$10x_1 + 5x_2 \le 2500 \quad x_1 \ge 0$

$4x_1 + 10x_2 \le 2000 \quad x_2 \ge 0$

$2x_1 + 3x_2 \le 900$

(15 Marks)

Module-3

5 a. Describe various methods of non-linear optimization. **(05 Marks)**

b. Find the minimum of $f = \lambda^5 - 5\lambda^3 - 20\lambda + 5$ by cubic interpolation method. **(15 Marks)**

OR

6 a. Differentiate between Fibonacci method and Golden section method. **(05 Marks)**

b. Minimize $f(x) = 0.65 - \left[\frac{0.75}{1+x^2}\right] - 0.65x \tan^{-1}\left(\frac{1}{x}\right)$. Use Fibonacci method, n = 6 iterations in interval [0, 3]. **(15 Marks)**

Module-4

7 Use Exterior penalty function method to,

Minimize $f = 9x_1^2 + 4x_2^2 + 3x_1 + 3x_2$

Subjected to, $9(x_1) = 5 - 2x_1 \leq 0$

$9(x_2) = 2x_2 - 3 \geq 0$. **(20 Marks)**

OR

8 a. Write step by step procedure for cutting plane method. **(10 Marks)**

b. Write step by step procedure for complex method. **(10 Marks)**

Module-5

9 a. Describe geometric and dynamic programming problem. **(05 Marks)**

b. Solve NLPP using geometric programming method,

Minimize $f = 7x_1x_2^{-1} + 3x_2x_3^{-2} + 5x_1^{-3}x_2x_3 + x_1x_2x_3$. **(15 Marks)**

OR

10 a. Explain the types of multistage decision problem. **(05 Marks)**

b. An open cylindrical vessel is to be constructed to transport 100 m^3 of a chemical from a store to a factory. The sheet metal used for bottom cost Rs.1000/- and that used for the cylindrical wall costs Rs.500/- square meter. If it costs Rs.100/- for each round trip of vessel, find the dimensions of the vessel for minimizing the transportation cost. Assume that vessel has no salvage upon completion of operation. **(15 Marks)**

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20 - I sem. M.Tech. M.M.D

CBCS SCHEME

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20MMD11

First Semester M.Tech. Degree Examination, June/July 2023
Mathematical Methods in Engineering

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Explain about :
- i) Inherent error
- ii) Rounding off error
- iii) Truncation error
- iv) Absolute error
- v) Relative and percentage error

(10 Marks)

b. A parachutist of mass 68.1Kg jumps out of a stationary not air balloon. Use $\frac{dv}{dt} = g - \frac{c}{m}V$ to compute the velocity V prior to opening the chute. The drag coefficient is equal to 12.5Kg/s. Given that $g = 9.8 m/sec^2$, V = 0 at t = 0. Tabulate the values of v for t = 2(2) 14. **(10 Marks)**

OR

2 a. Determine the maximum relative error for the function $F = 3x^2y^2 + 5y^2z^2 - 7x^2z^2 + 38$. For x = y = z = 1 and $\Delta x = -0.05$, $\Delta y = 0.001$ and $\Delta z = 0.02$. **(10 Marks)**

b. The deflection of a strut of length 'ℓ' with one end (x = 0) built in and other supported and subjected to end thrust P, satisfies the equation $\frac{d^2y}{dx^2} + a^2y = \frac{a^2R}{P}(\ell - x)$. Prove that the deflection curve is $y = \frac{R}{P}\left(\frac{\sin ax}{a} - \ell\cos ax + \ell - x\right)$ where $a\ell = \tan a\ell$ **(10 Marks)**

Module-2

3 a. Solve the system of equations

$$\begin{bmatrix} 4 & 2 & 14 \\ 2 & 17 & -5 \\ 14 & -5 & 83 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 14 \\ -101 \\ 155 \end{bmatrix}$$

Using Cholesky method **(10 Marks)**

b. By employing the Given's method, reduce the matrix

$$A = \begin{bmatrix} 2 & 1 & -2 \\ 1 & 2 & -2 \\ -2 & -2 & 3 \end{bmatrix}$$

To tridiagonal form and hence find its largest eigen value. **(10 Marks)**

OR

4 a. Solve the system of equations
$x + y + z = 9$
$2x - 3y + 4z = 13$
$3x + 4y + 5z = 40$
Using Gauss – Jordan method. **(10 Marks)**

b. Using the partition method, solve the system of equations **(10 Marks)**
$x + y + z = 1$
$4x + 3y - z = 6$
$3x + 5y + 3z = 4$

Module-3

5 a. Perform two iteration using Muller method to find the root of the equation
$f(x) = \cos x - xe^x = 0$, $x_0 = -1$, $x_1 = 0$, $x_2 = 1$. **(10 Marks)**

b. Using Picard's method, find approximate values of Y and Z corresponding to $x = 0.1$. Given that $y(0) = 2$, $z(0) = 1$ and $\frac{dy}{dt} = x + z$, $\frac{dz}{dx} = x - y^2$. **(10 Marks)**

OR

6 a. Apply Graeffe's root squaring method to find the root of $x^3 - 2x^2 - 5x + 6 = 0$ squaring trice. **(10 Marks)**

b. By employing the Runge – kutta method, find an approximate solution for Y at the point $x = 0.1$ for the differential equation.
$\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 5y = 0$. Under the conditions $y(0) = 3$, $y'(0) = -5$. Take step length $h = 0.1$ **(10 Marks)**

Module-4

7 a. Evaluate the pivotal values of the equation $u_{tt} = 16u_{xx}$ taking $\Delta x = 1$ upto $t = 1.25$. The boundary conditions are $u(0, t) = u(5, t) = 0$, $u_t(x, 0) = 0$ and $u(x, 0) = x^2(5 - x)$. **(10 Marks)**

b. Given the values of u(x, y) on the boundary of the square in the Fig Q7(b), evaluate the functions u(x, y) satisfying the Laplace equation $\nabla^2 u = 0$ at the pivotal point of this figure by Gauss – Seidal method.

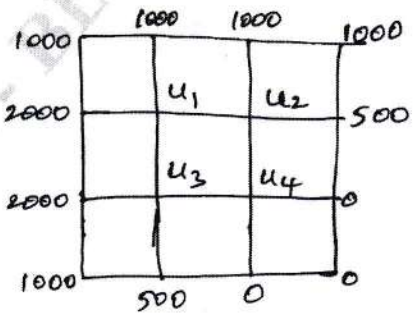

Fig Q7(b) **(10 Marks)**

OR

8 a. Solve the boundary value problem $u_t = u_{xx}$ under the conditions $u(0, t) = u(1, t) = 0$ and $u(x, 0) = \text{Sin } \pi x$, $0 \le x \le 1$ using Schmidt method $\left(\text{Take } h = 0.2 \text{ and } \alpha = \frac{1}{2}\right)$. **(10 Marks)**

b. Solve $25u_{xx} = u_{tt}$ at the pivotal point given $u(0, t) = 0 = u(5, t)$; $u_t = (x, 0) = 0$ and $u(x, 0) = \begin{cases} 20x, & 0 \le x \le 1 \\ 5(5-x), & 1 \le x \le 5 \end{cases}$ by taking $h = 1$. Compute $u(x, t)$ for $0 \le t \le 0.1$. **(10 Marks)**

Module-5

9 a. Explain the following terms :

i) Null Hypothesis
ii) Type – I and Type – II errors
iii) Level of significance
iv) Confidence limits **(10 Marks)**

b. Five dice were thrown 96 times and the number 1, 2 or 3 appearing on the face of the dice follows the frequency distribution as follows : No of dice showing

1, 2 or 3	:	5	4	3	2	1	0
Frequency	:	7	19	35	24	8	3

Test the hypothesis that the data follow a binomial distribution $\chi^2_{0.05} = 11.07$ for 5 d.f. **(10 Marks)**

OR

10 a. Following are the weekly sale records (in lakh) of three salesmen A, B and C of a company during 13 sale – calls.

A 3 4 3 5

B 6 3 3 4

C 7 3 4 6 5

Test whether the sales of three salesman are different $[F_{2, 10, 0.05} = 4.10]$ **(10 Marks)**

b. Three varieties of a crop are tested in a RBD with 4 replications, the layout being given in the table. The plot yields are also given. Analyze the experimental yield and state your conclusions.

A	6	C	5	A	8	B	9
B	8	A	4	B	6	C	9
C	7	B	6	C	10	A	6

(10 Marks)

$[F_{3, 6, 0.05} = 4.76, F_{2, 6, 0.05} = 5.14]$

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20MMD12

First Semester M.Tech. Degree Examination, June/July 2023
Design of Vibration Control Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define Simple Harmonic Motion (SHM). Represent SHM and their derivatives using vector diagram. **(04 Marks)**

b. Differentiate between Under Critical and over damping. Represent the motion of above systems graphically. **(06 Marks)**

c. Define logarithmic decrement. Derive the expression of logarithmic decrement in terms of damping factor. **(06 Marks)**

d. A vibrating system in a vehicle is to be designed with the following parameters, K = 100 N/m, C = 2 N-s/m, m = 1 kg. Calculate the decrease of amplitude from its starting value after 3 complete oscillations. **(04 Marks)**

OR

2 a. Name the various methods to control vibrations in dynamic system. **(04 Marks)**

b. What is vibration isolation? Differentiate between active isolator and passive isolator. **(06 Marks)**

c. Describe the working of Active vibration isolation system. **(10 Marks)**

Module-2

3 a. Define transient response. Give the mathematical and graphical representation of impulse excitation. **(06 Marks)**

b. Obtain the response for a spring-mass system subjected to the following excitation as shown in Fig. Q3 (b). **(14 Marks)**

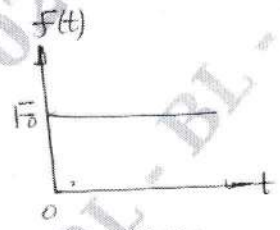

Fig. Q3 (b)

OR

4 a. Represent Random time function mathematically and graphically. Give some examples of it. **(04 Marks)**

b. Write the expressions for expected value ; Mean Square value, Variance and Standard deviations of Random Time Function x(t). **(04 Marks)**

c. A single DOF system with natural frequency $\omega_n = \sqrt{\frac{K}{m}}$ and damping factor (ξ) = 0.2 is excited by the force $F(t) = F\cos\frac{1}{2}\omega_n t + F\cos\omega_n t + F\cos\frac{3}{2}\omega_n t$. Determine the mean square response of the system. **(12 Marks)**

Module-3

5 a. Explain the basic features and importance of a vibration measurement using schemati illustration. **(06 Marks)**

b. Write a note on vibration pickups. **(06 Marks)**

c. Name any two frequency measuring instruments. Explain briefly any one measuring instrument. **(08 Marks)**

OR

6 a. Name and explain the various equipments required for experimental modal analysis. **(10 Marks)**

b. Show the general arrangement for the experimental modal analysis of a mechanical system. Explain briefly the experimental setup. **(10 Marks)**

Module-4

7 a. What is a noise? List out the various sources of noise pollution. **(04 Marks)**

b. How a sound wave is represented mathematically? Specify all the terms of an equation. **(04 Marks)**

c. Briefly explain the various noise controlling techniques. **(12 Marks)**

OR

8 a. Define the following with respect to sound wave :
(i) Amplitude (ii) Frequency (iii) Wave length (iv) Decibles. **(04 Marks)**

b. Write a note on frequency analysis of soundwave. **(06 Marks)**

c. Explain briefly the working of simple sound level meter using a block diagram. **(10 Marks)**

Module-5

9 a. How does a continuous system differ from a discrete system in the nature of its equation of motion? **(06 Marks)**

b. Find the natural frequencies and the free vibration solution of a bar fixed at one end and free at the other. **(14 Marks)**

OR

10 a. Derive the wave equation for a uniform shaft subjected to torsional vibrations. **(10 Marks)**

b. Determine the equation for the natural frequencies of a uniform shaft in torsional oscillations with one end fixed and other end free. **(10 Marks)**

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CBCS SCHEME

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20MMD13

First Semester M.Tech. Degree Examination, June/July 2023
Continuum Mechanics

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Derive the equation of equilibrium for 3-D state of stress with usual notations. **(10 Marks)**

b. The state of stress at a point is given by as follows:
$\sigma_x = x^2y + 20$, $\tau_{xy} = 3x^2y$, $\tau_{yz} = yz$, $\tau_{xz} = xz$, $\sigma_y = x^3z + y^2$, $\sigma_z = yz^2 + 10$. Determine the body force distribution at a point (1, 2, 3) so that the stresses are inequilibrium. **(10 Marks)**

OR

2 a. Define the following:
i) Stress vector
ii) Stress tensor
iii) Principal stress
iv) Deviatoric tensor
v) Octahedral stress. **(05 Marks)**

b. The state of stress at a point is given by the following matrix:

$$\sigma_{ij} = \begin{bmatrix} 9 & 6 & 3 \\ 6 & 5 & 2 \\ 3 & 2 & 4 \end{bmatrix}$$

Determine the principal stresses at that point. **(15 Marks)**

Module-2

3 a. Derive 2D-strain compatibility equations in Cartesian coordinate system. **(10 Marks)**

b. Given the following displacement field:
$U = 3x^2y + y^2$, $v = 3yz + xy$, $w = 4xz^2 + 5xy^2$. What is the change in distance between two points P and Q after deformation originally at P(1, 2, 3) and Q(1, -1, 2). **(10 Marks)**

OR

4 a. State generalized Hooke's law in terms of engineering constants for homogeneous material. **(05 Marks)**

b. Obtain the relationship between Young's modulus (E), poisson's ratio (v) and Lame's constant (λ). **(05 Marks)**

c. The state of strain at a point in a stressed body is given by $\epsilon_x = 0.001$, $\epsilon_y = -0.003$, $\epsilon_z = \gamma_{xy} = 0$, $\gamma_{xz} = -0.004$, $\gamma_{yz} = 0.001$. Obtain the stress tensor at the point in the body. Take $E = 2.1 \times 10^5$ MPa and $v = 0.28$. **(10 Marks)**

Module-3

5 a. Differentiate between plane stress and plane stain problems. **(04 Marks)**

b. What is Airy's stress function? When weight is the only body force, show that the solution of a 2D-elasticity problem can be reduced to $\nabla^4\phi = 0$, where $\phi(x, y)$ is Airy's stress function. **(08 Marks)**

c. Investigate what problem of plane stress can be solved by $\phi = \frac{-F}{d^2} xy^2(3d - 2y)$ applied to region included in y = 0 to d, x = 0 on the side of x-positive. **(08 Marks)**

OR

6 a. State the principle of superposition. **(04 Marks)**

b. Formulate the suitable stress function $\phi(x, y)$ that satisfy the biharmonic function and applicable for a narrow cantilever beam subjected to an end load (P) at free end. Also obtain the stress distribution. **(16 Marks)**

Module-4

7 a. Obtain the expression for radial and tangential stresses due to centrifugal load for an annular disk (rotating) of uniform thickness. **(10 Marks)**

b. Show that in a hollow rotating disk, the maximum radial stress occurs at the geometric mean of outer and inner radii of the disk. Also determine its magnitude. **(10 Marks)**

OR

8 a. Obtain an expression for radial and tangential stresses induced in a circular disk due to uniform temperature distribution $T = \lambda(b^2 - r^2)$ where λ is constant b is outer radius. **(10 Marks)**

b. The temperature distribution in a long cylindrical conductor due to the passage of current is given by $T = \lambda(b^2 - r^2)$ where λ is a constant, b is the radius of cylindrical conductor and r is the radial distance from the axis of the conductor. Determine the stresses induced in the conductor due to thermal loading only. Assume both ends are fixed. **(10 Marks)**

Module-5

9 a. Discuss the torsion of a solid circular cross sectional bar. **(10 Marks)**

b. Discuss the torsion of a thin walled section. **(10 Marks)**

OR

10 a. Explain viscoelastic behavior of a material and illustrate it lag two simple models. **(10 Marks)**

b. Explain the following:

i) Newtonian fluid

ii) Stokesian fluid. **(10 Marks)**

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20MMD15

First Semester M.Tech. Degree Examination, June/July 2023
Dynamics and Mechanism Design

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Explain Planar, Spherical and Spatial mechanisms with examples. **(10 Marks)**

b. Define Grashoffs law and elaborate the inversions of Grashoffs law. **(10 Marks)**

OR

2 a. What are equivalent mechanism? Obtain the equivalent mechanisms of mechanisms shown below Fig.Q2(a).

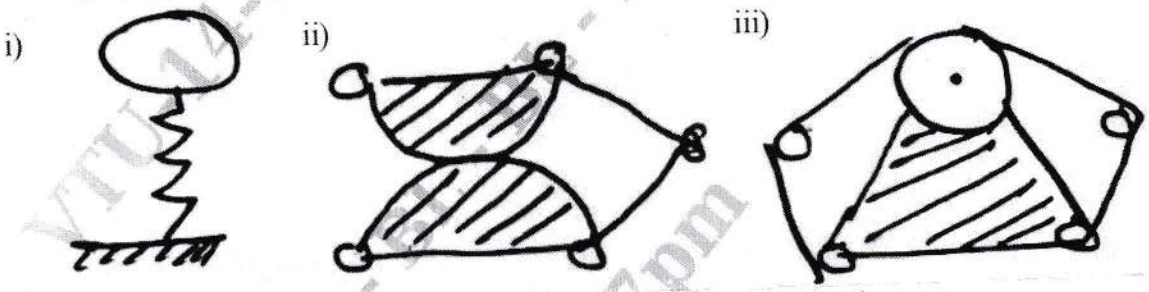

Fig.Q2(a)(i)(ii)(iii) **(10 Marks)**

b. Explain mechanical advantage and transmission angle. **(10 Marks)**

Module-2

3 a. Describe the principal of virtual work. **(10 Marks)**

b. Explain Halonomic and non-hlonomic constraints. **(10 Marks)**

OR

4 a. Derive Lagrange's equation from D'Alembert's principle. **(10 Marks)**

b. Find the equation of motion for system shown in Fig.Q4(b) using Hamilton principle.

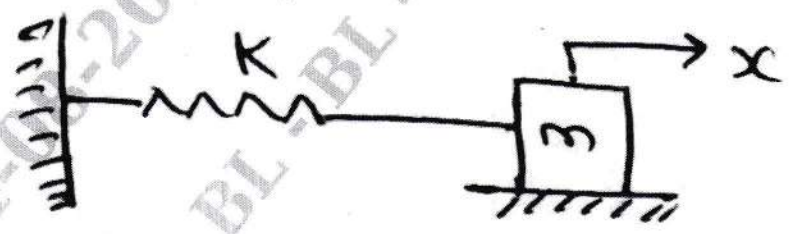

Fig.Q4(b) **(10 Marks)**

Module-3

5 a. Explain type, number and dimensional synthesis. **(10 Marks)**

b. Elaborate Chebychev spacing of accuracy points. **(10 Marks)**

OR

6 a. Describe Function generation, Path generation an Body guidance. **(10 Marks)**

b. Explain the two position synthesis of a slider crank mechanism. **(10 Marks)**

Module-4

7 a. Synthesize a linkage to generate function $y = \log_e x$ over the interval $10 \le x \le 60$ using an input crank range of 120° and output range of 90° using four position synthesis. **(12 Marks)**

b. Explain overlay method. **(08 Marks)**

OR

8 a. Obtain the equations for coordinates of coupler curve for slider crank mechanism. **(10 Marks)**

b. Synthesize a four-bar linkage to give the following values of angular velocities and accelerations using Bloch synthesis.

$\omega_2 = 200$rad/s, $\omega_3 = 85$ rad/s, $\omega_4 = 130$rad/s

$\alpha_2 = 0$ rad/s^2, $\alpha_3 = -1000$rad/s^2, $\alpha_4 = -1600$rad/s^2. **(10 Marks)**

Module-5

9 a. Explain the Eulerian angles. **(12 Marks)**

b. What are spatial mechanism explain with examples. **(08 Marks)**

OR

10 a. Sketch any two four bar spatial linkages having mobility of m = 1. **(10 Marks)**

b. What is a Gyroscope and obtain equation for Gyroscopic couple. **(10 Marks)**

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/ 20. II Sem M.Tech. M.M.D.

CBCS SCHEME

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20MMD21

Second Semester M.Tech. Degree Examination, June/July 2023
Advanced Finite Element Analysis

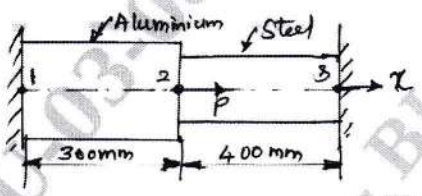
Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume any missing data suitably.

Module-1

1 a. Derive the shape function for linear bar element in global coordinates. **(06 Marks)**

b. Consider the bar shown in Fig.Q.1(b). An axial load P = 200 × 10^3N is applied as shown using elimination approach for handling boundary conditions, determine:
i) Nodal displacements
ii) Stress in each element
iii) Reaction forces. **(14 Marks)**



$A_1 = 2400mm^2$
$E_1 = 70 \times 10^9 N/m^2$
$A_2 = 600mm^2$
$E_2 = 200 \times 10^9 N/m^2$

Fig.Q.1(b)

OR

2 a. Derive stiffness matrix of truss element in 2-dimensions. **(08 Marks)**

b. For the two bar truss shown in Fig.Q.2(b). Determine the displacements, stress in each elements and reactions at the support. **(12 Marks)**

E = 200GPa
$A = 200mm^2$
for both elements

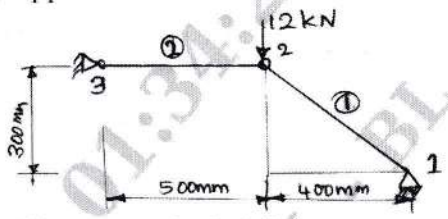


Fig.Q.2(b)

Module-2

3 a. Obtain [B] matrix for an axisymmetric triangular element. **(10 Marks)**

b. An axisymmetric surface is shown in Fig.Q.3(b). Determine the equivalent loads at nodes 6, 4 and 2 the coordinates of nodes are point 6 are (60, 40)mm point 4 are (40, 55)mm and point 2 are (20, 70)mm, **(10 Marks)**

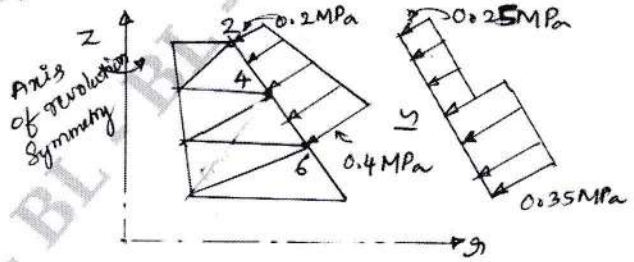


Fig.Q.3(b)

OR

4 Derive stiffness matrix, consistent load vector due to body force and traction force for axisymmetric triangular element. **(20 Marks)**

Module-3

5 a. Derive shape functions of a linear tetrahedral element. **(06 Marks)**

b. Derive element strain vector, element stiffness matrix of a linear tetrahedral element. **(14 Marks)**

OR

6 a. Derive shape functions of a 8 node hexahedral element. **(10 Marks)**

b. Derive body force terms, surface force terms and principal stresses of a tetrahedral (linear) element. **(10 Marks)**

Module-4

7 a. Derive element mass matrix or consistent mass matrix for a bar element. **(06 Marks)**

b. For a beam shown in Fig.Q.7(b), determine the eigen values and corresponding natural frequencies.
Take E = 200GPa, $\rho = 7840kg/mm^3$, $A = 240mm^2$, $I = 200mm^4$.

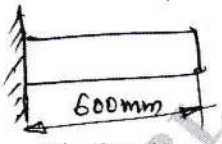


Fig.Q.7(b)

(14 Marks)

OR

8 For the stepped bars shown in Fig.Q.8. Determine the eigen values and eigen vectors. E = 200GPa, $\rho = 7830kg/m^3$. **(20 Marks)**

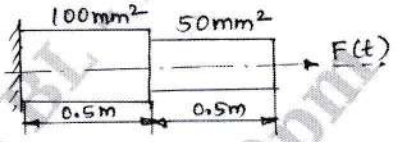


Fig.Q.8

Module-5

9 a. Derive the shape function of a 1-D bar element with temperature T_1 and T_2 at the nodes. **(10 Marks)**

b. Calculate the temperature distribution in a 1-D fin with the physical properties given in Fig.Q.9(b). There is a uniform generation of heat inside the wall of $\overline{Q} = 400W/m^3$. **(10 Marks)**

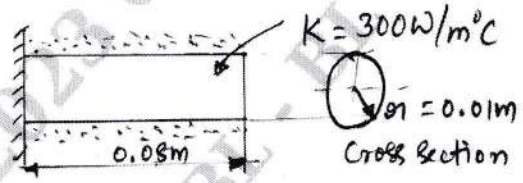


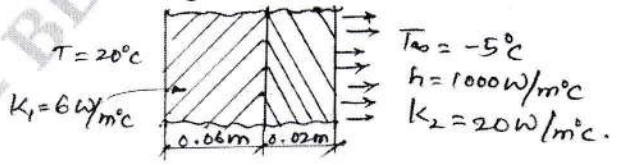
Fig.Q.9(b)

OR

10 a. Explain the types of boundary conditions in heat transfer problems. Briefly describe the rate equations. **(10 Marks)**

b. Determine the temperature distribution through the composite wall as shown in Fig.Q.10(b). Convective heat loss occurs on the right side surface. Assume a unit area.

Fig.Q.10(b)



(10 Marks)

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20MMD22

Second Semester M.Tech. Degree Examination, June/July 2023
Advanced Machine Design

Time: 3 hrs. Max. Marks: 100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. Use of data hand book is permitted.

Module-1

1 a. Describe the following with example :
i) Safe life design
ii) Fail safe design
iii) Even and uneven materials. **(10 Marks)**

b. A ductile steel bar has yield strength in tension and compression of 350MPa. Using distortion energy and maximum shear stress theory determine the factor of safety for the following plane stress conditions.
i) $\sigma_x = 84MPa, \sigma_y = 42MPa$
ii) $\sigma_x = -42MPa, \sigma_y = -70MPa, \tau_{xy} = 35MPa$. **(10 Marks)**

OR

2 a. Explain the following with a neat sketch :
i) Coulomb – Mohr's theory
ii) Modified Mohr's. **(10 Marks)**

b. The cast – Iron specimen has ultimate strength of 210MPa in tension, 700MPa in compression. Find the factor of safety using maximum normal stress theory for the following stress conditions :
i) $\sigma_x = 140MPa, \quad \sigma_y = 42MPa$
ii) $\sigma_x = 84MPa, \quad \tau_{xy} = -56MPA$
iii) $\sigma_x = -84MPa, \quad \tau_{xy} = 56MPa$ **(10 Marks)**

Module-2

3 a. Explain any three parameters influencing the S – N behavior materials. **(10 Marks)**

b. As forged 50MM diameter. 1040 steel rod has $S_u = 650MPa$ and $S_y = 500MPa$. It is subjected to constant amplitude cyclic bending. Determine the following values using appropriate fatigue models.
i) Fully reversed bending fatigue strength at 10^6 cycles
ii) S_a and S_M for 10^5 cycles if R = 0
iii) S_a and S_M for 10^4 cycles if R = 0. **(10 Marks)**

OR

4 a. With a neat sketch explain the working of rotating pure bending type of fatigue testing machine. **(10 Marks)**

b. The strain life properties of a material rae as follows :
$\sigma_f' = 2700MPa, \in_f' = 0.1, b = 0.08, c = -0.7, E = 200GPa$. Determine :
i) Transition life
ii) $\in_a$ at 200 reversal
iii) σ_a at 200 reversal. **(10 Marks)**

Module-3

5 a. Describe the three basic crack displacement modes with sketch. (10 Marks)

b. A very wide SAE1020 cold rolled thin plate is subjected to constant amplitude uniaxial cycle loads that produce nominal stress varying from $S_{max} = 250MPa$ to $S_{min} = -50MPa$. The monotonic properties for this steel are $\sigma_y = 630MPa$, $\sigma_u = 670MPa$, $E = 207GPa$ and $K_C = 104MPa\ \sqrt{M}$. If an initial, through thickness edge crack of 2mm length existed what will be the fatigue life of the plate? Take $A = 6.9 \times 10^{-12}$ m/cycle and $n = 3$. (10 Marks)

OR

6 a. Draw sigmoidal $\left(\frac{da}{dN}\right)$ versus (ΔK) curve and explain different regions of the curve. (10 Marks)

b. With a neat sketch explain cycle plastic zone. (10 Marks)

Module-4

7 a. With a neat sketch explain spectrum loads. (10 Marks)

b. Explain Plamgren – Miner Liner damagerule what are its limitations. (10 Marks)

OR

8 With a neat sketch explain the following :

a. Rain flow counting method (10 Marks)

b. Level crossing counting method. (10 Marks)

Module-5

9 Explain the following :

a. Friction

b. Corrosion wear

c. Abrasive wear

d. Adhesive wear. (20 Marks)

OR

10 a. Briefly explain design to avoid surface failures. (10 Marks)

b. Derive an expression for the contact pressure destitution in spherical contact surface. (10 Marks)

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CBCS SCHEME

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20MMD251

Second Semester M.Tech. Degree Examination, June/July 2023
Automobile System Design

Time: 3 hrs. Max. Marks: 100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. Use of Design data hand book is permitted.
3. Missing data, if any, may be suitably assumed.

Module-1

1 a. What is the need of aero dynamically profiled body and explain.
i) Draw force
ii) Lift force
iii) Side force
iv) Pitching moment
v) Yawing moment. **(12 Marks)**

b. Explain an engine spray formation. **(08 Marks)**

OR

2 a. What do you mean by direct injection system? Explain any two types of petrol injection system for SI engine. **(10 Marks)**

b. With a neat sketch explain air injection system for diesel engines. **(10 Marks)**

Module-2

3 a. Briefly describe cylinder liners and cylinder lubrication. **(10 Marks)**

b. Explain any two different types of indirect combustion chambers of CI engines. **(10 Marks)**

OR

4 a. A four stroke diesel engine has the following specification which is working on diesel cycle is mentioned below :
i) Compression ratio = 15
ii) Stroke volume = 100cc
iii) Cut-off = 10% of the stroke volume
iv) Power = 5KW
v) Speed = 1500 rpm with a possibility of overspending of 2000 rpm
vi) Cylinder material = cast iron. **(10 Marks)**

b. Determine :
i) Cylinder bore
ii) Cylinder length
iii) Wall thickness
iv) Thickness of cylinder head. **(10 Marks)**

Module-3

5 Design a Castiorn piston for a single acting four stroke diesel engine from the following data:

Cylinder bore	= 100mm
Length of the stroke	= 125mm
Speed	= 2000 rpm
Brake mean effective pressure	= 0.5MPa
Maximum gas pressure	= 5MPa
Fuel consumption	= 0.25 kg/Brake power in KW/h

Assume any further data required for the design

OR

6 Design a connecting rod of circular section for the following data :

Diameter of the piston or cylinder bore	= 150mm
Length of the connecting rod	= 350mm
Stroke of the piston	= 160mm
Mass of the reciprocating parts	= 2.8kg
Speed of engine	= 1500rpm
Material of connecting rod	= 40C8 steel (σ_{ys} = 328.6 N/mm^2)
FOS for buckling	= 4

Length to diameter ratio of crank pin and gudgeon pin = 1.5
Allowable bearing pressure at the gudgeon pin = 16.5 N/mm^2

Material for the bolt and cap	= 50C4 steel (σ_{ys} = 372.7N/mm^2)
Factor of safety for the bolt and cap	= 4

Assume any further data required for the design. **(20 Marks)**

Module-4

7 a. Explain the following gear boxes :
i) Sliding – Mesh gear box
ii) Constant – Mesh gear box **(10 Marks)**

b. Sketch a section through a sliding type gear box with four forward and one reverse speeds and explain clearly how the different speed ratios will be obtained in the following cases :

Gear ratio of top gear	= 1 : 1
Gear ratio of third gear	= 1.38 : 1
Gear ratio on second gear	= 2.24 : 1
Gear ratio on first gear	= 3.8 : 1
Gear ratio on reverse gear	= 3.8 : 1

Assume counter shaft or layout shaft speed is half that of the engine speed and smallest gear is not to have less than 15 teeth. **(10 Marks)**

OR

8 a. Classify and explain the types of suspension springs. **(10 Marks)**
b. Define Resonance, Isolation, Forced Vibration, Time period, Degree of freedom **(05 Marks)**
c. Obtain two degree of freedom equation of motion for vehicle suspension. **(05 Marks)**

Module-5

9 Explain briefly :
a. Engine coolant flow
b. Forced circulation water cooling system
c. Radiator
d. Purpose of cooling system. **(20 Marks)**

OR

10 a. Explain the following related to common emission control system :
i) Crank case emission control
ii) Exhaust emission control. **(10 Marks)**

b. Write the advantages and disadvantages of liquid cooled engine system. **(10 Marks)**

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/ 22. IIsem M.Tech. M.M.D

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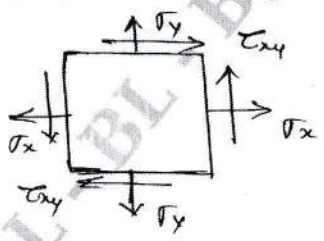
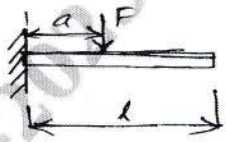
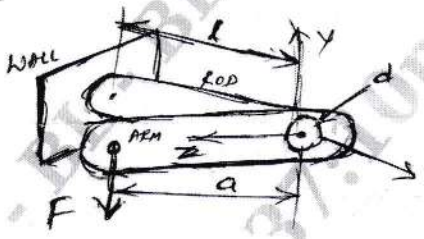
22MMD/MEA21

Second Semester M.Tech. Degree Examination, June/July 2023
Advanced Machine Design

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain with a flow chart of phases and interaction of the design process.	10	L2	CO1
	b.	Write a short note on : i) Design factor and Factor of safety ii) Dimensions and Tolerances.	10	L2	CO1
		OR			
Q.2	a.	What are the professional responsibilities of the Design Engineer's and also list and explain solution process technique of Design Engineer's.	12	L2	CO1
	b.	Explain Standards and Codes. List some of the standards organisation in Mechanical Engineers.	8	L2	CO1
		Module – 2			
Q.3	a.	Name and explain different types of loads acting on a Machine member.	10	L2	CO1
	b.	With an example, explain how 2D static loading analysis carried out in a machine element.	10	L2	CO1
		OR			
Q.4	a.	Define Free Body Diagram and explain its importance in load analysis.	6	L2	CO1
	b.	Explain the following : i) Impact loading ii) Beam loading.	14	L2	CO1
		Module – 3			
Q.5	a.	What are principal stresses and derive an equation of principal stresses for a 2 – D element subjected to general stress system.	10	L2	CO1
	b.	A biaxial stress element as shown in Fig. Q5(b) has σ_x = 40,000 psi , σ_y = -20,000 psi and τ_{xy} = 30 psi CCW. Use Mohr's circles to determine the principal stresses. Check the result with a Analytical method.  Fig. Q5(b) and Fig. Q(6(b)	10	L4	CO2
		OR			
Q.6	a.	Explain the following : i) Axial Tension ii) Direct shear stress iii) Bearing stress iv) Tear out.	10	L2	CO1

	b.	A biaxial stress element as shown in Fig. Q6(b) has σ_x = 40,000 psi , σ_y = 20,000 psi and τ_{xy} = 10000 psi CCW. Use Mohr's circle to determine the principal stresses. Check the solution with a Analytical method.	**10**	**L4**	**CO2**
		Module – 4			
Q.7	**a.**	Explain Stresses acting on Beams , Shafts and Cylinders.	**10**	**L2**	**CO1**
	b.	Determine and plot the slope and deflection functions for the beam shown in Fig. Q7(b). Take beam length ℓ = 10 in and load location a = 4 in. The beam's I = 0.5 in^4 and E = 30 MPsi. The magnitude of the applied force is F = 400 ℔b. Fig. Q7(b) 	**10**	**L4**	**CO2**
		OR			
Q.8	**a.**	What are Stress concentration and explain with a neat sketch methods to reduce stress concentration in a machine elements.	**10**	**L2**	**CO1**
	b.	Find the most highly stressed locations on the bracket shown in Fig. Q8(b) and determine the applied and principal stresses at those locations. Take the rod length ℓ = 6 in and the arm a = 8 in. The rod outside diameter d = 1.5 in. load F = 1000 ℔b.  Fig. Q8(b) , Fig. Q9(b) and Fig. Q10(b)	**10**	**L4**	**CO2**
		Module – 5			
Q.9	**a.**	List theories of failure of Ductile materials. Under static loading and explain in detail any one theory.	**10**	**L2**	**CO1**
	b.	Determine the safety factors for the bracket shown in Fig. Q9(b) based on both the distortion energy theory and the maximum shear theory and compare them. Take the materials as 2024 – T4 aluminum with yield strength of 47000 Psi. The rod length ℓ = 6 in and arm a = 8 in. The rod outside diameter d = 1.5 in. load F = 1000 ℔b.	**10**	**L4**	**CO2**
		OR			
Q.10	**a.**	List theories of failure of Brittle materials under static loading and explain in detail any one theory.	**10**	**L2**	**CO1**
	b.	Determine the safety factors for the bracket rod shown in Fig. Q10(b) based on the modified Mohr theory. Take material as class 50 gray cast iron with σ_{ut} = 52500 Psi and σ_{uc} = -164000 Psi. The rod length ℓ = 6 in and arm a = 8 in. The rod outside diameter d = 1.5 in. load F = 1000 ℔b.	**10**	**L4**	**CO2**

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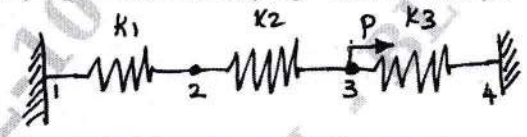
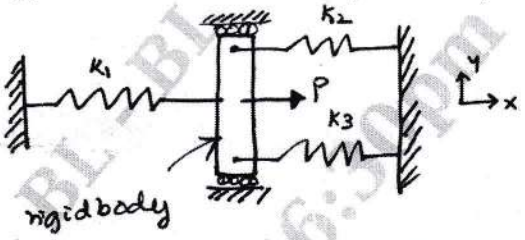
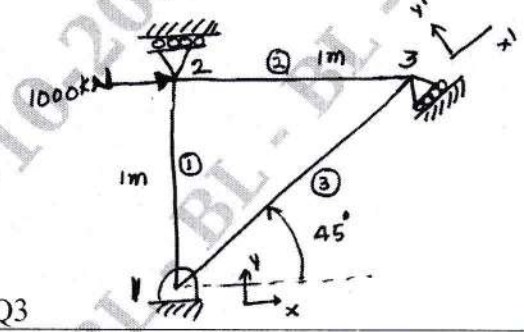
22MMD/MEA/MDE22

Second Semester M.Tech. Degree Examination, June/July 2023
Advance Finite Element Methods and Applications

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Derive the finite element equations from the principle of virtual work.	12	L1	CO1
	b.	For the spring assemblage shown in Fig.Q1(b), find the nodal displacements and support reactions. Given : $K_1 = 200$ N/mm ; $K_2 = 400$ N/mm ; $K_3 = 600$ N/mm ; P = 25 kN  Fig.Q1(b)	8	L2	CO1
		OR			
Q.2	a.	For the spring assemblage shown in Fig.Q2(a), find the displacements of the rigid body and the support reactions. Solve the problem symbolically.  Fig.Q2(a)	10	L2	CO2
	b.	Sketch come of the 1D, 2D, 3D and axisymmetric finite elements commonly encountered.	10	L1	CO2
		Module – 2			
Q.3		For the plane truss shown in the Fig.Q3, determine the displacement and reactions. Let E = 210 GPa, $A = 6\times10^{-4}$ m^2 for elements 1 and 2, and $A = 6\sqrt{2}\times10^{-4}$ m^2 for the element 3. (Given load at node 2 is 1000 kN)  Fig.Q3	20	L3	CO2
		OR			
Q.4	a.	Obtain the stiffness matrix for a bar arbitrarily oriented in the plane.	12	L2	CO2
	b.	How do we compute the stress in a bar element arbitrarily oriented and whose end displacements in global coordinate system are known.	8	L2	CO2
		Module – 3			
Q.5	a.	Using the direct stiffness method, solve the problem of the propped cantilever beam subjected to end load P in Fig.Q5(a). The beam is assumed to have constant EI and length 2L. It is supported by a roller at mid-length and built in at the right end.	10	L3	CO3

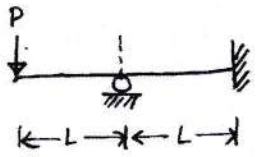


Fig.Q5(a)

	b.	A beam is subjected uniform distributed load W. The beam is of length L. Using the work-equivalence method, find the equivalent nodal forces and moments. Assume the beam to have constant EI throughout its length.	10	L2	CO3
		OR			
Q.6	a.	Determine the displacement and rotation under the force and moment located at the centre of the beam in Fig.Q6(a). The beam is fixed at both ends. A downward force of 10 kN and an applied moment of 20 kN-m act at the centre of the beam. Let E = 210 GPa and I = 4×10^{-4} m^4 throughout the beam.	10	L3	CO3
	b.	Determine the nodal displacement and rotations for the beam shown in Fig.Q6(b). The beam is fixed at left end, has a roller support at the middle and a spring support at the right end. A downward force of P = 50 kN acts at the right end. Let E = 210 GPa, I = 2×10^{-4} m^2 and K = 200 kN/m.	10	L3	CO3
		Module – 4			
Q.7	a.	Obtain the finite element equations (stiffness matrix) for a plane stress element (CST) in global coordinate system.	16	L2	CO1
	b.	List the stress and strains in case of plane stress and plane strain conditions.	4	L2	CO1
		OR			
Q.8		Find the nodal displacement for the structure shown in the Fig.Q8 which can be idealized as two CST elements. Assume plane stress condition. Take $\gamma = 0.25$, E = 2×10^5 N/mm^2 and thickness = 15mm.	20	L3	CO3
		Module – 5			
Q.9	a.	Obtain the stiffness matrix for a bar element using isoparametric formulation.	10	L2	CO1
	b.	Determine the shape functions for 4-noded rectangular element using natural coordinate system.	10	L2	CO2
		OR			
Q.10	a.	Using Lagrange functions, derive the shape function for hexahedron (brick) element.	10	L2	CO2
	b.	Show that the constant derivative condition and conditions for rigid body are satisfied for isoparametric elements if $\Sigma N_i = 1$.	10	L2	CO1

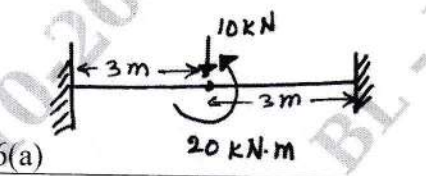


Fig.Q6(a)

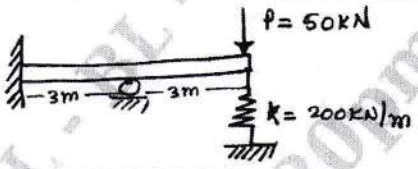


Fig.Q6(b)

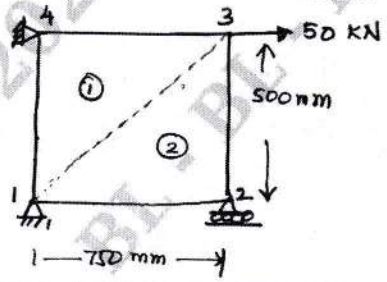


Fig.Q8

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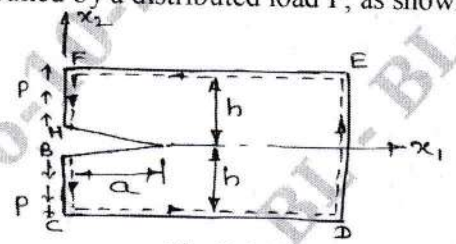
22MMD/MDE/MEA232

Second Semester M.Tech. Degree Examination, June/July 2023
Fracture Mechanics

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is Fracture Mechanics? Discuss briefly the ductile and brittle fracture.	8	L2	CO1
	b.	Discuss the fracture mechanics approach to structural design.	8	L2	CO1
	c.	With a neat sketch, explain the modes of failure.	4	L2	CO1
		OR			
Q.2	a.	With a neat diagram, explain the working principle of Magnetic particle inspection.	6	L2	CO1
	b.	Illustrate crack detection using X-ray imaging.	6	L2	CO1
	c.	Explain briefly with a neat diagram the liquid penetration inspection.	8	L2	CO1
		Module – 2			
Q.3	a.	Derive an expression for fracture strength of a brittle material using Griffith's energy balance.	10	L3	CO2
	b.	Determine the energy release rate of a Double Cantilever Beam (DCB) specimen subjected to a constant load.	10	L3	CO2
		OR			
Q.4	a.	Determine the stress distribution on the surface of a thin plate with a center crack. Draw the Mohr's circle diagram.	10	L3	CO2
	b.	Briefly explain the critical energy release rate in a plate with center crack and subjected to plane stress.	10	L3	CO2
		Module – 3			
Q.5	a.	Explain: i) LEFM ii) EPFM.	6	L2	CO3
	b.	Deduce the stress and displacement expressions for an isotropic flat plate with a crack length of "2a".	6	L3	CO3
	c.	Write a note on: i) Equilibrium equations and ii) Compatibility relations between strain components.	8	L3	CO3

		OR			
Q.6	**a.**	Derive an expression for the stress intensity factor when wedge load acts on a cracked surface i) Symmetrically ii) Asymmetrically.	**10**	**L3**	**CO3**
	b.	Discuss the importance of stress intensity factor. What are the factors on which it depends?	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Derive an expression for Irwin's plastic zone correction.	**10**	**L3**	**CO4**
	b.	Briefly explain the effect of plate thickness on stress intensity factor variation.	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	Determine the J-integral for a Double Cantilever Beam (DCB) specimen, if each cantilever is pulled by a distributed load P, as shown in Fig.Q.8(a).  Fig.Q.8(a)	**10**	**L3**	**CO4**
	b.	Discuss the numerical evaluation of J-integral and predicting safety or failure.	**10**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Derive relationship between CTOD, K_I and G_I for small scale yielding.	**10**	**L3**	**CO5**
	b.	Establish a relation between CTOD and J.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Explain the load-displacement test using clip gauge.	**10**	**L3**	**CO5**
	b.	Discuss the graphical interpretation method of J_{IC}.	**10**	**L3**	**CO5**

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22MMD/MEA/MDE241

Second Semester M.Tech. Degree Examination, June/July 2023
Mechatronics System Design

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is Mechatronics? Explain with block diagram basic elements of mechatronics system.	10	L2	CO1
	b.	Explain with block diagram, open loop systems and closed loop systems.	10	L2	CO1
		OR			
Q.2	a.	Briefly explain Smart Sensors and Potentiometer sensors.	10	L2	CO1
	b.	Explain with sketch Hydraulic actuation systems.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain with sketch mechanical switches and solid state switches.	10	L2	CO2
	b.	Explain with sketch Solenoids and Stepper motors.	10	L2	CO2
		OR			
Q.4	a.	What is Engineering systems models? Explain with sketch rotational translational systems.	10	L2	CO2
	b.	Explain with sketch Electro mechanical systems.	10	L2	CO2
		Module – 3			
Q.5	a.	What is signal conditioning? Explain with sketch the operational amplifier.	10	L2	CO3
	b.	Explain with sketch protection and filtering in signal conditioning.	10	L2	CO3
		OR			
Q.6	a.	Explain with sketch Wheatstone Bridge and Multiplexers.	10	L2	CO3
	b.	What is MEMS? Explain materials for MEMS and micro systems.	10	L2	CO3
		Module – 4			
Q.7	a.	What is modeling dynamic systems? Briefly explain with sketch natural and forced responses.	10	L2	CO4
	b.	Explain with sketch Transient and Steady-state responses.	10	L2	CO4
		OR			
Q.8	a.	Explain with examples for First order systems and Transfer functions for First Order Systems.	10	L2	CO4
	b.	Explain with examples for systems in series connections.	10	L2	CO4
		Module – 5			
Q.9	a.	Explain with block diagram micro processor system and its buses.	10	L2	CO5
	b.	Explain with block diagram general architecture of a microprocessor.	10	L2	CO5
		OR			
Q.10	a.	Explain with suitable diagram of micro controllers.	10	L2	CO5
	b.	Briefly explain Assembly Languages of instructions set of Data transfer movement.	10	L2	CO5

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22-IIsem. M.Tech. CS

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22SCS21

Second Semester M.Tech. Degree Examination, June/July 2023
Big Data Analytics

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain MapReduce data flow with multiple tasks with a diagram.	10	L1	CO1
	b.	Briefly explain the following HDFS concepts: (i) Blocks (ii) Name Node and Data Nodes (iii) HDFS High Availability	10	L1	CO1
		OR			
Q.2	a.	Explain the Hadoop File system and Basic File system operations commands.	10	L1	CO1
	b.	How a client writing data to HDFS with a diagram.	10	L1	CO1
		Module – 2			
Q.3	a.	Explain Anatomy of a YARN Application Run with a neat diagram.	10	L1	CO2
	b.	Explain scheduling in YARN with a neat diagram.	10	L1	CO2
		OR			
Q.4	a.	Explain Data Integrity and Compression in HDFS.	10	L1	CO2
	b.	With a neat diagram, explain sequence file format with record compression and block compression.	10	L1	CO2
		Module – 3			
Q.5	a.	Explain (i) Types of Hadoop Logs (ii) Tuning a Job checklist	10	L2	CO3
	b.	Briefly discuss about Apache Oozie and program for Oozie work flow definition to run the maximum temperature MapReduce Job.	10	L2	CO3
		OR			
Q.6	a.	Explain the Anatomy of a MapReduce Job RUN with a neat diagram.	10	L2	CO3
	b.	How status updates are propagated through the MapReduce system with a neat diagram.	10	L2	CO3
		Module – 4			
Q.7	a.	Explain the Input Format class hierarchy with a neat diagram.	10	L3	CO4
	b.	Explain the Output Format class hierarchy with a neat diagram.	10	L3	CO4
		OR			
Q.8	a.	With a neat diagram, explain how FLUME Agent with a spooling directory source and a logger sink connected by a file channel.	10	L3	CO4
	b.	Describe how Load balancing between two Agents in FLUME with a diagram.	10	L3	CO4
		Module – 5			
Q.9	a.	Discuss about PIG. Explain the two execution modes of PIG and three ways of executing PIG program.	10	L3	CO5
	b.	Explain Loading, Storing, Grouping, Joining and Splitting Data in PIG.	10	L3	CO5
		OR			
Q.10	a.	Discuss about SPARK. How SPARK Runs a Job with a diagram.	10	L3	CO5
	b.	Explain SPARK on YARN client mode with a diagram.	10	L3	CO5

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22SCS/SCN22

Second Semester M.Tech. Degree Examination, June/July 2023
Artificial Intelligence and Machine Learning

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is AI? Explain the fields where foundations of AI is used. Mention some applications of AI.	10	L2	CO1
	b.	You are provided with two water jugs, one with 5 gallons of capacity and the other with 3 gallons of capacity. Neither have any measuring marks on it. How can we get exactly 4 gallons of water in 5 gallon jug? i) Write down the production rules for the above problem. ii) Find any one solution for the above problem.	10	L2	CO1
		OR			
Q.2	a.	Write Breadth first search algorithm and explain by taking suitable example.	10	L2	CO1
	b.	Explain the process of simple hill climbing with algorithm and also explain the problems with hill climbing.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain MINIMAX procedure, strategy and algorithm.	12	L2	CO1
	b.	Show that $\alpha : (A \wedge B) A(B \rightarrow \sim A)$ is unsatisfiable using the tableau method.	8	L2	CO1
		OR			
Q.4	a.	Write down the steps to transform a formula to its equivalent CNF. Convert the formula $(\sim A \rightarrow B) \wedge (C \wedge \sim A)$ into its equivalent CNF representation.	10	L2, L3	CO1
	b.	Explain the game playing problem with an example game tree, where MAX is playing first.	10	L2, L3	CO2
		Module – 3			
Q.5	a.	What is Means Ends analysis? Write the algorithm and explain by taking suitable example.	10	L2	CO2
	b.	Explain semantic net method of knowledge representation with an example.	10	L2	CO2

		OR			
Q.6	**a.**	Discuss about knowledge representation with frames. Give the structure and faults in a frame.	**10**	**L3**	**CO2**
	b.	Demonstrate forward reasoning and backward reasoning inference mechanism for the following set of classes: isa (X, human ← is a (X, man) isa (John, man).	**10**	**L3**	**CO2**
		Module – 4			
Q.7	**a.**	Explain the concept of Bayes theorem and derive Bayes theorem from conditional probability.	**10**	**L2**	**CO2**
	b.	We are given probability of any person chosen at random bring literate as 0.40 and probability of any person chosen at random having age > 60 years as 0.005. Find the probability of the fact that a person chosen at random of age > 60 years is literate.	**10**	**L2**	**CO2**
		OR			
Q.8	**a.**	Discuss about K Means and hierarchical clustering techniques in brief.	**10**	**L2**	**CO2**
	b.	Explain the components of a learning system with a neat sketch.	**10**	**L2**	**CO2**
		Module – 5			
Q.9	**a.**	What is SVM? Outline the working of SVM (Support Vector Machine) for linear and non linear classification.	**10**	**L2**	**CO3**
	b.	Discuss the different issues while designing an ANN (Artificial Neural Network).	**10**	**L3**	**CO3**
		OR			
Q.10	**a.**	What is an ANN? Explain a neuron model with relevant expressions.	**10**	**L2**	**CO3**
	b.	Design a perceptron for Boolean or function using learning algorithm. Assume $W_1 = -0.2$, $W_2 = 0.4$ and Learning rate $A = 0.2$.	**10**	**L2**	**CO3**

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22SCS231

Second Semester M.Tech. Degree Examination, June/July 2023
Wireless Networks and Mobile Computing

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What are the various tiers in three tier architecture? Describe the functions of each tier in detail.	12	L2	CO1
	b.	Explain how can an ISP implement a system using ICAP where some web sites are inaccessible during certain times of the day.	8	L2	CO1
		OR			
Q.2	a.	How is content rating and filtering helpful in classifying content? What is the role of RSACI and PICS in classifying content?	8	L2	CO1
	b.	What is a content aware system? What all can be the types of information needed for developing a fully content aware system?	8	L2	CO1
	c.	Write a short note on client content manager.	4	L2	CO1
		Module – 2			
Q.3	a.	Describe the IS-95 architecture in detail.	12	L2	CO1
	b.	Differentiate between GSM and 3G.	8	L2	CO2
		OR			
Q.4	a.	Differentiate between Hard handoff, soft handoff and softer handoff.	5	L2	CO2
	b.	What is direct sequence spread spectrum technology? How does it work in CDMA technology?	10	L2	CO2
	c.	Explain the design constraints in applications for handheld devices.	5	L2	CO2
		Module – 3			
Q.5	a.	Explain the smart client architecture with a neat diagram.	12	L2	CO1
	b.	Explain the palm OS architecture in detail.	8	L2	CO1
		OR			
Q.6	a.	Explain the smart client application development process in detail.	12	L2	CO2
	b.	Explain the two ways of deployment of wireless applications.	8	L2	CO2

		Module – 4			
Q.7	**a.**	Explain thin client architecture with a neat diagram.	**12**	**L2**	**CO1**
	b.	Explain the process of processing a wireless request in detail.	**8**	**L2**	**CO1**
		OR			
Q.8	**a.**	Explain the Wireless Application Protocol (WAP) stack both 1.x and 2.x and also WAP benefits.	**12**	**L2**	**CO1**
	b.	Write an HDML code for inventory search which includes three go links as search by Name, Search by SKV and Inventory list.	**8**	**L2**	**CO2**
		Module – 5			
Q.9	**a.**	What is J2ME MIDP? Explain its various functional components.	**4**	**L2**	**CO3**
	b.	What is CLDC? How do you program for CLDC?	**8**	**L2**	**CO3**
	c.	What are the different security considerations in MIDP? Explain in detail.	**8**	**L2**	**CO3**
		OR			
Q.10	**a.**	Explain MIDlet life cycle in detail.	**8**	**L2**	**CO3**
	b.	Discuss in detail about GUI in MIDP.	**12**	**L2**	**CO3**

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22SCS/SAM/SAD244

Second Semester M.Tech. Degree Examination, June/July 2023
Agile Technologies

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain different types of success with a neat diagram.	10	L2	CO2
	b.	How agile development helps to achieve organizational success?	10	L1	CO2
		OR			
Q.2	a.	What does it mean to "be agile"?	05	L1	CO2
	b.	What are Agile methods?	05	L1	CO2
	c.	List the principles behind the agile manifesto.	10	L1	CO2
		Module – 2			
Q.3	a.	Explain XP lifecycle and briefly explain how it works.	10	L2	CO1
	b.	Discuss the functions of on-site customers and product managers in XP team.	10	L2	CO1
		OR			
Q.4	a.	Discuss the recommendation for adopting XP.	10	L2	CO1
	b.	Discuss the function of management support, team management and collocated team.	10	L2	CO2
		Module – 3			
Q.5	a.	What is root-cause analysis? How do you find root cause? When to fix and not to fix root cause?	10	L1	CO2
	b.	What is iteration demo? How to conduct iteration demo?	10	L1	CO2
		OR			
Q.6	a.	What are the technique XP uses to achieve zero bugs? Explain in detail.	10	L1	CO1
	b.	What is meant by documentation? Explain different types of documentation.	10	L1	CO1
		Module – 4			
Q.7	a.	Define "values", "principles" and "practices" in XP.	10	L1	CO1
	b.	When do you think it's time to break the rules?	05	L1	CO1
	c.	Anything more is wasteful. Eliminate it! How do you do it?	05	L1	CO3
		OR			
Q.8	a.	Discuss how we build effective relationship with people.	10	L2	CO3
	b.	How to build process for the people? Explain.	10	L1	CO3
		Module – 5			
Q.9	a.	Only releasable code has value. Justify.	10	L2	CO3
	b.	Discuss the Universal Design Principles.	10	L2	CO3
		OR			
Q.10	a.	Explain how do you state great designs.	10	L2	CO3
	b.	Software doesn't exist. Justify.	05	L2	CO3
	c.	Design is for understanding. Justify.	05	L2	CO1

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CBCS SCHEME

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22LDC/LDN/LDE12

First Semester M.Tech. Degree Examination, June/July 2023
Advanced Digital Signal Processing

Time: 3 hrs. Max. Marks: 100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	With neat block diagram, explain representation of discrete time system and also mention the classification of discrete time system.	10	L2	CO1
	b.	Explain recursive and non recursive Realizations of FIR systems.	10	L2	CO1
		OR			
Q.2	a.	Explain implementation of sampling rate conversion.	10	L2	CO1
	b.	Explain correlation of discrete time systems.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain design of a Linear phase FIR Filters by the frequency sampling method.	10	L2	CO2
	b.	Discuss the two nobel identities used for inter changing of filters.	10	L3	CO2
		OR			
Q.4	a.	Explain the two channel QMF. Suppose the poly phase matrix the three channel perfect reconstruction FIR QMF bank is $P(z^3) = \begin{bmatrix} 1 & 1 & 2 \\ 2 & 3 & 1 \\ 1 & 2 & 1 \end{bmatrix}$. Determine the analysis and synthesis filters in QMF bank.	10	L3	CO2
	b.	How the subband coding is useful for sampling rate conversion? Explain the suband coding of speech signals.	10	L2	CO2
		Module – 3			
Q.5	a.	Write a short note on the following i) Stationary random process ii) Statistical Averages for joint random processes iii) Power density spectrum iv) Mean Ergodic process.	10	L2	CO3
	b.	Explain the properties of linear prediction error filters.	10	L2	CO3
		OR			
Q.6	a.	Derive an expression for the prediction of coefficient using Levin's and Durbin algorithm.	10	L3	CO3
	b.	Derive the expression for forward linear filter.	10	L3	CO3

		Module – 4			
Q.7	**a.**	Explain the principles of adaptive channel equalization with a neat block diagram.	**10**	**L2**	**CO4**
	b.	Explain adaptive noise cancellation with an example.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain Least Mean Square (LMS) algorithm with necessary steps.	**10**	**L2**	**CO4**
	b.	Explain the properties of the direct form RLS algorithm.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	How the non parametric methods used for power spectrum estimation. Explain Welch method for Averaging modified peridograms.	**10**	**L2**	**CO5**
	b.	Explain Bartlet method for computing the average periodogram	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain the Burg's method for computing the AR model parameters.	**10**	**L2**	**CO5**
	b.	Explain the ARMA model for power spectrum estimation.	**10**	**L2**	**CO5**

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22. II Sem. M.Tech. EE

CBCS SCHEME

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22LDN21

Second Semester M.Tech Degree Examination, June/July 2023
Advanced Communication Systems

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

		Module – 1	M	L	C
Q.1	a.	Explain the representation of digitally modulated signals.	10	L2	CO1
	b.	With a neat diagram and expressions, explain MQAM.	10	L2	CO1
		OR			
Q.2	a.	With a neat diagram and expressions, explain offset QPSK (OQPSK).	10	L2	CO1
	b.	Explain power spectral density of digitally modulated signals with finite memory.	10	L2	CO1
		Module – 2			
Q.3	a.	With a neat diagram and expressions, explain the matched filter receiver. Also explain the frequency domain interpretation of the matched filter.	10	L3	CO2
	b.	Explain optimal detection for a general vector channel.	10	L3	CO2
		OR			
Q.4	a.	Explain the optimal detection and error probability for PSK signaling.	10	L3	CO2
	b.	Briefly explain the comparison of digital signaling methods interms of bandwidth and dimensionality.	10	L3	CO2
		Module – 3			
Q.5	a.	Explain the design of band limited signals for no intersymbol interference. The Nyquist criterion.	10	L4	CO3
	b.	Explain the performance characteristics of the MSE equalizer.	10	L4	CO3
		OR			
Q.6	a.	With a neat block diagram, explain adaptive linear equalizer.	10	L4	CO3
	b.	With a neat diagram, explain decision feedback equalization.	10	L4	CO3
		Module – 4			
Q.7	a.	Discuss the differences between shadowing and path loss in wireless communication. How do these phenomena affect signal quality and what are the typical models used to describe them.	10	L2	CO4
	b.	Explain the differences between delay spread and Doppler spread in wireless communication channels. How do these parameters influence the design of communication systems and what techniques are used to mitigate their effects?	10	L2	CO4
		OR			
Q.8	a.	Discuss the performance characteristics of Maximum Likelihood (ML) estimators in statistical modeling.	10	L2	CO4
	b.	Explain the significance of symbol timing recovery in digital communication systems.	10	L2	CO4
		Module – 5			
Q.9	a.	Explain the generation and demodulation of direct sequence spread spectrum signals with necessary equation and block diagram.	10	L4	CO5
	b.	With a neat block diagram, explain the frequency hopped spread spectrum.	10	L4	CO5
		OR			
Q.10	a.	With a neat block diagram, explain the CDMA system based on IS – 95.	10	L4	CO5
	b.	Explain the process of generating a Pseudo-Random Noise (PN) sequence using liner feedback shift register (LFSR) and also properties of maximum	10	L4	CO5

CBCS SCHEME

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22LDN/LDS/LEC22

Second Semester M.Tech. Degree Examination, June/July 2023
Antenna Theory and Design

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Derive solution of Maxwell's equation for Radiation problems.	8	L2	CO1
	b.	What is an ideal dipole? Derive an expression for electric and magnetic fields of ideal dipole.	8	L2	CO1
	c.	Write directivity of an ideal dipole and directivity of an sector omnidirectional pattern.	4	L1	CO1
		OR			
Q.2	a.	Explain Slip's in the evaluation of Radiation fields.	6	L2	CO1
	b.	Explain Radiation from line current.	8	L2	CO1
	c.	Explain the basic principle of Radiation Mechanism with a suitable example.	6	L2	CO1
		Module – 2			
Q.3	a.	What is Antenna Synthesis? Explain Antenna Synthesis principles.	10	L2	CO2
	b.	Explain the Taylor Line - Source Method.	10	L2	CO2
		OR			
Q.4	a.	Explain Array Pattern Evaluation Including Mutual Coupling.	6	L2	CO2
	b.	Explain the Wood Ward – Lawson Sampling Method.	6	L2	CO2
	c.	Explain with Relevant equation of the array factor expression of uniformly excited.	8	L2	CO2
		Module – 3			
Q.5	a.	Explain with figure of Helical Antenna.	10	L2	CO3
	b.	What is a Yagi – uda Antenna? Explain with neat sketches of Yagi - uda Antenna.	10	L2	CO3
		OR			
Q.6	a.	Explain with neat sketches of Microstrip Patch antenna.	10	L2	CO3
	b.	Explain Infinite Biconical Antenna and Finite Biconical Antenna.	10	L2	CO3

		Module – 4			
Q.7	**a.**	What is Reflector Antennas? Explain Parabolic Reflector Antenna.	**10**	**L2**	**CO4**
	b.	Explain the dual Reflector Antennas with figures.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain Relevant equation general feed model.	**6**	**L2**	**CO4**
	b.	Explain Gain calculations for Reflector Antenna.	**8**	**L2**	**CO4**
	c.	Explain effect Parabolic Reflector.	**6**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain two alternative approaches to the MOM.	**10**	**L2**	**CO5**
	b.	Explain Weighted Residuals and the method of moments.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Derive Kirchoff's Network equation form integral equation.	**10**	**L3**	**CO5**
	b.	Derive Pocklington's integral equation in the MOM.	**10**	**L3**	**CO5**

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22LDE/LDN/LCS231

Second Semester M.Tech. Degree Examination, June/July 2023
Wireless Sensor Networks

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

			M	L	C
		Module – 1			
Q.1	**a.**	Explain WSN architecture and protocol stack.	**10**	**L2**	**CO1**
	b.	Explain military and home application in WSN.	**10**	**L2**	**CO1**
		OR			
Q.2	**a.**	Explain Wireless HART architecture and its components with neat diagram.	**10**	**L2**	**CO1**
	b.	Explain IEEE 802.15.4 and Zigbee protocol stack with neat diagram.	**10**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	Explain general hardware of sensor node with neat diagram.	**10**	**L2**	**CO2**
	b.	Explain the concept of fault tolerance and WSN topology.	**10**	**L2**	**CO2**
		OR			
Q.4	**a.**	Explain joint source-channel coding and correlation model and architecture.	**10**	**L2**	**CO2**
	b.	Explain IEEE 802.15.4 Topology structure: (i) Star (ii) Mesh (iii) Cluster tree	**10**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Explain challenges of MAC with respective to energy consumption.	**10**	**L2**	**CO3**
	b.	Explain S-MAC contention based medium access with neat diagram.	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	Explain the mechanism of CSMA.	**10**	**L2**	**CO3**
	b.	Explain Zebra MAC hybrid medium access with neat diagram.	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the various challenges for transport layer in WSN.	**10**	**L2**	**CO4**
	b.	Explain Source Coding (data compression) techniques.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain Central, distributed and hierarchical network management types with neat diagram.	**10**	**L2**	**CO4**
	b.	Explain Query Processing architecture with neat diagram.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain with a neat diagram, direct sequence spread spectrum techniques.	**10**	**L2**	**CO5**
	b.	Explain fast and slow frequency hopping.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain the generation of PN sequence with example and verify its properties.	**10**	**L2**	**CO5**
	b.	Define spread spectrum with neat diagram. Explain model of SS technique.	**10**	**L2**	**CO5**

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CBCS SCHEME

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22LDN241

Second Semester M.Tech. Degree Examination, June/July 2023
Multimedia Over Communication Links

Time: 3 hrs. Max. Marks: 100

Note: **1.** ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***M : Marks , L: Bloom's level , C: Course outcomes.***

		Module – 1	M	L	C
Q.1	a.	Describe briefly about the telephone network and network.	10	L1	CO3
	b.	Describe the interactive applications over internet.	10	L1	CO3
		OR			
Q.2	a.	Describe the interpersonal communication multimedia applications.	10	L1	CO3
	b.	Describe briefly about the broadcast television and ISDN network.	10	L2	CO3
		Module – 2			
Q.3	a.	Describe various types of texts with example for each.	10	L1	CO2
	b.	Define aspect ratio, compute the memory requirement to store single digital image for the vertical resolution 480 pixels and with i) 8 – bit/pixel ii) 24 – bit/pixel. Use aspect ratio 4:3	10	L4	CO2
		OR			
Q.4	a.	Describe the main features of DMS.	10	L1	CO2
	b.	Describe the functions of multimedia operating systems.	10	L3	CO2
		Module – 3			
Q.5	a.	Describe the architecture of general perceptual audio coding.	10	L1	CO2
	b.	Describe about the psychoacoustic fundamentals with principles of critical band frequency analysis and temporary making.	10	L2	CO2
		OR			
Q.6	a.	Describe about the optimum coding in the frequency domain.	10	L1	CO2
	b.	Describe about the audio subband coders.	10	L2	CO2
		Module – 4			
Q.7	a.	Describe the block diagram of ISO/IEC decoder and audio encoder.	10	L2	CO3

	b.	Describe MPEG – 2 systems hierarchy based on the different transport streams, and MPEG – 2 transport packet headers.	10	L3	CO3
		OR			
Q.8	a.	Describe the comparison between MPEG – 1 and MPEG and MPEG – 2 coding parameters.	10	L2	CO3
	b.	Describe MPEG – 4 version 1 six parts.	10	L3	CO3
		Module – 5			
Q.9	a.	Describe the concept of packet voice and also describe NTI reconstruction scheme.	10	L2	CO4
	b.	Describe the concept of bit rate control with diagram. Also describe various rate control techniques.	10	L3	CO4
		OR			
Q.10	a.	Describe the concept of multiplexing in ATM networks. Also describe frame based and cell based interleaving multiplexing.	10	L2	CO4
	b.	Draw the Video – streaming architecture across the internet and describe the function of server and client.	10	L3	CO4

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