

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

	<u>UNIT-I</u>	Marks	CO	Blooms Level
1. a	Derive the expression for the unit weight of soil mass in terms of its void ratio, specific gravity and degree of saturation.	5	1	Understand
b	A soil sample has a porosity of 40% .the specific gravity of solids 2.70, Calculate (a) Void ratio (b) Dry density (c) Unit weight if the soil is 50% saturated (d) Unit weight if the soil is completely saturated	5	1	Apply
	(OR)			
2. a	Describe the I.S. Classification of the fine grained soils.	5	1	Understand
b	Describe briefly the hydrometer analysis test.	5	1	Understand
	<u>UNIT-II</u>			
3. a	Derive the relationship to determine the coefficient of permeability using variable head test.	5	2	Understand
b	What are the principles of a flow net and mention its uses also explain the phenomenon of “Piping” in brief.	5	2	Understand
	(OR)			
4. a	Differentiate constant head permeability test and variable head permeability.	5	2	Understand
b	What are the characteristics of flow net and write the uses of it.	5	2	Understand
	<u>UNIT-III</u>			
5. a	Compute the total, effective and pore pressure at a depth of 15m below the bottom of a lake 6 m deep as shown in Figure 1. The bottom of the lake consists of soft clay with a thickness of more than 15 m. The saturated unit weight of the deposit is 17.67 kN/m^3 , the specific gravity of soils may be assumed to be 2.65 and assume unit weight of water as 9.81 kN/m^3	6	3	Apply

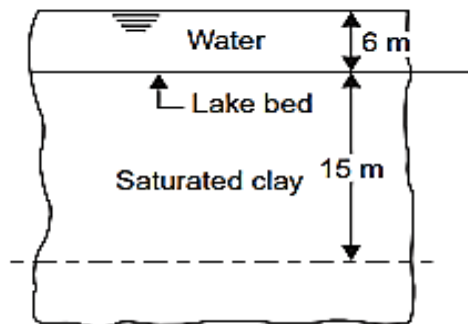


Figure 1

- b A 8 m thick layer of stiff saturated, clay ($\gamma = 19.0 \text{ kN/m}^3$) is underlain by a layer of sand. The sand is under an artesian pressure of 5m. Calculate the maximum depth of the cut that can be made without causing a heave.

(OR)

6. a Discuss the phenomena of quicksand condition with a neat sketch and derive an expression for critical hydraulic gradient. 4 3 Understand
- b A soil profile consists of a surface layer of clay 3m thick and a sand layer 2m thick overlaying an impermeable rock. The water table is at the ground surface. If the water level in a stand pipe driven in to the sand layer rises 2m above the ground surface. Draw the plot showing the variation of σ , u and σ' . 6 3 Apply

UNIT-IV

7. a How does compaction improve the engineering properties of soils? 5 4 Understand
- b Write the difference between compaction and consolidation process. 5 4 Understand

(OR)

8. a Explain square root time method to determine coefficient of consolidation. 5 4 Understand
- b A thick layer beneath a building is overlain by a permeable stratum and is underlain by an impervious rock. The coefficient of consolidation of the clay was found to be $0.025 \text{ cm}^2/\text{minute}$. The final expected settlement for the layer is 8cm. How much time will it take for 80% of the total settlement to take place? Determine the time required for a settlement of 2.5cm to occur. 5 4 Apply

UNIT-V

9. a Write brief note on the concept of pressure bulb. 5 5 Understand
- b A rectangular area 3m x 1.5m is uniformly loaded with load intensity of 125 kN/m^2 at the ground surface. Calculate the vertical pressure at a point 4.5m below one of its corners. 5 5 Apply

(OR)

10. a Draw the pressure distribution diagrams on a horizontal plane and vertical plane due to concentrated load using Boussinesq's theory. 5 5 Understand
- b A concentrated load of 30kN acts on the surface of a homogeneous soil mass of large extent. Find the stress intensity at a depth of 8m and directly under the load 5 5 Apply

UNIT-VI

11. a Explain the basic differences between a box shear test and triaxial test for soils. 4 6 Understand
- b A direct shear test was performed on a dry sandy soil. Normal and shear stress at failure are given below. Determine shear parameters of sand. 6 6 Apply

Normal stress (kN/m^2)	50	100	200
Shear stress (kN/m^2)	35	80	150

(OR)

12. a What is Mohr Circle? Discuss its important characteristics? 5 6 Understand
- b Explain briefly about direct shear test with neat sketch and also explain advantages and disadvantages. 5 6 Understand

OPERATING SYSTEMS**(Common TO CSE, CSE(AIML) & IT Branches)****Time: 3 Hours****Max Marks: 60**

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		Marks	CO	Blooms Level
	<u>UNIT-I</u>			
1.	Explain different types of operating systems (OR)	10	1	2
2.	Explain Scheduling Algorithms with examples?	10	1	2
	<u>UNIT-II</u>			
3.	Explain the Critical section problem with suitable example. Mention the requirements to be satisfied by a solution to the critical-section problem (OR)	10	2	2
4.	What is Monitor? Explain with any example using monitor?	10	2	2
	<u>UNIT-III</u>			
5.	Discuss the necessary conditions that cause deadlock situation to occur (OR)	10	3	3
6.	Explain the techniques used to prevent the deadlocks	10	3	3
	<u>UNIT-IV</u>			
7.	Discuss Swapping and Paging (OR)	10	4	2
8.	What is Thrashing? What is the cause of Thrashing? How does the system detect Thrashing? What can the system do to eliminate this problem?	10	4	2
	<u>UNIT-V</u>			
9.	Explain various file access methods (OR)	10	5	2
10.	Discuss free space management of file system	10	5	2
	<u>UNIT-VI</u>			
11.	Discuss Mass-storage structure (OR)	10	6	2
12.	Explain disk scheduling	10	6	2

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		<u>UNIT-I</u>	Marks	CO	BTL
1.	a.	Derive the expression for propagation constant of infinite transmission line.	5	CO1	3
	b.	A lossy transmission line has $R=3.5\Omega/m$, $L=2\mu H/m$, $C=120pF/m$, and $G=0$ at 400MHz, determine α , β , Z_0 .	5	CO1	2
(OR)					
2.	a.	What is loading? Explain different types of loading in transmission lines.	5	CO1	2
	b.	Draw the equivalent circuit, derive the transmission line equations for V and I, in terms of the source parameters.	5	CO1	3
<u>UNIT-II</u>					
3.	a.	Define the reflection coefficient and derive the expression for input impedance in terms of reflection coefficient.	5	CO2	2
	b.	What is Smith Chart? How it is used to find the impedance of transmission line.	5	CO2	3
(OR)					
4.	a.	Explain how single stub is used for matching with suitable diagram? Derive equations for its length and location.	5	CO1	3
	b.	Explain the principle of impedance matching with quarter wave transformer	5	CO1	3
<u>UNIT-III</u>					
5.		Derive an expression for electric field intensity due to a finite length line charge along the z-axis at an arbitrary point P(x, y, z).	10	CO3	3
(OR)					
6.		Using Gauss's law, derive the expressions for electric field intensity and electric flux density due to an infinite sheet of conductor of charge density ρ C/cm.	10	CO3	2
<u>UNIT-IV</u>					
7.		Derive an expression for magnetic field strength, H, due to a current carrying conductor of finite length placed along the y-axis, at a point in x-z plane and 'r' distant from the origin. Hence deduce expressions for H due to semi-infinite length of the conductor.	10	CO3	3
(OR)					
8.		Find the magnetic field strength, H at the center of a square conducting loop of side '2a' in z=0 plane if the loop is carrying a current, I, in anti-clockwise direction.	10	CO3	2
<u>UNIT-V</u>					
9.	a.	State and explain Maxwell's equation in point form for general time varying fields.	5	CO4	3
	b.	State and explain Faraday's law .	5	CO4	3
(OR)					
10.		Write Maxwell's equations in different final forms .	10	CO4	3
<u>UNIT-VI</u>					
11.	a.	Define Brewster angle? Obtain the expression for Brewster angle?	5	CO4	2
	b.	Define reflection and transmission coefficient for normal incidence and write the formulae for E?	5	CO5	3
(OR)					
12.	a.	Prove that E&H reflected waves are standing waves when uniform plane wave is incident normal to the free space and conductor boundary surface?	5	CO5	3
	b.	Explain the concept of Reflection of plane waves.	5	CO5	3

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			<u>UNIT-I</u>	Marks	CO	BTL
1.	a	Distinguish between Open loop control system and closed loop control system.		5	1	2
	b	State and explain the Mason's gain formula.		5	1	2
		(OR)				
2.	a	Explain the classification of control systems		5	1	2
	b	Explain the modelling of translational mechanical systems using force-voltage and force-current analogies.		5	1	2
		<u>UNIT-II</u>				
3.		Derive an expression for the transfer function of an armature-controlled DC servo motor.		10	2	2
		(OR)				
4.		List and explain Standard test signals.		10	2	2
		<u>UNIT-III</u>				
5.		Explain the construction rules for root locus technique.		10	3	3
		(OR)				
6.	a	Test the stability of the system with the following characteristic equation by Routh's test $s^6 + 2s^5 + 8s^4 + 20s^2 + 16s + 16 = 0$		5	3	3
	b	Apply Routh's test for the following characteristic to test the stability $s^4 + 4s^3 + 3s^2 + 3s + k = 0$. Find the range of 'k' for which the system to be stable.		5	3	3
		<u>UNIT-IV</u>				
7.	a	Explain any two frequency domain specifications.		5	4	3
	b	A unity feedback control system has an open loop transfer function given by $G(s)H(s) = 100/s(s+5)(s+2)$. Draw Nyquist diagram and determine stability.		5	4	3
		(OR)				
8.	a	Sketch the polar plot and discuss the stability of the system represented by $G(s)H(s) = k/s(s+1)(s+5)$.		5	4	3
	b	Given the open loop transfer function of a unity feedback system $G(s) = 1/s(s+3)(2s+1)$. Draw the Bode plot and measure from the plot the frequency at which the magnitude is 0 dB.		5	4	3
		<u>UNIT-V</u>				
9.		Derive the expression for the transfer function of a lag-lead compensator.		10	5	2
		(OR)				
10.		Explain the design procedure of lag compensator.		10	5	2
		<u>UNIT-VI</u>				
11.	a	Discuss the properties of state transition matrix.		5	6	2
	b	Obtain the state space representation of an n^{th} order differential equation.		5	6	2
		(OR)				
12.	a	Diagonalize the system matrix given below		5	6	2
		$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & -5 & -4 \end{bmatrix}$				
	b	Distinguish between Transfer function model and State Space model.		5	6	2

**STRENGTH OF MATERIALS
(MECHANICAL ENGINEERING)**

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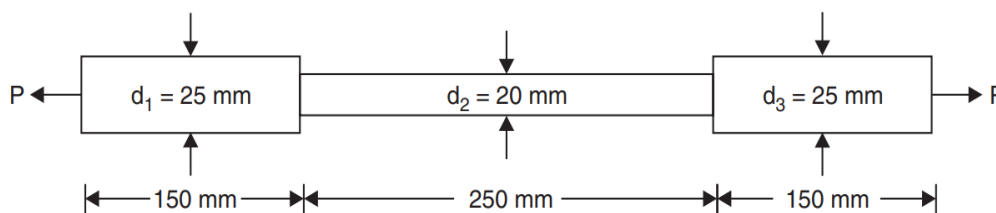
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UNIT-I

1. The bar shown in figure below is tested in universal testing machine. It is observed that at a load of 40 kN the total extension of the bar is 0.280 mm. Determine the Young's modulus of the material.

Marks	CO	BTL
10M	CO1	L3



(OR)

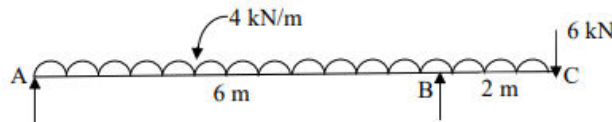
2. A bar of length 20 cm tapers uniformly from 40 mm dia. to 35mm dia. calculate the change in its length due to an axial pull of 100kN, if $E = 200\text{GPa}$. Derive the formula used in the calculations

10M	CO1	L2
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UNIT-II

3. An overhanging beam is shown in Figure. Draw the S.F and B.M diagrams

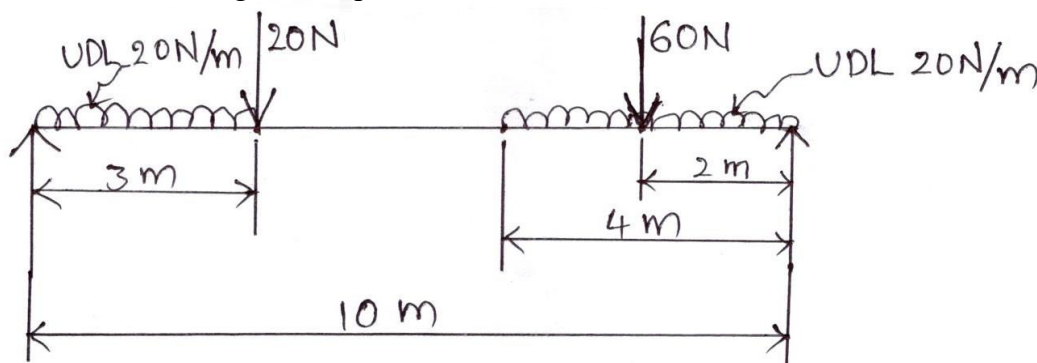
10M	CO2	L4
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(OR)

4. A simply supported beam AB of span 10 m carries a U.D.L. of 20 N per metre over 3 metres from L.H support and also over 4 m from the R.H. supports as shown in figure. It has also two point loads of 20 N and 60 N at 3 m and 8 m respectively from the L.H. support. Draw the B.M. and S.F. diagrams and calculate the B.M. at significant points.

10M	CO2	L4
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UNIT-III

5. Derive the equation for theory of simple bending and also write the assumptions 10M CO3 L3
(OR)
6. A T – section beam with 100 mm x 15 mm flange and 150 mm x 15 mm web is subjected to a shear force of 12kN at a section. Draw the variation of shear stress across the depth of the beam and obtain the value of maximum shear stress of the section 10M CO3 L4

UNIT-IV

7. What are the assumptions of torsion and derive the equation 10M CO4 L3
(OR)
8. A hollow cylindrical drum of 600 mm diameter and a wall thickness of 10mm. and is subjected to an internal pressure of 3MPa. $E = 2 \times 10^5$ MPa, $\mu = 0.3$ and length is 3m. Find (a) Circumferential stress (b) Longitudinal stress (c) Change in diameter (d) Change in Length. 10M CO4 L3

UNIT-V

9. Define column and discuss in detail about the different types of columns 10M CO5 L3
(OR)
10. Derive the crippling load when both columns are hinged. 10M CO5 L3

UNIT-VI

11. A simply supported beam of span 5 m, carrying a point load of 5 kN at a distance of 3 m from the left end. Find (i) slope at the left support, (ii) deflection under the load and (iii) maximum deflection. Take $E = 2 \times 10^5$ N/mm² and $I = 1 \times 10^8$ mm⁴. Use double integration method. 10M CO6 L4
- (OR)
12. What is moment area method? Explain the two Mohr's theorems, as applicable to the slope and deflection of a beam 10M CO6 L4