U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: IV**

Branch: Civil Engineering **Duration: 3 hrs.**

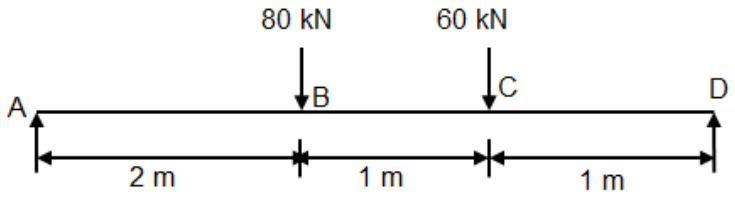
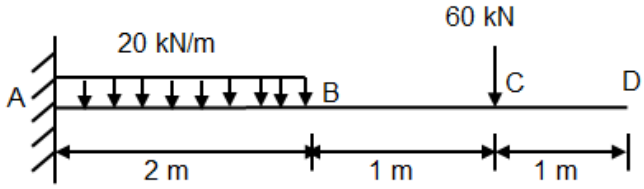
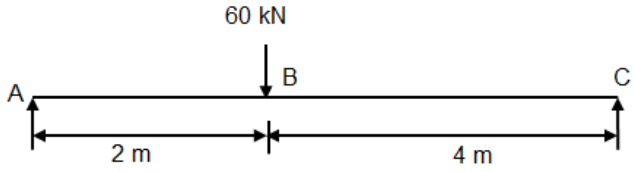
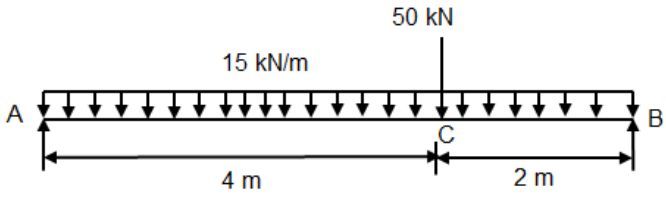
Course Code: 19CV4PCSTA **Max Marks: 100**

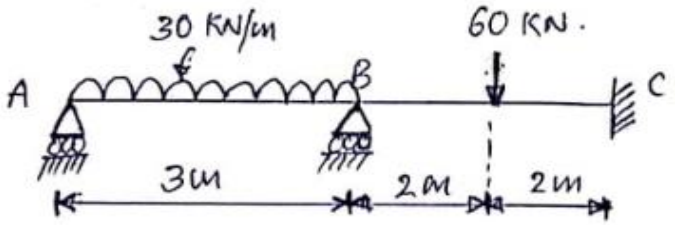
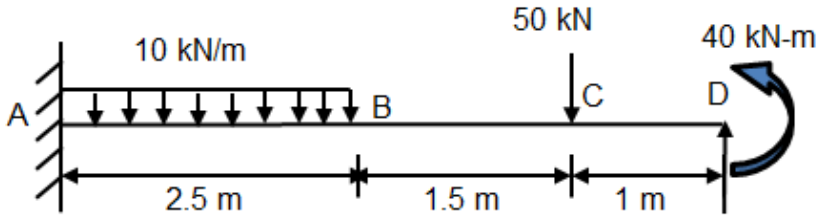
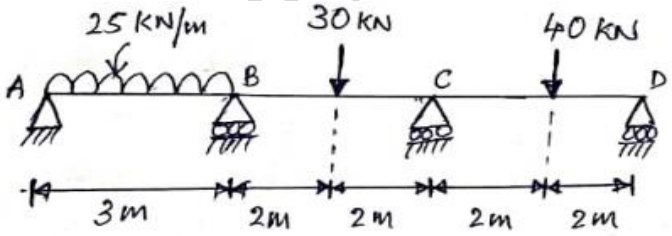
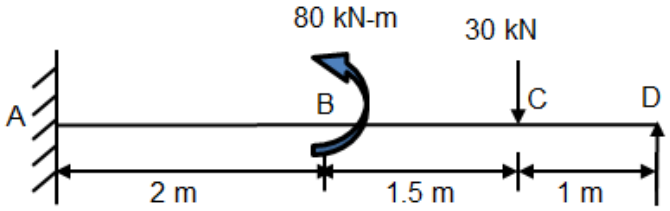
Course: Structural Analysis

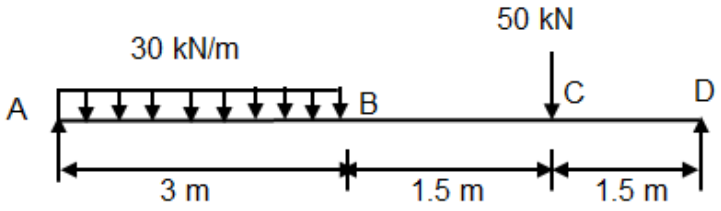
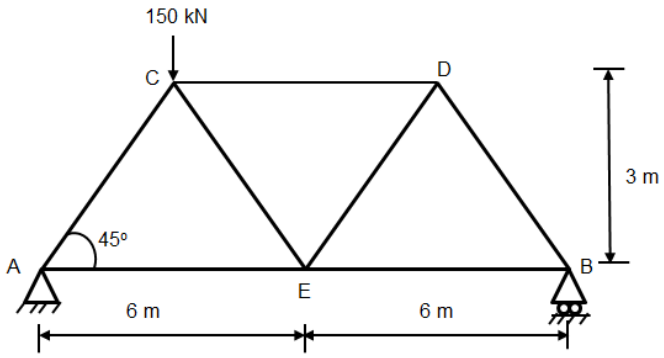
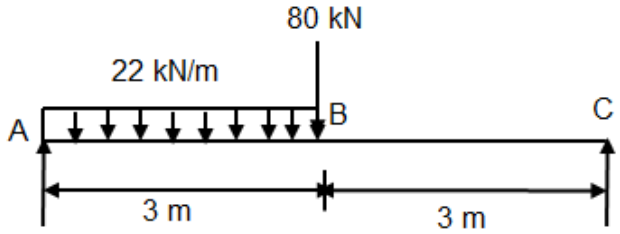
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

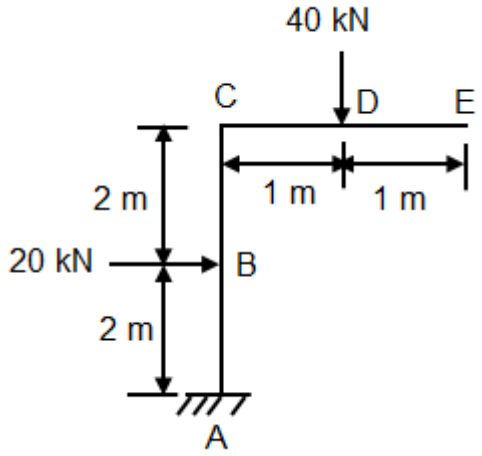
			UNIT - I	CO	PO	Marks
1	a)		Explain statically determinate and indeterminate structures with any two examples each.	CO 1	PO 1	**04**
	b)		A three hinged parabolic arch with supports at same level having a total span 30 m and a central rise of 4 m. The arch supports a point load of 40 kN at 8 m from left support and a uniformly distributed load of 20 kN/m over the right half of the span from crown point. Determine the moment, normal thrust and radial shear at a section 10 m from the left support.	CO 2	PO 2	**10**
	c)		Show that every point on the arch acts as an internal hinge (funicular shape) for a three hinged arch subjected to uniformly distributed load over its entire span.	CO 2	PO 2	**06**
			OR			
2	a)		A Three hinged parabolic arch having overall span of 60 m with supports at different levels is hinged at supports and at the crown point. The vertical distance between the left support and crown is 5 m and that of right support and crown is 3 m. The arch carries a u.d.l of 30 kN/m over the portion left of the crown and also a concentrated load of 30 kN at a distance of 10 m from the right support. Determine the horizontal thrust, normal thrust, radial shear and bending moment at a section 15 m from the left support.	CO 2	PO 2	**10**
	b)		A light cable is supported at two points 30 m apart which are at the same level. The cable supports three concentrated loads 60 kN, 40 kN and 30 kN at distances 10 m, 15 m and 20 m respectively from the left support. The deflection under the first point load (60 kN) is found to be 0.9 m. Determine the tension in the different segments and also the length of the cable.	CO 2	PO 2	**10**

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - II			
	3	a)	Determine the deflection at point 'C' and slope at point 'A' for the simply supported beam as shown in the Fig. Q3(a) below using Macaulay's double integration method. Take EI Constant.  **Fig Q3(a)**	*CO 2*	*PO 2*	**10**
		b)	Determine the slope and deflection at the free end for the cantilever beam as shown in the Fig. Q3(b) below using conjugate beam method. Take EI Constant.  **Fig Q3(b)**	*CO 2*	*PO 2*	**10**
			OR			
	4	a)	Determine the deflection at the point 'B' and slope at support 'A' for the simply supported beam as shown in the Fig. Q4(a) below using moment area method. Take EI Constant.  **Fig. Q4(a)**	*CO 2*	*PO 2*	**10**
		b)	Determine the deflection at point 'C' and slope at point 'A' for the simply supported beam as shown in the Fig. Q4(b) below using conjugate beam method. Take EI Constant.  **Fig. Q4(b)**	*CO 2*	*PO 2*	**10**

			UNIT - III			
	5	a)	Analyse the continuous beam as shown in Fig.Q5(a) below using theorem of three moments. Take EI constant. Draw BMD.  **Fig.Q5(a)**	*CO 2*	*PO 2*	**12**
		b)	Analyse the propped cantilever beam as shown in the Fig Q5(b) using consistent deformation method. Draw BMD. Take EI constant.  **Fig Q5(b)**	*CO 2*	*PO 2*	**08**
			OR			
	6	a)	Analyse the continuous beam as shown in Fig Q6(a) below using theorem of three moments. Take EI constant. Draw BMD.  **Fig Q6(a)**	*CO 2*	*PO 2*	**12**
		b)	Analyse the propped cantilever beam as shown in the Fig Q6(b) using consistent deformation method. Draw BMD. Take EI constant.  **Fig Q6(b)**	*CO 2*	*PO 2*	**08**
			UNIT - IV			
	7	a)	Derive an expression for strain energy due to bending.	*CO 3*	*PO 2*	**10**

		b)	Determine the deflection at point 'B' for the simply supported beam as shown in the Fig Q7(b) below using Castiglianos method. Take EI Constant.  **Fig Q7(b)**	*CO 3*	*PO 2*	**10**
			OR			
	8	a)	State and prove Maxwell theorem of reciprocal deflection.	*CO 3*	*PO 2*	**10**
		b)	Determine the maximum deflection in a simply supported beam of span 'L' meters carrying a uniformly distributed load of 'W' kN/m over the entire span. Use Castiglianos theorem. Take EI constant.	*CO 3*	*PO 2*	**10**
			UNIT - V			
	9	a)	Determine the horizontal and vertical deflection of joint 'E' of the truss as shown in the Fig Q9(a) below using unit load method. Take cross sectional areas of all the members as 800 mm^2. Modulus of elasticity, E = $2x10^5$ MPa  **Fig Q9(a)**	*CO 3*	*PO 2*	**20**
			OR			
	10	a)	Determine the deflection at point 'B' for the simply supported beam as shown in the Fig Q10(a) below using unit load method. Take EI Constant.  **Fig Q10(a)**	*CO 3*	*PO 2*	**10**

		b)	Determine the vertical deflection at 'E' of the cantilever frame as shown in Fig Q10(b) below. Take EI constant.  **Fig Q10(b)**	*CO 3*	*PO 2*	**10**

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