U.S.N.										

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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

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

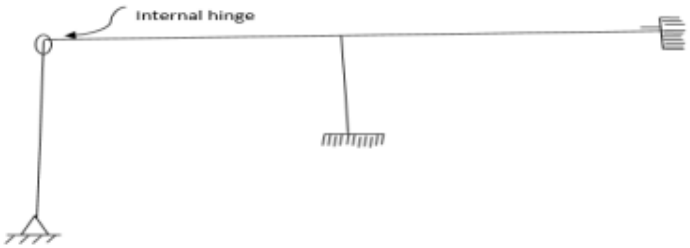
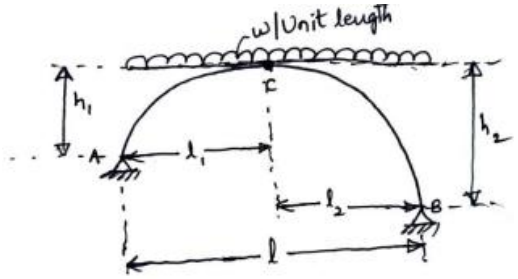
Branch: Civil Engineering **Duration: 3 hrs.**

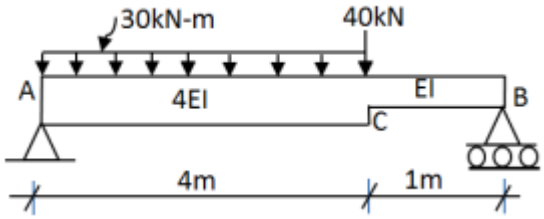
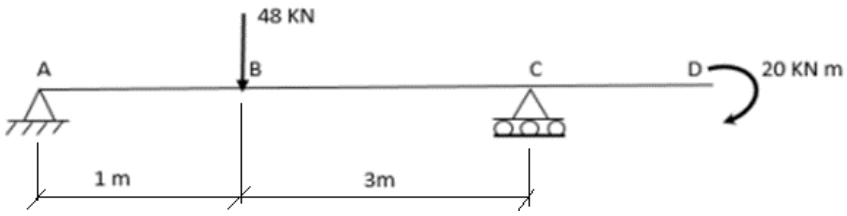
Course Code: 19CV4PCSTA **Max Marks: 100**

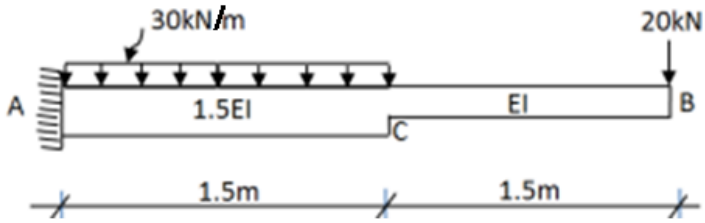
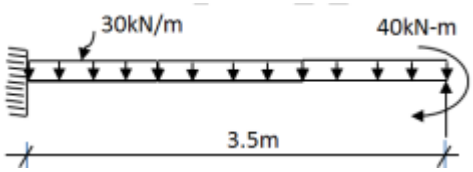
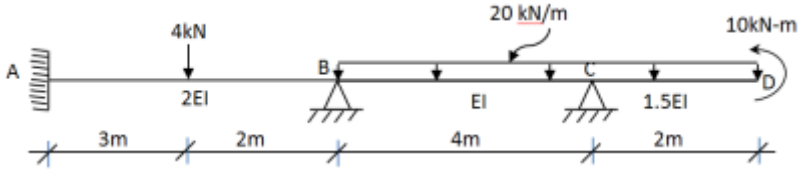
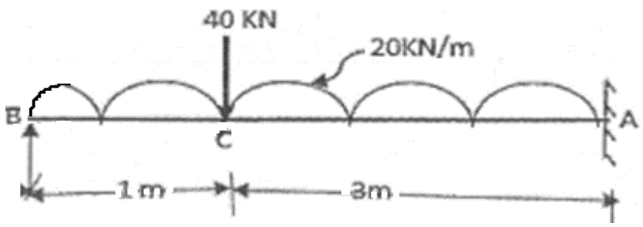
Course: STRUCTURAL ANALYSIS

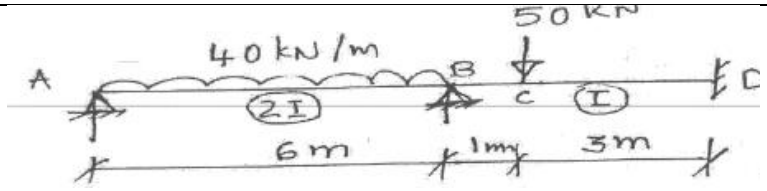
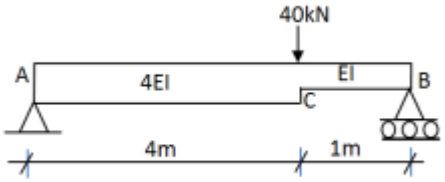
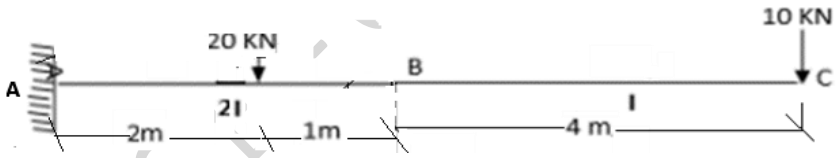
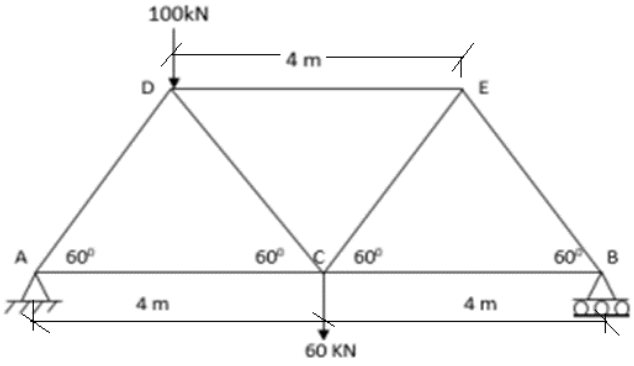
Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

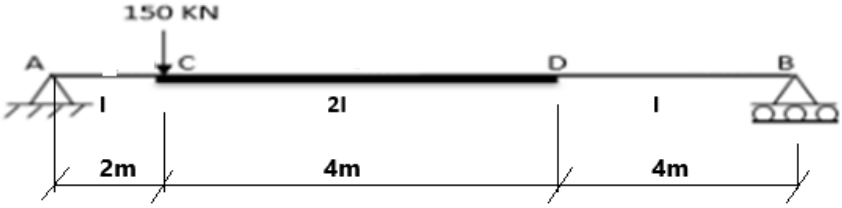
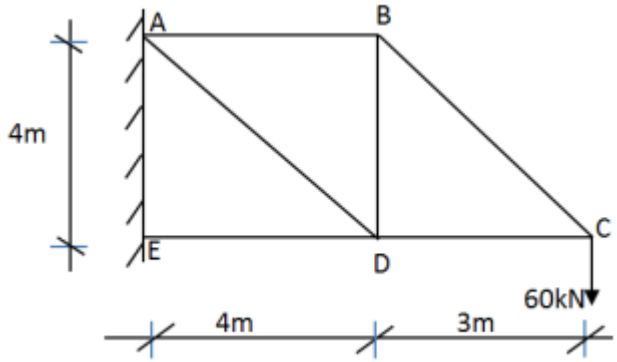
Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Explain statically determinate and statically indeterminate structures with examples	*CO1*	*PO 1*	**06**
	b)	Determine the static and kinematic indeterminacies of structures shown in fig.1&2 below.  Fig-1  Fig-2	*CO1*	*PO1, 2*	**08**
	c)	A three hinged parabolic arch of span 'l' has its abutments at depths h1 and h2 below the crown. The arch carries uniformly distributed load of w per unit length over the whole span. Determine the horizontal thrust, at each support. (Ref Fig-3).  Fig-3	*CO1*	*PO1, 2*	**06**

			OR			
	2	a)	A cable is supported from two points A and B which are 80 m apart. B is 6 m below A, the lowest point on the cable is 10 m below B. The cable supports a udl of intensity 24 kN/m over the entire span. Calculate maximum tension in the cable. If the cable passes over a roller on the top of pier at the end A and anchored, find the forces transmitted to the pier. Assume anchor cable makes 32^0 with horizontal.	*CO2*	*PO1, 2*	**08**
		b)	A three hinged parabolic arch of span 40 m and central rise 10 m, carries an udl of 30 kN/m over the left quarter span. Besides two vertical point loads of 20 kN each act at distances of 20 m and 30 m from left support. Find the reactions, normal thrust, radial shear and bending moment at 8 m from left support.	*CO2*	*PO1, 2*	**12**
			UNIT - II			
	3	a)	A simply supported beam of span 10 m carries a point load of 20 kN at 4m from left support and a point load of 40 kN at 3m from right support. Find the deflection under the 40 kN load using Macaulay's method. Assume EI is constant.	*CO2*	*PO1, 2*	**10**
		b)	Determine the slope and deflection at point 'C' for the beam shown in fig 4 below using conjugate beam method. Take E=200 GPa, $I=1.2x10^8$ mm ^{4}  Fig-4	*CO2*	*PO1, 2*	**10**
			OR			
	4	a)	Calculate the deflection at B and D for the beam shown in Fig 5 by Macaulay's method. Assume EI is constant. Assume CD as 1m.  Fig-5	*CO2*	*PO1, 2*	**10**
		b)	Find the maximum deflection and maximum slope for the beam shown in Fig 6 using moment area method. Take E=200 GPa, $I=1.2x10^8$ mm^4	*CO2*	*PO1, 2*	**10**

			 Fig-6			
			UNIT - III			
5	a)	Analyze the propped cantilever shown in fig 7 below for the reactions by consistent deformation method  Fig-7	*CO2*	*PO1, 2*	**08**
	b)	Using the theorem of three moments analyze the continuous beam shown in fig-8 below. Take E=200 KN/mm^2, I=1.8 x 10^8 mm^4. Draw BMD and elastic curve.  Fig-8	*CO2*	*PO1, 2*	**12**
			OR			
6	a)	In propped cantilever beam shown in fig 9 support B yields by 2mm during loading. Analyze the beam using consistent deformation method to find the support reaction. Assume EI=4*10^4 kN-m^2  Fig-9	*CO2*	*PO1, 2*	**08**
	b)	Analyze the continuous beam shown in fig 10 using Clapeyron's theorem of three moments. The support at A sink by 2mm and B sinks by 3mm. Take E=200GPa, I =*2*10^8*. Sketch the BMD and SFD.	*CO2*	*PO1, 2*	**12**

			 Fig-10			
			UNIT - IV			
	7	a)	State and explain Castigliano's first theorem.	*CO3*	*PO1*	**05**
		b)	A non-prismatic simply supported beam ACB is loaded as shown in fig 11 below. Determine deflection below the load by using strain energy method. Take I = 5000 cm^4, E = 2 x 10^5 N/mm^2.  Fig-11	*CO3*	*PO1, 2*	**15**
			OR			
	8	a)	Derive the expression for strain energy due to bending.	*CO3*	*PO1*	**05**
		b)	Determine the displacement at the point C of the rigid frame shown in fig 12 using Castigliano's first theorem. Take EI=10*10^3 kN-m^2  Fig-12	*CO3*	*PO1, 2*	**15**
			UNIT - V			
	9	a)	Determine the vertical displacement at the point C of the pin jointed frame shown in figure Fig13 using unit load method. Take E=200 GPa , Take area of tension members as 8 cm^2 and area of compression members as 5 cm^2  Fig-13	*CO3*	*PO1, 2*	**10**

		b)	A simply supported beam of span 6 m carries an udl of 8 kN/m over entire span along with a point load of 12 kN acting at 2m from the left end. Determine the deflection at a point located 3/4th span from left end, using unit load method. Assume EI is constant.	*CO3*	*PO1, 2*	**10**
			OR			
	10	a)	Determine the deflection at D for the beam shown in Fig 14 using unit load method.  Fig-14	*CO3*	*PO1, 2*	**10**
		b)	Determine the vertical deflection at the point C in the truss shown in fig 15 below using unit load method. The cross-sectional area of members AD & DE are 1500 mm^2 while those of other members are 1000 mm^2. Take E = 200 kN/mm^2.  Fig15	*CO3*	*PO1, 2*	**10**

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