U.S.N.										

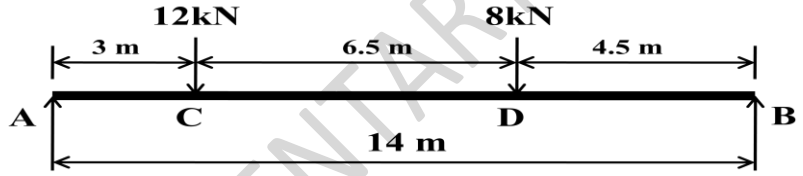
B.M.S. College of Engineering, Bengaluru-560019

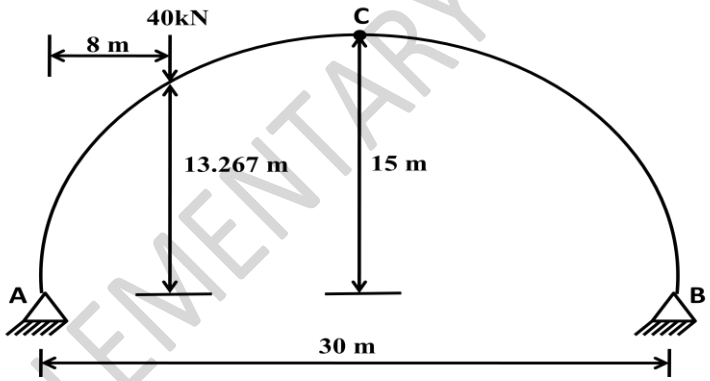
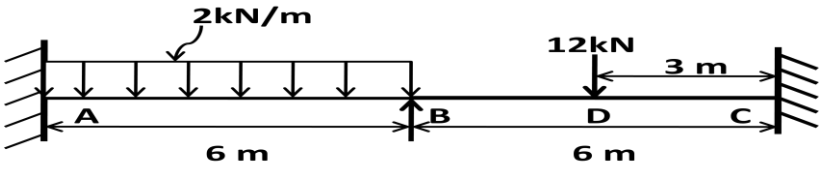
Autonomous Institute Affiliated to VTU

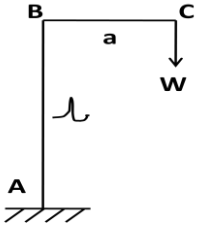
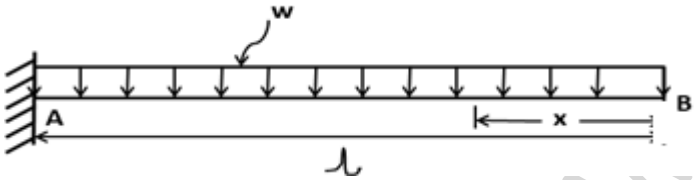
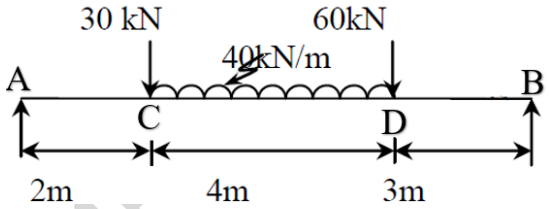
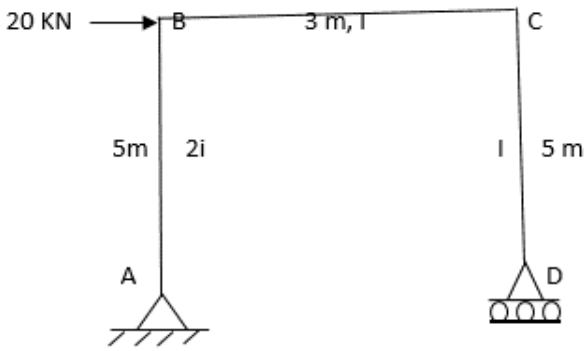
October 2024 Supplementary Examinations

Programme: B.E. **Semester: IV**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 23CV4PCSTA **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.

			CO	PO	Marks
		UNIT – I			
1	a)	Explain static and kinematic indeterminacies with examples	*CO*1	*PO1*	**6**
	b)	A horizontal steel girder of 14 m long having uniform cross-section is simply supported at its ends. It carries two concentrated loads as shown in figure. Calculate the deflections of the beam under the loads C and D using Macaulay's method. Take E=200 GPa and moment of inertia I = 160 X 10^6 mm^4. 	*CO*1	*PO1*	**14**
		UNIT – II			
2	a)	A cantilever beam of span 2.4 m carries a point load of 15 kN at a distance of 1.8 m from the fixed end. What are the values of slope and deflection at the free end of the cantilever by using moment area method, if the flexural rigidity of the beam section is 9 X 10^{12} N-mm^2.	*CO*1	*PO1*	**10**
	b)	A simply supported beam AB of span 4m, carrying a load of 100kN at its mid span C has cross-sectional moment of inertia 24 X 10^6 mm^4, over the left half of the span and 48 X 10^6 mm^4 over the right half. Find the slopes at the two supports and deflection under the load using Conjugate beam method. Take E = 200GPa.	*CO*1	*PO1*	**10**
		OR			

	3	a)	A simply supported beam AB of 2.8 m span carries a point load of 60 kN at a distance 1m from the left hand support A. What is the position of maximum deflection of the beam? Also find the magnitude of the deflection under the load by using moment area method. Take EI for the beam section as 4 $X10^{12}$ N-mm^2 .	*CO* 1	*PO1*	**10**
		b)	A cantilever beam AB having fixed support at A and with a span of "L" is carrying a point load "W" at B. The moment of inertia for the left half is "2I", whereas that for the right half is "I". Find the slope and deflection at B in terms of EI, W and L, by using Conjugate beam method.	*CO* 1	*PO1*	**10**
			UNIT - III			
	4	a)	A suspension cable 140 m span and 14 m central dip carries a load of 1kN/m over entire span. calculate the maximum and minimum tension in the cable. Find the horizontal and vertical forces in pier if the cable passes over a frictionless rollers on top of the piers. Assume the anchor cable makes an angle of 30^o with respect to the horizontal.	*CO* 1	*PO1*	**10**
		b)	A three-hinged parabolic arch of uniform cross section is loaded as shown in Fig. Calculate the location and magnitude of maximum bending moment in the arch.  	*CO* 1	*PO1*	**10**
			UNIT – IV			
	5	a)	Analyze the continuous beam shown in figure using Clapeyron's theorem of three moments. Take EI constant.  	*CO* 1	*PO1*	**14**
		b)	A cantilever beam of 4 m span is subjected to an udl of 10 kN/m over the entire span and a point load of 30 kN at the free end. The free end is propped. Analyze the beam using Consistent Deformation method.	*CO* 1	*PO1*	**06**

			UNIT – V			
	6	a)	A rigid cantilever frame shown in figure carries a load W at the free end. Assuming a constant value of EI, determine the vertical displacement of the free end C. Use strain energy method. 	*CO 2*	*PO1*	**10**
		b)	Determine deflection and slope at the free end of a cantilever with uniformly distributed load on the whole span. Use Castigliano's theorem. 	*CO 2*	*PO1*	**10**
			OR			
	7	a)	Determine the deflection at the point 'D' of the beam as shown below by Castigliano's theorem. Take EI constant. 	*CO 2*	*PO1*	**10**
		b)	Determine the horizontal displacement at 'D' of the rigid frame shown in figure below using Unit load method. 	*CO 2*	*PO1*	**10**

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