

Name:

Enrolment No:



**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**  
**Online End Semester Examination, December 2020**

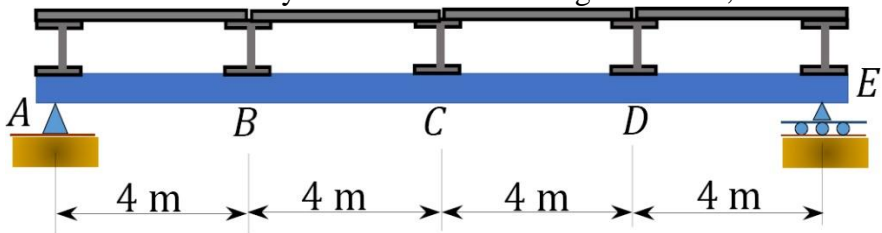
**Course: Mechanics of Material**  
**Program: B. Tech (Civil Engineering)**  
**Course Code: MECH3025**

**Semester: V**  
**Time 03 hrs.**  
**Max. Marks: 100**

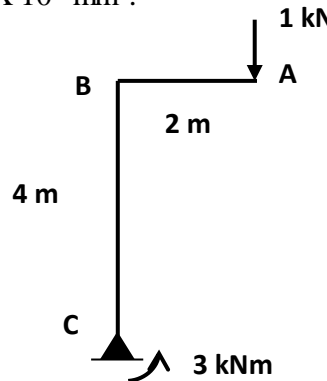
**Instructions: Please write every equation as required and then solve the numerical. Draw relevant labelled figures and each steps followed to arrive at the solution. Please do not forget the units for your answers.**

**SECTION A**

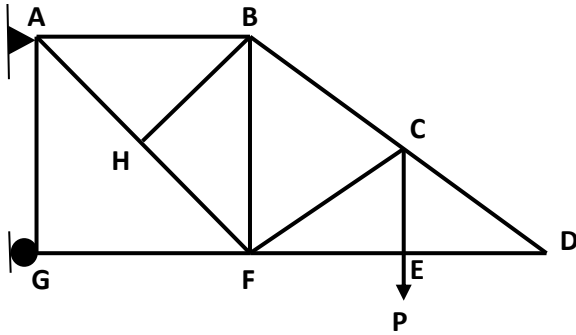
Sr. No.		Marks	CO
Q 1	Kindly type your choice from True or False for the following questions; (i) Shear force is the first derivative of bending moment (ii) The maximum slope of a symmetrically loaded simple beam occurs at the mid-span section (iii) For a section with one axis of symmetry, the shear center does not coincide with the centroid, but lies on the axis of symmetry (iv) Knowledge of deflections helps in solving statically indeterminate structures (v) Macaulay's approach of determining deflections of beams is a modification of the moment area method	05	CO1
Q 2	Fill in the Blanks; (i) A truss that can be analyzed fully by using only the laws of static equilibrium is called _____. (ii) If a structure has both external (reactions) and internal (member forces) indeterminacies, the total of these is the _____ of indeterminacy. (iii) Degree of kinematic indeterminacy = Number of degree of freedom x Number of _____ - Number of restraints against displacement giving rise to reaction components. (x is sign for multiplication) (iv) The degree of indeterminacy of the frame given is _____. (Fill in the number you computed as answer)	05	CO2

	(v) A propped cantilever with purely vertical loading is externally indeterminate to the _____ degree (Ex: first, second, third or fourth degree)		
Q 3	List the five methods that can be used to compute the slope and deflection of a beam.	05	CO1
Q 4	State Castigliano's first and second theorem and their use from the perspective of structural analysis.	05	CO3
Q 5	Kindly type your choice from True or False for the following questions; (i) The influence line diagram for the maximum bending moment for a simply supported beam is parabolic. (ii) Influence lines are useful to study the effect of moving loads on a structure (iii) Influence lines are used to calculate the value of stress function for the critical load condition (iv) Influence lines are used to find the position of live load for a maximum value for a specific stress function (v) Influence lines are used for beams, arches and trusses	05	CO4
Q 6	Using influence lines for the system shown in the diagram below;  (i) The value for reaction at A for distance of 4 m from A is _____ kN. (ii) The value for reaction at A for distance of 12 m from A is _____ kN.	05	CO4

**SECTION B**

Q 7	Determine the deflection at point A for the frame illustrated below. Consider $E = 200 \text{ kN/mm}^2$ and $I = 30 \times 10^6 \text{ mm}^4$ . 	10	CO1
Q 8	Determine the deflection at point C of the beam illustrated below using the moment area method. Consider $E = 200 \text{ GPa}$ and $I = 250 \times 10^{-6} \text{ m}^4$	10	CO1

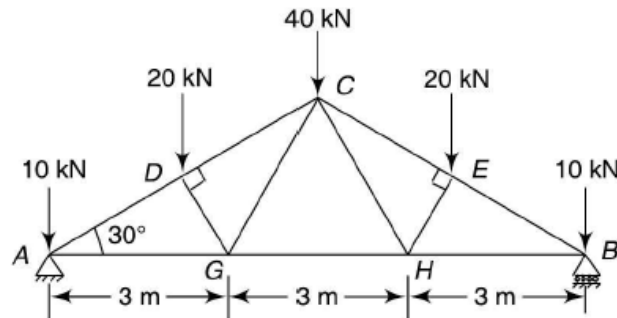
Q 9	Analyze the continuous beam illustrated below using moment-area method and draw the SFD and BMD.	10	CO3
Q 10	Analyze the beam illustrated below, and consider $EI$ as constant and no axial loading effects. Total span length is 20 m, and the udl acts on 10 m.	10	CO3
Q 11	An overhanging beam is illustrated below. Analyze and draw the influence line diagram @ Point B and Point C considering section n-n.	10	CO4
	<p style="text-align: center;"><b>SECTION-C</b></p>		
Q 12	Analyze the truss illustrated below using method of joints to indicate all the zero force members.	20	CO2



OR

Q 12

Determine the forces in all the members of the truss illustrated below using the method of sections.



20

CO2