Name: Enrolment No:	UPES UNIVERSITY OF TOMORROW

UPES, Dehradun

End Semester Examination, December 2023

Programme Name: B Tech Civil Engineering
Semester : V
Course Name : Structural Engineering **Time : 3 hrs**
Course Code : CIVL 3059 **Max. Marks: 100**
Nos. of page(s) : 3

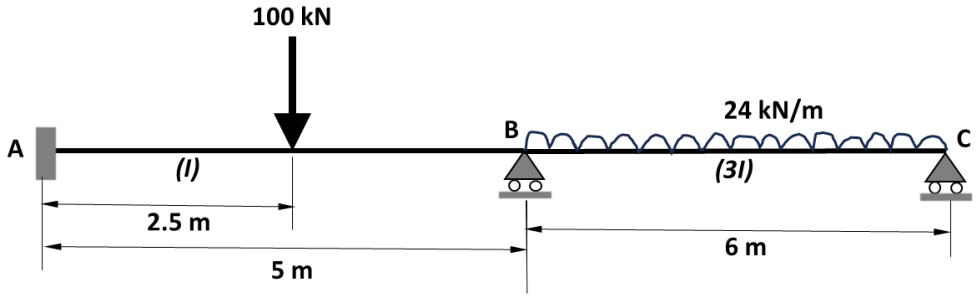
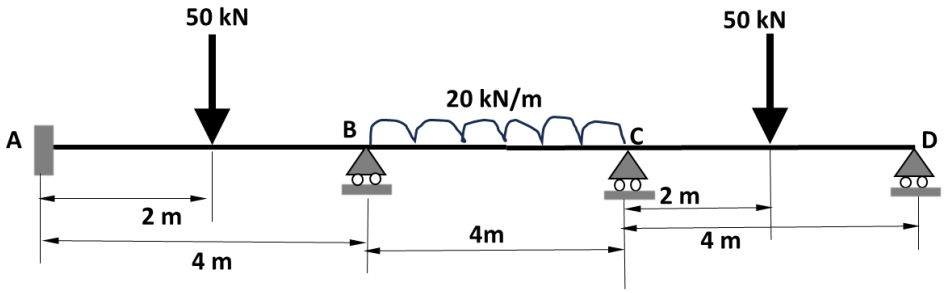
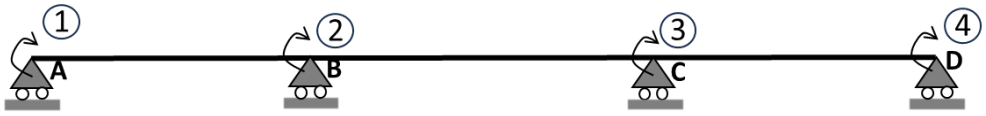
Instructions: Any missing data may be suitable assumed.

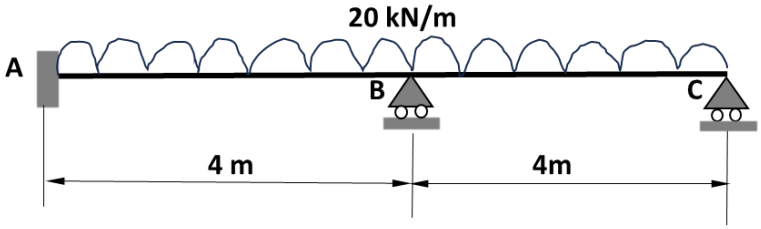
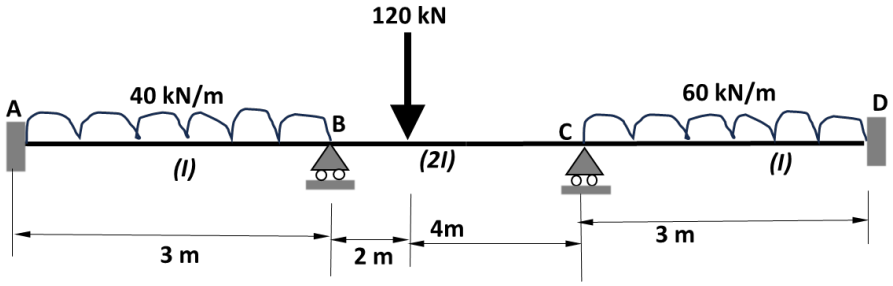
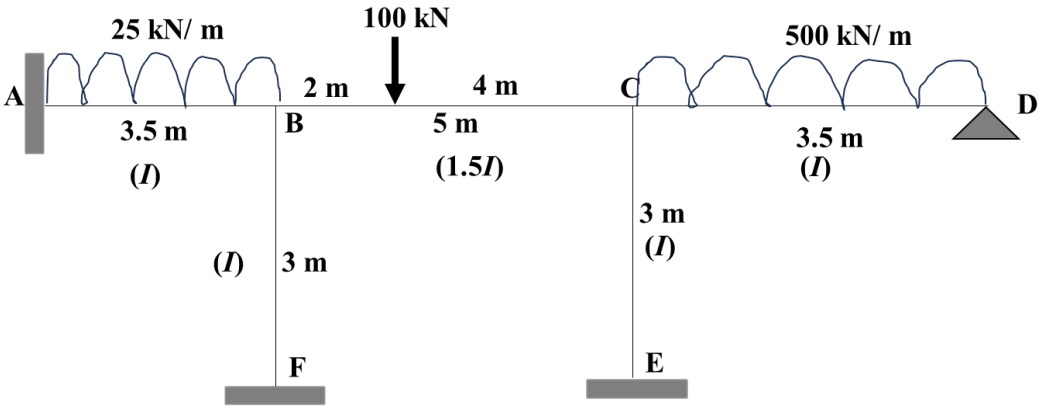
SECTION A

S. No.		Marks	CO
Q 1	What is the degree of static and kinematic indeterminacy? What will be the degree of static and kinematic indeterminacy for a simply supported and a fixed beam?	2+2	CO1
Q 2	Write down the properties of a flexibility matrix.	4	CO3
Q 3	Define shape factor and derive shape factor for a circular section of diameter 'D'.	1+3	CO4
Q 4	Discuss flexibility and stiffness. How can you find out 'j^{th}' column of a flexibility and stiffness matrix?	2+2	CO3
Q 5	What is the distribution factor and rotation factor? Find out rotation factor for all the members shown in the below figure.	2+2	CO2

SECTION B

Q 6	Derive shape factor for a symmetric I-section. Calculate the shape factor for a symmetric I-section having flange width of 100 mm, flange thickness of 10 mm, web thickness of 6 mm and overall depth of 250 mm. If the yield stress is 250 MPa, find out the plastic moment capacity of the section.	10	CO4
Q 7	Use slope-deflection method to analyze the beam shown below.	10	CO2

			
Q 8	Analyze the continuous beam shown below using rotation contribution method.  ***(EI is constant throughout)***	**10**	**CO2**
Q 9	With respect to the coordinates for the beams shown below, develop the flexibility matrix.  OR With respect to the coordinates for the beams shown below, develop the stiffness matrix. 	**10**	**CO3**
SECTION-C			

Q 10	Outline the steps involved in analyzing an indeterminate structure using the force method (flexibility matrix method) and displacement method (stiffness matrix method). For the beam shown in the figure below, find out the support reactions using flexibility matrix method. E and I for the beam are 2×10^5 N/mm^2 and 2.5×10^7 mm^4 respectively.  OR Using slope-deflection method, analyze the continuous beam shown in the figure below, if support C sinks by 10 mm.  **(E = 2 x 10^5 N/mm^2; I = 4 x 10^7 mm^4)**	**20**	**CO3**
Q 11	Use the moment distribution method to analyze the portal frame shown below.  	**20**	**CO2**