Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2023

Subject Code:2150608 Date:02-12-2023

Subject Name:Structural Analysis-II

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Explain the characteristics of flexibility matrices.	**03**
	(b)	State and explain Castigliano's first theorem.	**04**
	(c)	Find the deflection under the 60 kN load for the beam shown in **figure.1** by Castigliano's first theorem. Assume E = 200 GPa, I = 24 x 10^6 mm^4.	**07**
Q.2	**(a)**	Draw qualitative ILD for support reactions of two equal spans continuous beam with all simple supports.	**03**
	(b)	Write and explain Muller Breslau's principal.	**04**
	(c)	A propped cantilever beam is having 10 m span. Draw ILD for shear force at section 4 m from the fixed end.	**07**
		OR	
	(c)	Draw ILD of top chord and bottom chord member for a warren truss shown in **figure 2**.	**07**
Q.3	**(a)**	Define: (1) Carry over moment. (2) Absolute maximum bending moment (3) Distribution factor.	**03**
	(b)	A two span simple support continuous beam ABC having AB=5 m and BC = 6m. The span AB is loaded by a point load at centre by 30kN and span BC is loaded by a UDL of 40 kN/m over entire span. Analyze the beam by moment distribution method and draw BMD.	**04**
	(c)	Analyze the beam shown in **figure 3** by slope deflection method and draw bending moment diagrams.	**07**
		OR	
Q.3	**(a)**	Define: Sway. What are the causes for Sway in portal frames?	**03**
	(b)	Define and explain distribution factor with example.	**04**
	(c)	Draw the bending moment diagram for the beam as shown in **figure 4**. When support B sinks by 10 mm. Assume E = 200 GPa, I = 132 x 10^6 mm^4 for all the members. Using moment distribution method.	**07**
Q.4	**(a)**	Generate the stiffness matrix for a prismatic cantilever with coordinates as shown in **figure 5**.	**03**
	(b)	Differentiate: Stiffness method and Flexibility method.	**04**
	(c)	Find the matrices: [AD], [ADL], [S] and [D] with usual notations for the beam shown in **figure 6**, using Stiffness method.	**07**
		OR	
Q.4	**(a)**	Write assumptions made in slope deflection method.	**03**
	(b)	Define Stiffness. Derive relation between stiffness and flexibility.	**04**
	(c)	Analyze the beam ABC using Stiffness method fixed at A and rollers at B and C. EI of span AB and BC are EI and 3EI respectively. Span AB caring uniformly distributed load of 10 kN/m and span BC caring concentrated load of 16 kN at center. Span AB = BC = 10m.	**07**

Q.5	**(a)**	For two span continuous beam having span AB = 3m and BC = 4m, draw qualitative ILD for support reactions.	**03**
	(b)	Write slope deflection equation for the beam shown in **figure 4**. When support B sinks by 10 mm.	**04**
	(c)	Find the matrices: [DQ], [DQL], [F] and [Q] with usual notations for the beam shown in **figure 6**. Use Flexibility method assuming M_A and M_B as redundant.	**07**

OR

Q.5	**(a)**	State Castigliano's second theorem and its usefulness in analysis of structure.	**03**
	(b)	A simply supported beam AB has span 8 m. Draw ILD for R_A, R_B, Vx, Mx for section X at 3 m from left hand support.	**04**
	(c)	Determine support reactions for propped cantilever beam AB of span 4m. It carries point load of 16 kN at 3m from left support.	**07**

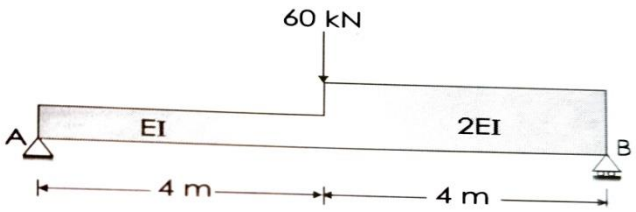

Fig. 1

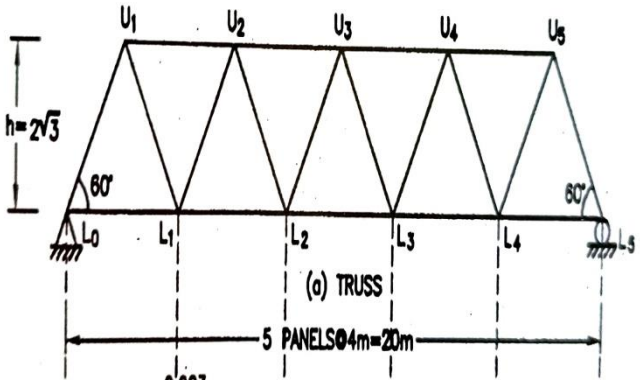

Fig 2.

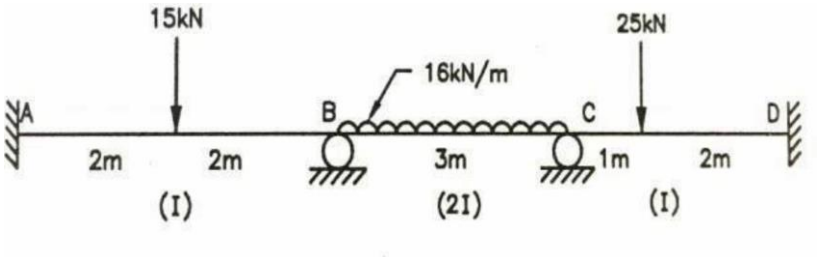

Fig. 3

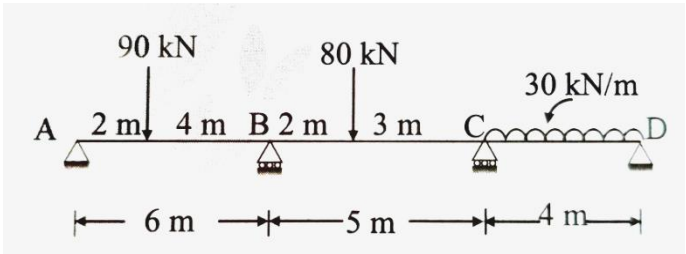

Fig. 4

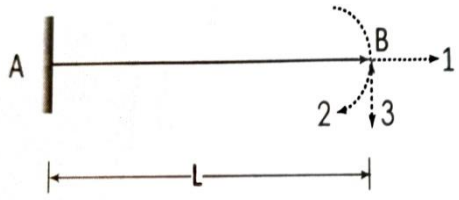

Fig. 5

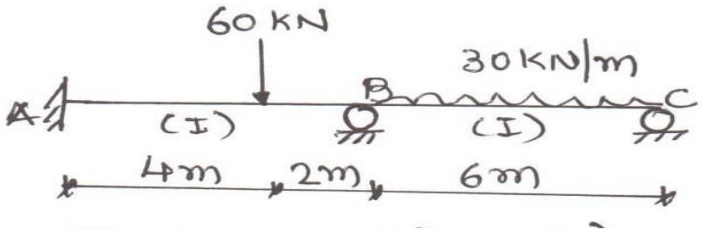

Fig. 6