Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–IV EXAMINATION – WINTER 2025

Subject Code:3140603 Date:15-11-2025

Subject Name:Structural Analysis-I

Time:02:30 PM TO 05:00 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)**	Define statically determinate and indeterminate structures.	**03**
	(b)	State and explain principle of superposition.	**04**
	(c)	Draw shear force, bending moment and Axial Force diagram for the rigid frame as sown in Figure 1.	**07**
Q.2	**(a)**	Define resilience, proof resilience and modulus of resilience.	**03**
	(b)	Explain gradual load, sudden load and load applied with impact.	**04**
	(c)	It is found that 36 mm in diameter stretches 2.1 mm under a gradual load of 120 KN. If a weight of 1500 N is dropped on to a collar at the lower end of this bar, through a height of 60 mm before commencing to stretch the bar, calculate the maximum instantaneous stress and elongation produced in the bar.	**07**
		OR	
	(c)	A simply supported beam AB of span 5m carries a uniformly distributed load of 5kN/m over its span. Determine the strain energy stored due to bending in the beam. Take E=200 GPa, I = 200cm^4.	**07**
Q.3	**(a)**	Derive the relation between slope, Deflection and Radius of Curvature.	**03**
	(b)	Differentiate Conjugate beam and real beam.	**04**
	(c)	A simply Supported beam of span 10 m is loaded as shown in Figure 2 determine the position and maximum deflection, Take E = 200 GPa, I = 6.95 x 10^8 mm^4	**07**
		OR	
Q.3	**(a)**	State advantages of fixed beam over simply supported beam	**03**
	(b)	Explain Moment -area theorem 1 and 2	**04**
	(c)	Determine maximum slope and deflection for a beam By moment area method show Figure 3. Take E = 200 GPa, I = 2 x 10^8 mm^4	**07**
Q.4	**(a)**	Define and explain: Kernel of Hollow circular section.	**03**
	(b)	A rectangular column of size 30 cm x 50 cm is acted upon by compressive force of 9000 kN at an eccentricity of ‘é’ cm from C.G. on axis parallel to 50 cm side. Find the eccentricity. If maximum tensile stress not to exceed by 4.8 N/mm^2.	**04**
	(c)	A masonry wall, 6 m high, is of solid rectangular section, 3 m wide and 1 m thick. A horizontal wind pressure of 1.2 kN/m^2 acts on the 3 m side. Find	**07**

the maximum and minimum stress induced on the base, if unit weight of masonry is 24 kN/m^3.

OR

Q.4 **(a)** Differentiate between long and short column **03**

(b) Derive the Euler's formula for crippling load for strut hinged at both ends. **04**

(c) A cast iron column of hollow circular section having 200 mm external diameter and 20 mm metal thickness. 5 m length has to carry a load 120 kN at an eccentricity of 20 mm from the geometrical axis. Calculate the maximum and minimum stresses included in the section, if the ends are fixed. Also calculate the maximum permissible eccentricity so that in tension is induced at the base. Take E = 120 Gpa. **07**

Q.5 **(a)** Explain advantages of three hinged arch over beam. **03**

(b) A thin cylindrical shell 900 mm diameter, 3m long and 10 mm thick is subjected to an internal pressure of 2MPa. Find the circumferential stress if the eccentricity of longitudinal joints is 75% **04**

(c) Using method of consistent deformation, analyze the propped cantilever beam shown in Figure 4, and draw shear force and bending moment diagrams. **07**

OR

Q.5 **(a)** What are the advantages and disadvantages of fixed beam? **03**

(b) Derive the expression for horizontal reaction, tension at the ends for a uniformly loaded cable **04**

(c) A propped cantilever beam of span 'L' is subjected to a point load 'P' at mid span. Determine the reactions at the supports. **07**

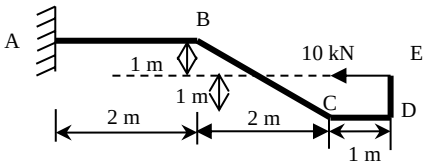

Fig .1

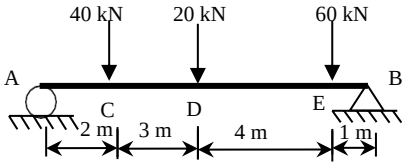

Fig .2

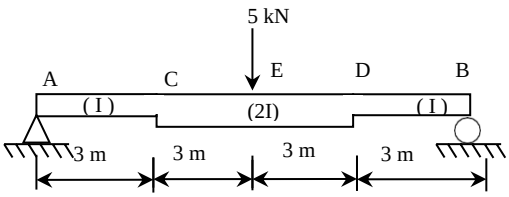

Fig. 3

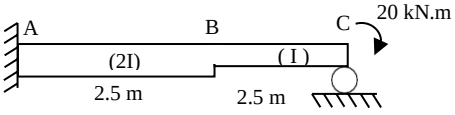

Fig. 4

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