Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV EXAMINATION – SUMMER 2025

Subject Code:3140603 Date:12-05-2025

Subject Name:Structural Analysis-I

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. **3140609Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Differentiate between direct stress and bending stress.	**03**
	(b)	State Moment Area theorems I and II.	**04**
	(c)	A vertical steel rod of uniform diameter, 3.0m long is rigidly secured at its upper end and a weight of 2 kN is allowed to slide freely on the rod through a distance of 25mm on to a collar at the lower end of the rod. Calculate the diameter of the rod, if the maximum strain is not to exceed 1/1600. Take E = 2 X 10^5N/mm^2.	**07**
Q.2	**(a)**	Find out fixed end moment for a fixed beam carrying uniformly distributed load for the whole span.	**03**
	(b)	Discuss Stability checks for a dam.	**04**
	(c)	A steel bar 1 meter in length is subjected to a pull such that the maximum stress is equal to 150 N/mm^2. Its cross-section is 200 mm^2 over a length of 950 mm and for the middle 50 mm length the sectional area is 100 mm^2. If E=2 X 10^5N/mm^2, calculate strain energy stored in the bar.	**07**
		OR	
	(c)	It is found that a bar 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**
Q.3	**(a)**	Explain in brief about stability of structures	**03**
	(b)	Derive the relation between slope, deflection and radius of curvature of the beam.	**04**
	(c)	A fixed beam AB of span 6 m carries two point loads of 20 kN each at distance 1.5 m from each end. Draw S.F. and B.M diagrams for the beam.	**07**
		OR	
Q.3	**(a)**	Draw neat sketch of kernel of the following cross-sections. (i). Rectangular block 200 mm x 300 mm (ii) Circular section of 300 mm diameter	**03**
	(b)	Derive formula for strain energy due to sudden loading.	**04**
	(c)	Explain in detail: i. Maxwell's reciprocal them ii. Principal of superposition	**07**
Q.4	**(a)**	Define(i) Strain energy (ii) Proof resilience (iii) Modulus of Resilience	**03**
	(b)	State basic difference between fixed and simply supported beams. State advantages of fixed beam over simply supported beam.	**04**

(c) A masonry dam 6 m high, 3 m wide at base and 1.2 m wide at top, retains water on vertical face for full height. Considering density of masonry as 17 kN/m^3 and density of water as 10 kN/m^3, find out maximum and minimum pressure intensities at the base. **07**

OR

Q.4 **(a)** Justify the support condition in conjugate beam. **03**

(b) Explain any two stability conditions for retaining wall. **04**

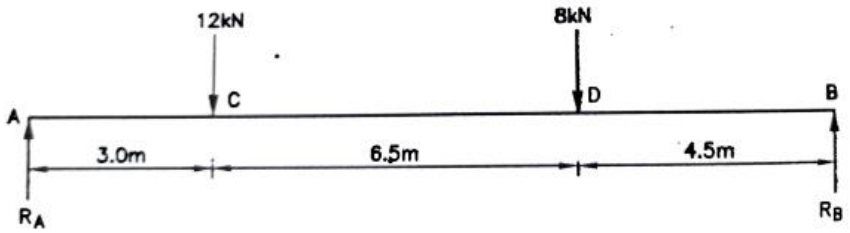
(c) A masonry trapezoidal dam is constructed with following data. Find the width of the dam at base so that 'no tension' is occurred on section. **07**

1. Top width = 1m
2. Height of dam = 5m
3. wt. of water = 10 kN/m^3
4. Height of water on vertical face of dam = 4.8 m
5. wt. of masonry = 20 10 kN/m^3.

Q.5 **(a)** Explain with neat sketch: Effective length of column with d ifferent end conditions. **03**

(b) Define and explain : Anchor cables. **04**

(c) Calculate deflections under the loads for a beam loaded as shown in figure.(By Macaulay's Method). **07**



OR

Q.5 **(a)** Prove that the maximum strain energy stored in a body is given by ,U= (σ^2/2E) x Volume. **03**

(b) A thin cylindrical shell of internal diameter d, wall thickness t and length L, is subjected to internal pressure p. Derive the expression for change in volume of the cylinder. **04**

(c) The external and internal diameter of a hollow cast iron column are 200 mm and 150 mm respectively. If column is hinged at both ends having a length of 4 m, determine the crippling load using Rankine formula. Take fs = 550N/mm^2 and α = 1/1600. **07**

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