Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2021

Subject Code:2140603   **Date:08/09/2021**
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)**	Find out fixed end moment for a fixed beam of span 'L' carrying Point load 'W' at centre of the span.	**03**
	(b)	Explain various types of framed structures with distinguishing features of each.	**04**
	(c)	Explain in detail: i. Principal of superposition ii. Maxwell's reciprocal theorem	**07**
Q.2	**(a)**	What is conjugate beam? Differentiate between real beam and conjugate beam. Justify the support condition in conjugate beam	**03**
	(b)	State and explain moment area theorem.	**04**
	(c)	For a cantilever beam 6 m long girder AB is subjected to a uniformly distributed load of 12 kN/m over the entire span. Find Deflection at free end of the beam. Take EI = 6 x 10^4 kNm^2. Use Macaulay's method.	**07**

OR

	(c)	Find slope & deflection at free end of the beam shown in Figure: 1 by Moment area method. E = 200 Gpa and I=5 x 10^8 mm^4.	**07**

Figure: 1

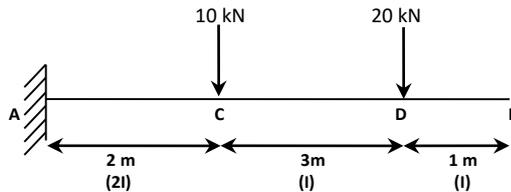|			
Q.3	**(a)**	Derive an equation of $y = \frac{4r}{L^2} x(L - x)$ for three hinged parabolic arch.	**03**
	(b)	Derive Euler's formula of critical load for column having both ends hinged	**04**
	(c)	A circular column of diameter 'd' is subjected to a load of 230 kN at an eccentricity of 0.3d. If the maximum stress at the base of the column is limited to 90 N/mm^2, determine the diameter of the column.	**07**

OR

Q.3	**(a)**	Explain with neat sketch: Effective length of column with different end conditions.	**03**
	(b)	Explain advantages of three hinged arch over beam.	**04**
	(c)	The external and internal diameter of a hollow cast iron column is 230 mm and 170 mm respectively. If column is hinged at both ends having a length of 4 m, determine the crippling load using Rankine formula. Take α = 1/1600 and f$_s$ = 550 N/mm^2.	**07**
Q.4	**(a)**	Define and Explain core and Kernel of a section with suitable example.	**03**
	(b)	Give advantages of fixed beam.	**04**
	(c)	Discuss the stability conditions for a dam subjected to hydrostatic pressure.	**07**

OR

Q.4	**(a)**	Draw a neat sketches of Kernel of following cross-section: a) Rectangular 400mm x 300mm b) Square with 400 cm^2 area c) Circular section with 300 mm diameter	**03**
	(b)	Discuss various types of Arches.	**04**
	(c)	Using method of consistent deformation, analyze the propped cantilever beam carrying a uniformly distributed load of 30 kN/m, over its entire span of 5 m. Draw shear force and bending moment diagrams.	**07**
Q.5	**(a)**	Explain in brief about stability of structures.	**03**
	(b)	A thin cylindrical shell of diameter 1.2 m and thickness 12 mm is subjected to an internal pressure of 24 N/mm^2. Find the circumferential and longitudinal stresses.	**04**
	(c)	Derive an expression for strain energy stored in a body i) The load is applied gradually ii) The load is applied suddenly iii) The load is applied with an impact	**07**

OR

Q.5	**(a)**	Define (i) Strain energy (ii) Proof resilience (iii) Modulus of Resilience	**03**
	(b)	Explain Eddy's theorem.	**04**
	(c)	Determine the ratio of strain energy stored for a simply supported beam of 4m span in following two cases (i) if a point load of 30 kN is applied at centre and (ii) if it carries a uniformly distributed load of 12 kN/m over its entire span. Assume EI = Constant.	**07**

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