Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2021
Subject Code:3140603   **Date:01/01/2022**
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. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Compute Static and kinematic indeterminacy of the structures shown in figure : 1.	**04**
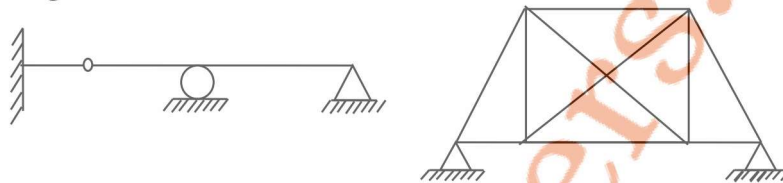
Figure : 1

	(b)	Distinguish between truss and frame.	**03**
	(c)	Analyze the beam shown in figure: 2 by moment distribution method and draw bending moment diagram.	**07**
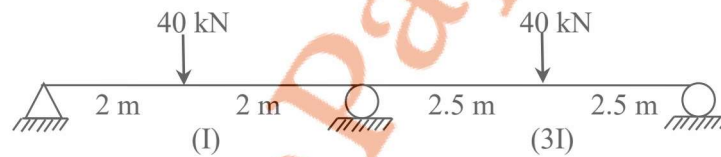
Figure: 2

Q.2	**(a)**	Differentiate between long and short column.	**03**
	(b)	Derive the expressions for Hoop and longitudinal stresses in a thin cylinder.	**04**
	(c)	For a three hinged parabolic arch having rise of 5 m, span of 25 m and loaded by a point load of 100 kN at 10 m from left support, calculate the maximum bending moment.	**07**

OR

	(c)	Analyze the portal frame shown in figure: 3 and draw shear force and bending moment diagram.	**07**

Figure: 3

Q.3	**(a)**	Derive relationship between strain energy due to gradual load and strain energy due to sudden load.	**03**
	(b)	Describe the Relationship between slope, deflection and radius of	**04**

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curvature.

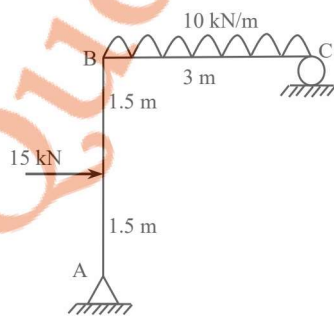|			
	(c)	Determine central deflection and slope at supports for a simply supported beam of length 'l' carrying a point load of 'w' at centre of the span. Take EI = constant. (Use Macaulay's method)	**07**

OR

Q.3	**(a)**	Derive an expression for strain energy due to bending.	**03**
	(b)	Explain gradual load, sudden load and load applied with impact.	**04**
	(c)	A cantilever beam of span 'l' is subjected to udl 'w' on the entire span. Find the slope and deflection at the free end by Conjugate beam method.	**07**
Q.4	**(a)**	Define conjugate beam. What are the different kinds of a support condition in conjugate beam?	**03**
	(b)	Define slenderness ratio. With the help of sketches, explain effective length of column for different end conditions.	**04**
	(c)	A rectangular column section ABCD (Figure: 4) having side AC=BD=450 mm and AB=CD=300 mm carries a compressive load of 230 kN at corner C. determine stress at each corner A,B,C,D also draw stress distribution diagram for each side.	**07**

Figure: 4

OR

| **Q.4**	**(a)**	Derive equation for maximum and minimum stresses in rectangular section.	**03**
	(b)	Write the assumptions and limitations of Euler's formula.	**04**
	(c)	Define column and strut. Show that for no tension in the base of a short column, the line of action of the load should be within the middle third.	**07**
Q.5	**(a)**	Write fixed end moment for a fixed beam of length 'l' carrying following loading on it	**03**
		(i) Central point load 'w'	
		(ii) Uniformly distributed load 'w' over entire span	
		(iii) Point load 'w' at a distance 'a' from left support and 'b' from right support.	
	(b)	Draw shear force and bending moment diagram for a fixed beam of length 'l' carrying a point load 'w' at centre.	**04**
	(c)	Analyze the fixed beam shown in figure: 5 and draw bending moment diagram.	**07**
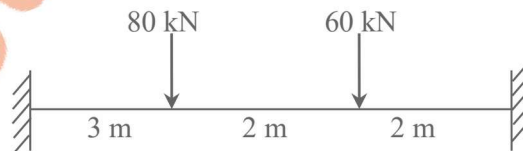
Figure : 5

OR

Q.5	**(a)**	Differentiate between direct stress and bending stress with example.	**03**
	(b)	Derive the equation of fixed end moment in a fixed beam of span 'L' having one of the support rotate clockwise θ.	**04**
	(c)	A fixed beam AB of span L carried a UDL of w per meter length over entire span. Support B settles by 'δ' during application of load. Calculate the settlement 'δ', so that there is no fixed end moment at B.	**07**

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