Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2023

Subject Code:2140603 Date:19-07-2023

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)**	Differentiate Real Beam and Conjugate Beam.	**03**
	(b)	Write advantages and disadvantages of indeterminate structures over determinate structures.	**04**
	(c)	Analyse the frame as shown in fig.-1 and draw AFD, SFD and BMD.	**07**
Q.2	**(a)**	Explain Maxwell's reciprocal theorem.	**03**
	(b)	A cantilever beam of span 4m is subjected to a UDL of 20 kN/m over entire span. Calculate deflection at free end by Macaulay's method.	**04**
	(c)	Find slope and deflection at free end C for a cantilever beam as shown in fig.-2 by conjugate beam method.	**07**
		OR	
	(c)	Find slope at A and deflection at C for a simply supported beam AB as shown in fig.-3 by any method. Take EI to be constant.	**07**
Q.3	**(a)**	Explain SI and KI with illustration.	**03**
	(b)	Derive the formula to find dimension of the core for a hollow circular section.	**04**
	(c)	A short column has a hollow square section. The external dimensions are 500 mm x 500mm and thickness of section is 100mm. A load of 1500 kN is acting on X axis at an eccentricity of 100mm from center. Find maximum and minimum stress intensities and draw stress distribution diagram.	**07**
		OR	
Q.3	**(a)**	Explain theorems of moment area method.	**03**
	(b)	A hollow cast iron column of 250mm external diameter and 150mm internal diameter is 4m long. Find Euler's crippling load if both the ends are hinged. Take E=120GPa.	**04**
	(c)	Derive Euler's formula for crippling load for a column having one end fixed and other end free.	**07**
Q.4	**(a)**	Describe types of arches.	**03**
	(b)	Explain actual arch and linear arch.	**04**
	(c)	A three hinged parabolic arch has a span of 25m and a central rise of 4m. It carries a point load of 70 kN at 10m horizontally from left end hinge. Calculate normal thrust, shear force and B.M under the load. Also draw BMD.	**07**
		OR	
Q.4	**(a)**	Write assumptions made in the Euler's column theory.	**03**
	(b)	Explain how reactions are found out on a guide pulley support and saddle on roller support for suspension cable.	**04**

Q.4 **(c)** A cylindrical vessel closed with plane ends is made of a 5mm thick steel plate. Its external diameter is 350mm and its length is 900mm. It is subjected to an internal fluid pressure of 3 N/mm^2. Calculate the longitudinal and hoop stresses in the shell plate. Also calculate the change in diameter, length and volume of the cylinder. Take $E=2x10^5$ N/mm^2, and Poission's ratio = 0.3. **07**

Q.5 **(a)** A thin spherical shell having 800 mm diameter is subjected to an internal pressure of 2.0 N/mm^2. Find the thickness of plate needed if permissible tensile stress is 100 N/mm^2. Take efficiency of joint to be 80%. **03**

(b) A propped cantilever beam of 5m span is fixed at A and roller supported at B. It is acted upon by a point load of 70 kN at 2m from A. Analyse the beam by consistent deformation method. Take EI = constant. **04**

(c) Analyse the fixed beam as shown in fig.4 and draw SFD and BMD. **07**

OR

Q.5 **(a)** Define resilience, proof resilience and modulus of resilience. **03**

(b) Derive expression for strain energy stored in a body when the load is applied with impact. **04**

(c) A simply supported beam AB of span 10m is acted upon by a UDL of 30 kN/m over entire span. Find strain energy stored in the beam. Take $I = 10^6$ mm^4 and E=200GPa. **07**

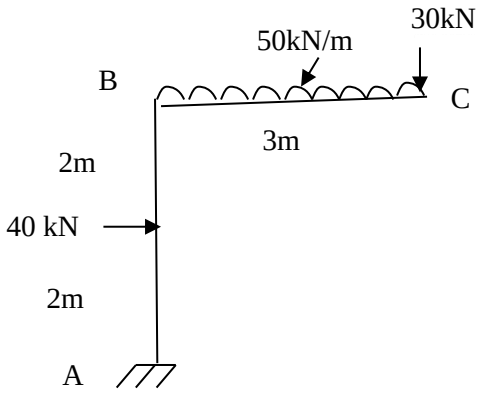

Fig.-1

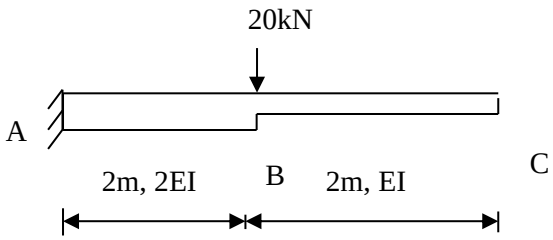

Fig.-2

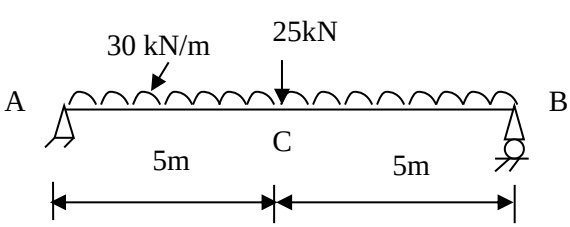

Fig.-3

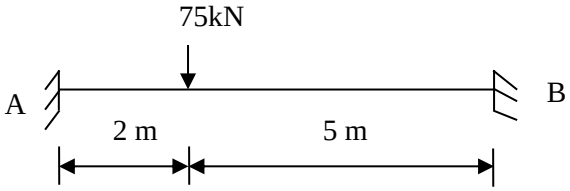

Fig.-4

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