Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV(New) • EXAMINATION – WINTER 2016

Subject Code:2140603 Date:23/11/2016

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.**

			MARKS
Q.1		**Short Questions**	**14**
	1	Give advantages of statically indeterminate structures.	
	2	Define Principle of superposition	
	3	Define Structural indeterminacy	
	4	Define Resilience	
	5	Effective length of column = ---------- times actual length of column if both ends of column are fixed.	
	6	Effective length of column = ---------- times actual length of column if one end of column is hinged and other end is fixed.	
	7	The bending moment at any section of an Arch is equal to ----	
	8	Enlist straining action for any cross section of Arch.	
	9	Define Column.	
	10	Define Thin Cylinder.	
	11	Define Crushing load.	
	12	Write-down only equation for strain energy due to Impact	
	13	Enlist advantages of Fixed beam.	
	14	Enlist disadvantages of fixed beam.	
Q.2	**(a)**	State and explain principle of superposition.	**03**
	(b)	Explain Maxwell's theorem of reciprocal deflections.	**04**
	(c)	Give equations of Static and Kinematics Indeterminacy for the following structures with meaning of each term used. (i) Beam (ii) Plane truss (iii) Plane Frame (iv) Grid	**07**
		OR	
	(c)	A cylindrical shell has 4.0 meter length, 1.2 meter diameter and 12 mm thickness. The shell, is subjected to internal pressure of 3 N/ mm^2.calculate maximum shear stress and change in dimension of shell.	**07**
Q.3	**(a)**	State assumptions and limitations of Euler's formula.	**03**
	(b)	A hollow pipe having external diameter 60 mm and 10 mm thickness is used as a column. If slender ratio is 90 find load carrying capacity of column. Take fc = 320 N/ mm2 and α = 1/4800. Consider one end fixed and other end hinged. Find length of the column.	**04**
	(c)	A hollow cylindrical cast iron column is 4.0 meter long, both ends being fixed. Design the column to carry an axial load of 250 kN use Rankine formula and adopt a factor of safety of 5. The internal diameter may be taken as 0.8 times the external diameter. Take fc = 550 N/ mm^2 and α = 1/1600.	**07**

OR

Q.3 **(a)** Find out fixed end moment for a fixed beam carrying point load at the center of the span. **03**

(b) A fixed beam AB carries an u.d.l. 20 kN/m over entire span of 5 meter. If support B sink by 1 mm find out fixed end moments. **04**

(c) Determine all reaction components and draw shear force and bending moment diagrams for a propped beam as shown in Fig. i. by consistent deformation method. **07**

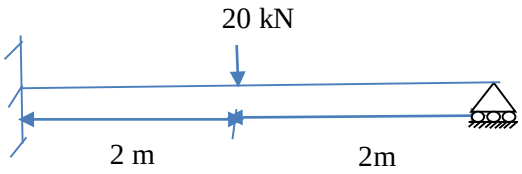


Fig.i

Q.4 **(a)** Define strain energy, proof resilience and modulus of resilience. **03**

(b) A simply supported beam AB of span 5m carries a uniformly distributed load of 5 kN/ m over its entire span. Determine strain energy stored in the beam due to bending in the beam. Take E =200GPa, I =200 cm^4. **04**

(c) It is found that a bar 36mm in diameter stretches 2.1 mm under a gradually applied load of 120 kN. If a weight of 1500N is dropped on to a collar at the lower end of this bar, through a height of 60mm before commencing to stretch the bar, calculate the maximum instantaneous stress and elongation produced in the bar. E=210 kN/mm^2. **07**

OR

Q.4 **(a)** A thin cylindrical shell of internal diameter d, wall thickness t and length I, is subjected to internal pressure p. Derive the expression for change in volume of the cylinder. **03**

(b) A thin cylindrical shell of internal diameter 1200mm, wall thickness 12mm and length 3000mm, is subjected to internal pressure 1.5 N/mm^2.Find the circumferential and longitudinal strains developed and hence find the increase in capacity of the shell. **04**

(c) A masonry dam 6.0 m high has 1.0 m top width and 4.0m base width. It retains water on its vertical face for its total height. Determine the stresses that develop at its base and check the section for its stability. Assume the density of the masonry to be 24 kN /$m^{3,}$ safe bearing capacity of the soil as 150 kN /m^2 and the coefficient of friction between masonry and foundation bed as 0.3. **07**

Q.5 **(a)** A symmetrical three hinged circular arch has a span of 16 m and a rise to the central hinge of 4 m. It carries a vertical load of 20 kN at 5 m from the left hand end. Find
(a) the magnitude of the thrust at the springing,
(b) the Reactions at the supports,
(c) Bending moment at 8 m from the left hand hinge. **03**

(b) Enlist advantages of double integration method and moment area method. **04**

(c) Find slope & deflection for the structure shown in fig below by Moment area method. **07**

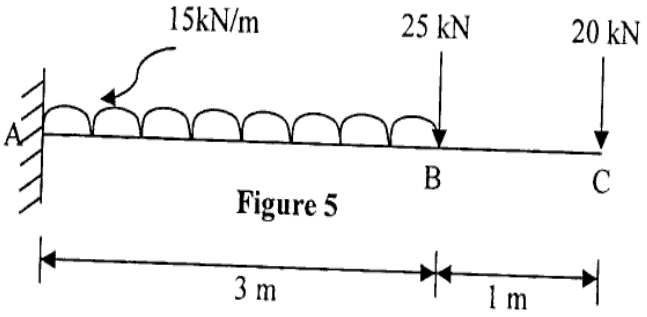


Figure 5

OR

Q.5 **(a)** Define core or kernel of a section .Obtain core or kernel of the rectangular section. **03**

(b) Find limit of eccentricity for rectangular and circular section. **04**

(c) Find static and kinematic indeterminacy for the structures shown below. Also comment about stability. **07**

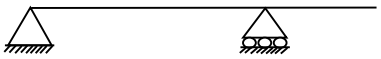


Fig. 5-a

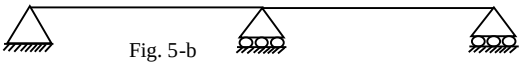


Fig. 5-b

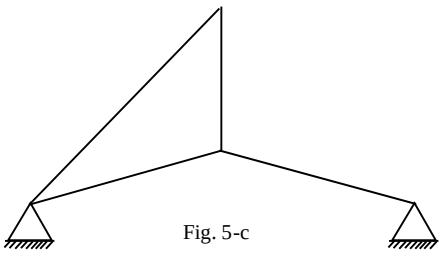


Fig. 5-c

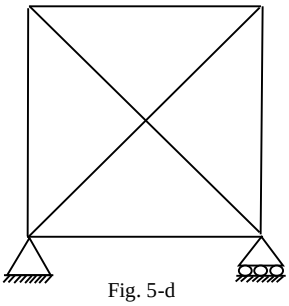
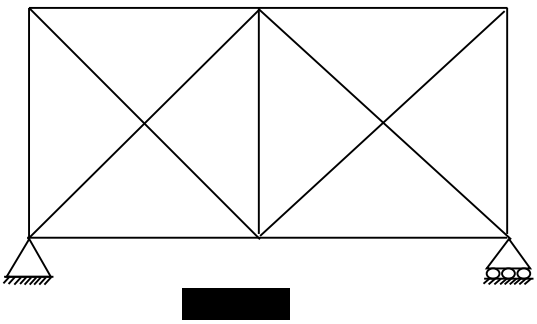


Fig. 5-d



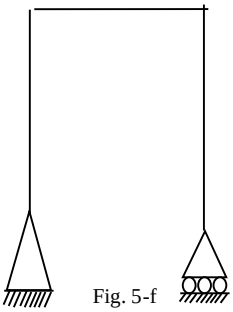


Fig. 5-f

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