Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III EXAMINATION – WINTER 2015

Subject Code:130604 **Date:23/12/2015**

Subject Name: Structural Analysis -I

Time: 2:30pm to 5:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Define (1) Resilience (2) Strain energy (3) Kinematic indeterminacy (4) Determinate structure (5) Static indeterminacy (6) Proof resilience (7) Modulus of resilience.	**07**
	(b)	(1) State and prove Maxwell's reciprocal theorem.	**04**
		(2) Define influence line and explain importance of influence line.	**03**
Q.2	**(a)**	A cylindrical thin shell 800 mm in diameter and 3 m long is having 10 mm metal thickness. If the shell is subjected to an internal pressure of 2.5×10^6 N/m^2. Find (a) change in length (b) change in diameter (c) change in volume. Take E = 200 GPa and $\mu = 0.25$.	**07**
	(b)	Find slope and deflection at free end for the cantilever beam shown in Fig.1.Take E = 200 kN/m^2 and I = 1.68×10^8 mm^4. Use moment area method.	**07**
		OR	
	(b)	Find slope and deflection at free end for the cantilever beam shown in Fig.1.Take E = 200 kN/m^2 and I = 1.68×10^8 mm^4. Use conjugate beam method.	**07**
Q.3	**(a)**	Derive relation between slope, deflection and radius of curvature.	**07**
	(b)	A trapezoidal masonry dam is 18 m height. The dam is having water upto depth 15 m on its vertical face. The top and bottom width of dam are 4 m and 8 m respectively. The weight density of masonry is 19.62 kN/m^3. Find maximum and minimum stresses intensities at base.	**07**
		OR	
Q.3	**(a)**	Find maximum deflection for the simply supported beam having span 'L' and carrying uniformly distributed load 'w' per meter over entire length.	**07**
	(b)	A cable carrying a load of 10 kN/m run of horizontal span is stretched between supports 100 m apart. The supports are at same level and central dip is 8 m. Find maximum and minimum tension in the cable.	**07**
Q.4	**(a)**	Derive Euler's formula for crippling load, when column is hinged at both ends.	**07**
	(b)	A hollow shaft of external diameter 120 mm transmits 300 kW power at 200 r.p.m. Find maximum internal diameter if the maximum stress in the shaft is not exceed 60 N/mm^2.	**07**
		OR	
Q.4	**(a)**	Calculate the safe compressive load on a hollow cast iron column (one end fixed and other end hinged) of 15 cm external diameter, 10 cm internal diameter and 10 m in length. Use Euler's formula. Take factor of safety = 5 and E = 95 kN/mm^2.	**07**
	(b)	A three hinge parabolic arch of span 20 m and rise 4 m carries a uniformly distributed load of 20 kN/m run on the left half of span. Find maximum bending moment for the arch.	**07**

Q.5	**(a)**	Two wheel load of 16 kN and 8 kN, at a fixed distance apart of 2 m, cross a simply supported beam of 10 m span. Find maximum shear force and maximum bending moment at a point 4 m from left support.	**07**
	(b)	A steel rod is 2 m long and 50 mm in diameter. An axial pull of 100 kN is suddenly applied to the rod. Calculate instantaneous stress induced and also instantaneous elongation produced in the rod. Take E = 200 GPa.	**07**

OR

Q.5	**(a)**	For simply supported beam AB of span 8 m, draw influence line diagram for (1) Reaction at A (2) Reaction at B (3) Shear force at a section 3 m from left, and (4) Bending moment at a section 3 m from left.	**07**
	(b)	A short column of rectangular cross section 80 mm × 60 mm carries a load of 40 kN at a point 20 mm from longer side and 35 mm from shorter side as shown in Fig.2. Find maximum and minimum stresses in the section.	**07**

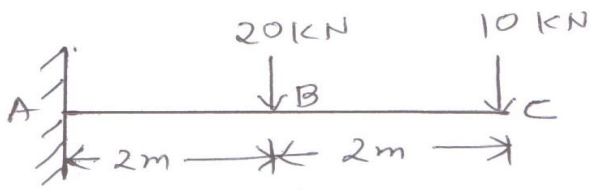

Fig:1, Q.2 (b) OR Q.2 (b)

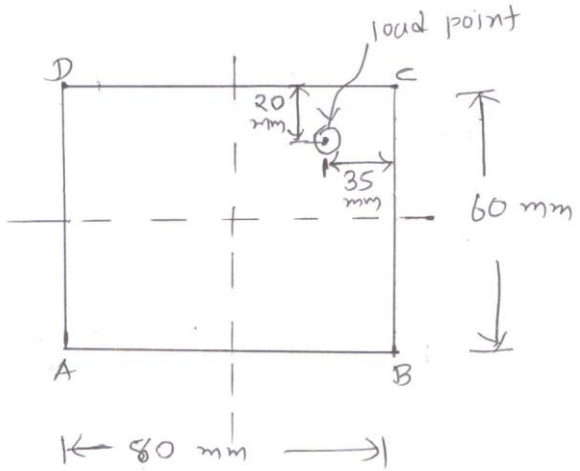

Fig:2, Q.5 (b) OR

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