Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (OLD) EXAMINATION – WINTER 2018

Subject Code:130604 Date:05/12/2018

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.**

Q.1 **(a)** Give advantages & disadvantages of statically indeterminate structures **07**

Determine Structural indeterminacy of the structures shown in figure:

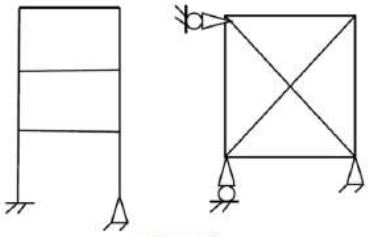


Figure 1

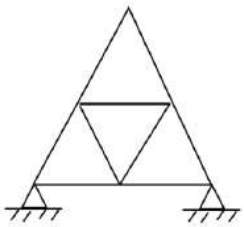


Figure 2

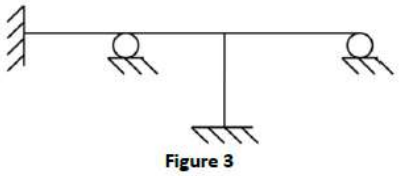


Figure 3

(b) Explain Maxwell's theorem of reciprocal deflections **07**

Q.2 **(a)** Write the assumptions made in the theory of torsion. A solid shaft is 100 mm in diameter, transmits 120kW at 200 rpm. Find the maximum intensity of shear stress induced and angle of twist for a length of 6 meters. Take C = 8 X 10^4 N/mm^2 **07**

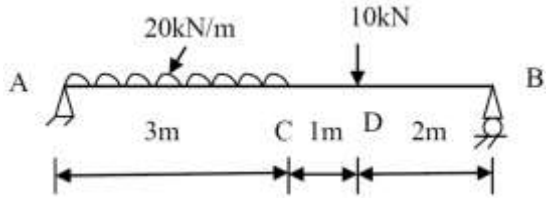
(b) Define 1) Thin cylinder 2) Thick cylinder 3) Hoop stress 4) Longitudinal stress **07**

A thin cylindrical shell with internal diameter 150mm and wall thickness 15mm is subjected to a steam pressure 12 N/mm^2. Find circumferential and longitudinal stresses in the shell material.

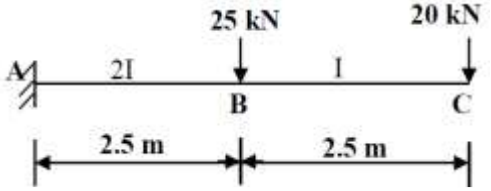
OR

(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. **07**

Q.3 **(a)** Using Macaulay's method calculates slope at point C and deflection at point D for a simply supported beam as shown in figure. Take EI=Constant **07**



(b) Find slope and deflection at point C for the beam shown in figure using Conjugate beam method. Take EI =20000 KN-m^2 **07**



OR

Q.3 **(a)** Define and Explain core and Kernel of a section with suitable example. Draw 'Core' for the (a) Rectangular section (b) Hollow circular section. **07**

(b) A masonry dam 6.0 m high has 1.2 m top width and 3.0m base width. It retains water on its vertical face for its total height. Assume the density of the masonry to be 17 KN /m^3 and density of water as 10kN/m^3, find out maximum and minimum pressure intensities at the base. **07**

Q.4 **(a)** Define strain energy, proof resilience and modulus of resilience, Resilience. Derive formula for strain energy due to Sudden Loading. **07**

(b) An axial pull of 50KN is suddenly applied to a steel bar 2m long and 100mm^2 in cross section. If modulus of elasticity of steel is 200kN/mm^2 find 1) maximum instantaneous stress, 2) maximum instantaneous extension, 3) strain energy, 4) modulus of resilience. **07**

OR

Q.4 **(a)** Define Influence line. Write the importance of Influence line diagram. **07**

(b) A simply supported beam AB has a span of 8m. Draw influence lines for R_A, R_B, V_X & M_X for a section3m from left end support. **07**

Q.5 **(a)** Differentiate between column and strut. State assumptions and limitations of Euler's formula. **07**

(b) State assumptions and limitations of Euler's formula. **07**
A hollow rectangular column having outside dimensions 200mmx150mm and inside dimensions 1500mmx100mm. Its length is 6m and is fixed at both the ends. Find Euler's crippling load. Take E=2x10^5 N/mm^2

OR

Q.5 **(a)** Write advantages of Three Hinge parabolic arch over a simply supported beam **07**

(b) A three hinged parabolic arch has a span of 20 m and a central rise 3m .It carries a point load of 10 KN at 7.5 m from the left hinge. Find normal thrust, shear and BM at section 7.5m from right end hinge. Also calculate maximum positive and negative bending moments and their positions. **07**

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