

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
Determine Structural indeterminacy of the structures shown in figure: 07

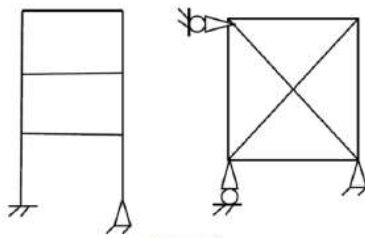


Figure 1

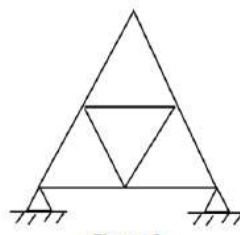


Figure 2

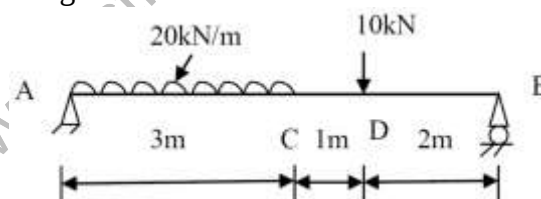


Figure 3

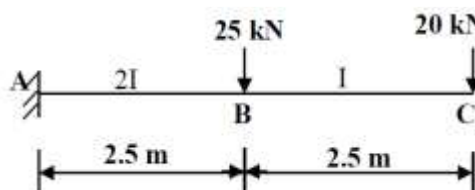
- (b)** Explain Maxwell's theorem of reciprocal deflections 07
- Q.2 (a)** Write the assumptions made in the theory of torsion. A solid shaft is 100 mm in diameter, transmits 120kW at 200 rpm. Find the maximum intensity of shear stress induced and angle of twist for a length of 6 meters. Take $C = 8 \times 10^4 \text{ N/mm}^2$ 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/mm². 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/mm². 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 $EI = \text{Constant}$ 07



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



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/m³ and density of water as 10kN/m³, 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 section 3m 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 $200\text{mm} \times 150\text{mm}$ and inside dimensions $150\text{mm} \times 100\text{mm}$. Its length is 6m and is fixed at both the ends. Find Euler's crippling load. Take $E = 2 \times 10^5 \text{ N/mm}^2$

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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