

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2130003

Date:18/05/2018

Subject Name:Mechanics of Solids

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) Define (i) Couple (ii) Moment (iii) Equilibrant 3
(b) State Lami's Theorem. Determine tension in wire AB and BC shown in Fig 1. 4
(c) Determine magnitude, direction and position of resultant for force system shown in fig 2. with respect to point O. 7

- Q.2** (a) State (i) Varignon's theorem and (ii) Pappus-Guldinus Theorems 3
(b) Determine C.G. of lamina shown in fig 3 4
(c) Derive equation for I_{xx} for triangular section with Base 'B' and Height 'H' 7

OR

- (c) Determine I_{xx} and I_{yy} for section shown in fig 4 7
Q.3 (a) Define (i) Strain (ii) Poisson's ratio (iii) Bulk Modulus 3
(b) State Hook's law. Draw stress strain curve for Mild Steel Specimen and explain each point in detail 4
(c) A Reinforced concrete column is applied 700 kN load. Size of column is 300 mm X 400 mm, and it is reinforced with 6 bars of 16 mm dia. Determine load taken by concrete and steel. 7

OR

- Q.3** (a) Define (i) Stress (ii) Young's modulus (iii) Modulus of rigidity 3
(b) Derive equation to find volumetric strain for cylindrical specimen. 4
(c) A 2.8 m long member is 60 mm deep and 40 mm wide. It is subjected to axial tensile force 210 kN. Determine change in dimension and in volume. Take $E=200$ Gpa and $\mu = 0.3$ 7

- Q.4** (a) State the assumption made in theory of bending. 3
(b) A simply supported beam 5 m in span carries udl of 20 kN/m. The cross section of beam is I section. It is having flange dimension 200 X 20 mm. The thickness of web is 20 mm, depth 260 mm and overall depth of I section is 300 mm. Calculate maximum stresses. 4
(c) 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 $C = 8 \times 10^4$ N/mm². 7

OR

- Q.4** (a) Define (i) Shear Force (ii) Point of Contraflexure (iii) Neutral Axis 3
(b) A simply supported beam 6 m in span carries udl of 18 kN/m. The cross-section of beam is hollow rectangular section with outer dimension 250 X 400 mm and 25 mm thick. Determine shear stress at various locations. 4

- (c) Draw shear force and bending moment for the beam shown in fig 5. 7
Q.5 (a) Explain cone of friction with neat sketch. 3
(b) State the laws of dry friction. 4
(c) A uniform ladder of weight 250 N, and length 5 m is placed against a vertical wall in position where its inclination with vertical is 30°. A man weighing 800N climbs the ladder. At what position will he induced slipping. Take $\mu = 0.2$ at all contact surface. 7

OR

- Q.5 (a)

Prove that for rectangular section maximum shear stress is 1.5 time average stress

3
- (b)

Find the reaction of beam shown in fig 6.

4
- (c)

Determine normal and tangential stress on plane AB, in a strained material shown in fig 7. Determine the stress by Mohr's circle also.

7


