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
  (b) State Lami's Theorem. Determine tension in wire AB and BC shown in Fig 1.
  (c) Determine magnitude, direction and position of resultant for force system
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  - shown in fig 2. with respect to point O.
- Q.2 (a) State (i) Verignon's theorem and (ii) Pappus-Guldinus Theorems
  (b) Determine C.G. of lamina shown in fig 3
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  - (c) Derive equation for Ixx for triangular section with Base 'B' and Height 'H'
  - (c) Determine I<sub>xx</sub> and I<sub>yy</sub> for section shown in fig 4
- Q.3 (a) Define (i) Strain (ii) Poisson's ratio (iii) Bulk Modulus
  (b) State Hook's low. Draw stress strain curve for Mild Steel Specimen and
  4
  - explain each point in detail

    (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.

## OR

- Q.3 (a) Define (i) Stress (ii) Young's modulus (iii) Modulus of rigidity
  (b) Derive equation to find volumetric strain for cylindrical specimen.
  - (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  $\mu = 0.3$
- 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 croos 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.
  - (c) A solid shaft is 100 mm in diameter, transmits 120kW at 200 rpm. Find the 7 maximum intensity of shear stress induced and angle of twist for a length of 6 meters. Take  $C = 8 \times 10^4 \text{ N/mm}^2$ .

## OR

- Q.4 (a) Define (i) Shear Force (ii) Point of Contraflexture (iii) Neutral Axis

  (b) A simply supported beam 6 m in aron parties will of 18 kN/m. The group species A
  - (b) A simply supported beam 6 m in span carries udl of 18 kN/m. The croos- section 4 of beam is hollow rectangular section with outer dimension 250 X 400 mm and 25 mm thick. Determine shear stress at various locations.
  - (c) Draw shear force and bending moment for the beam shown in fig 5.
- Q.5 (a) Explain cone of friction with neat sketch.(b) State the laws of dry friction.
  - (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.

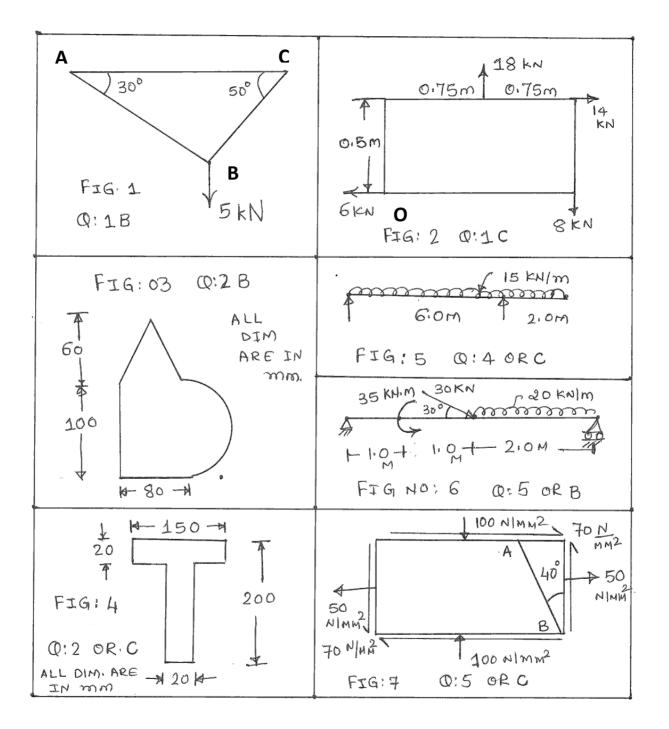
OR

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- **Q.5** (a) Prove that for rectangular section maximum shear stress is 1.5 time average stress
  - **(b)** Find the reaction of beam shown in fig 6.
  - (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.



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