

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER- III(NEW) EXAMINATION – WINTER 2022****Subject Code:3130608****Date:01-03-2023****Subject Name:Mechanics of Solids****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Explain following terms (i) Rigid body (ii) Deformable body (iii) Elastic body. **03**
- (b) State and explain parallelogram law of forces. **04**
- (c) Determine the location of centroid of plane lamina shown in **Figure 1** with respect to point A. **07**

- Q.2** (a) Write the assumptions made in the analysis of perfect truss. **03**
- (b) Find magnitude and direction of resultant for forces system as shown in **Figure 2**. **04**
- (c) Replace the forces acting on the rod by an equivalent single resultant force and couple system acting at point A for **Figure 3**. **07**

OR

- (c) Find the I_{xx} and I_{yy} for section shown in **Figure 4**. **07**

- Q.3** (a) Explain: (i) Type of beams (ii) Type of loading on the beams. **03**
- (b) Derive using first principle the equation for calculation of maximum shear stress at a section for a beam with rectangular cross section. **04**
- (c) Find support reaction and draw **S.F.D** and **B.M.D** for beam which is shown in **Figure 5**. **07**

OR

- Q.3** (a) Explain following terms: (i) Shear force (ii) Bending moment (iii) Point of contra flexure. **03**
- (b) Find support reaction for beam which is shown in **Figure 5**. **04**
- (c) Find support reaction and draw **S.F.D** and **B.M.D** for beam which is shown in **Figure 6**. **07**

- Q.4** (a) Explain assumptions made in theory of pure bending. **03**
- (b) Draw shear stress distribution diagram for Rectangular, Circular T section and I section. **04**
- (c) Determine deformation in each part of the bar ABCD shown in **Figure 7**. **07**

OR

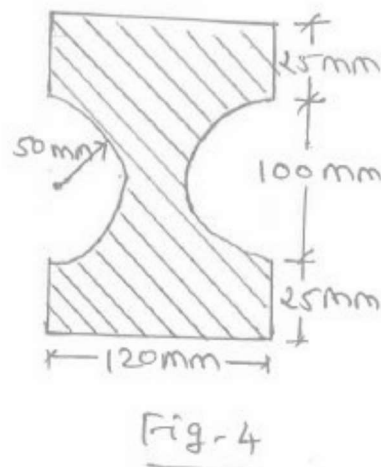
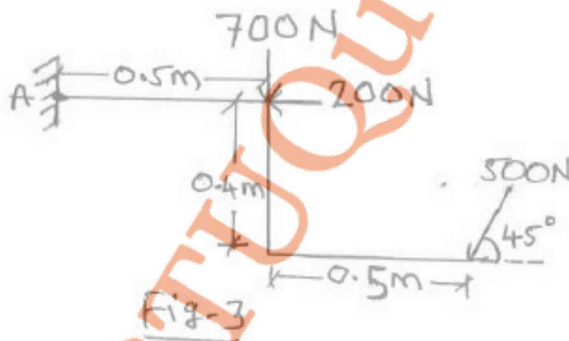
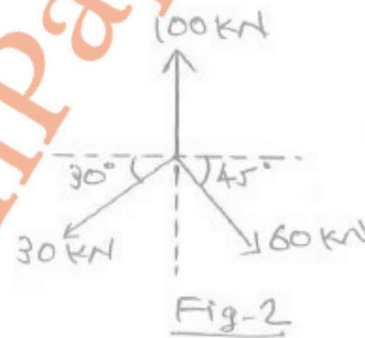
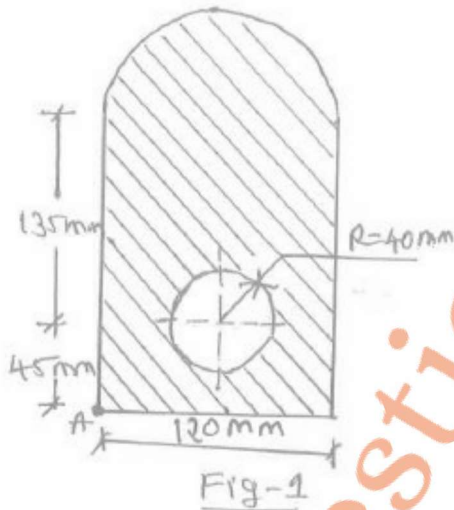
- Q.4** (a) Define stress, strain and poisson ratio. **03**
- (b) A solid circular shaft of 300 mm diameter has transmit 600 kW power at 200 R.P.M. Calculate maximum shear stress in shaft material. **04**

- (c) A beam of T shaped cross section is shown in **Figure 8**. is subjected to bending moment of 20 kN.m. Find the bending stress at the top and bottom of beam. 07

- Q.5 (a) Derive with usual notations the theorem of perpendicular axis. 03
 (b) Determine torque transmitted by hollow circular shaft of 100 mm external diameter and 70 mm internal diameter if maximum shear stress is not exceed 80 N/mm². 04
 (c) A beam of T shaped cross section is shown in **Figure 8**. is subjected to shear force of 50 kN. Find the maximum shear stress in section. 07

OR

- Q.5 (a) Define principal planes and principal stresses. 03
 (b) A steel bar of rectangular cross-section 25 mm x 40 mm carries an axial tension of 40 kN. Determine the average tensile stress in bar. 04
 (c) Determine normal and tangential stress on plane AB, in a strained material shown in **Figure 9**. 07



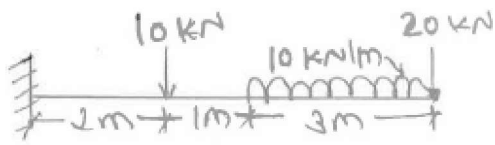


Fig-5



Fig-6

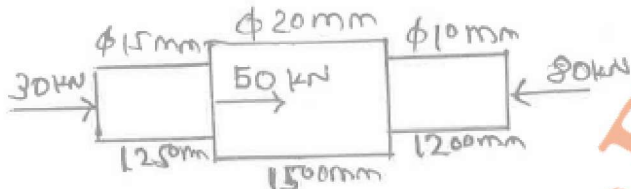


Fig-7

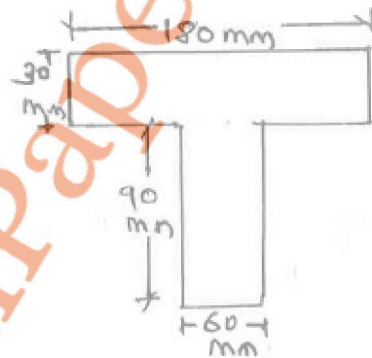


Fig-8

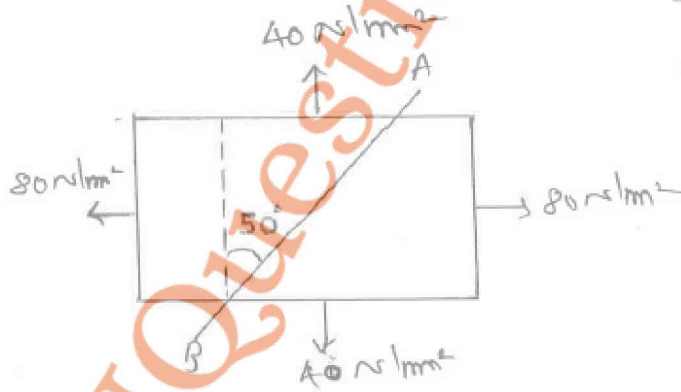


Fig-9
