Seat No.: _____   Enrolment No._____

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.**

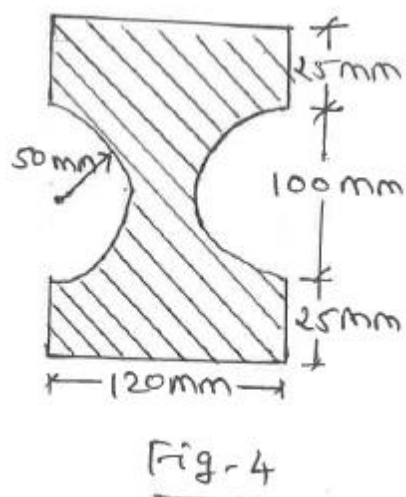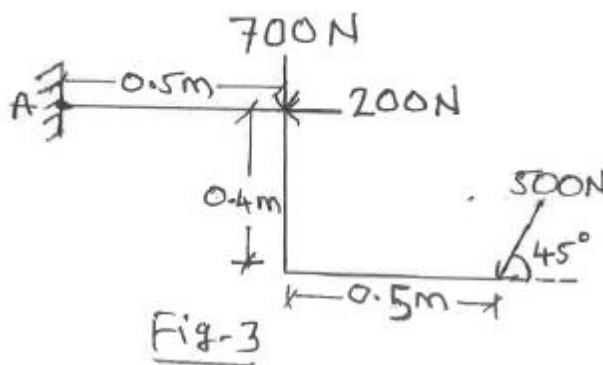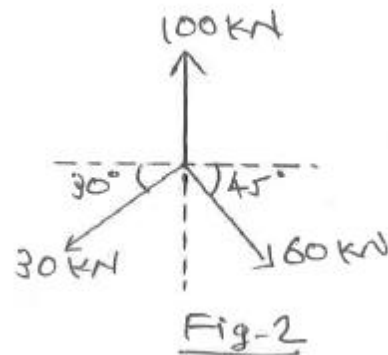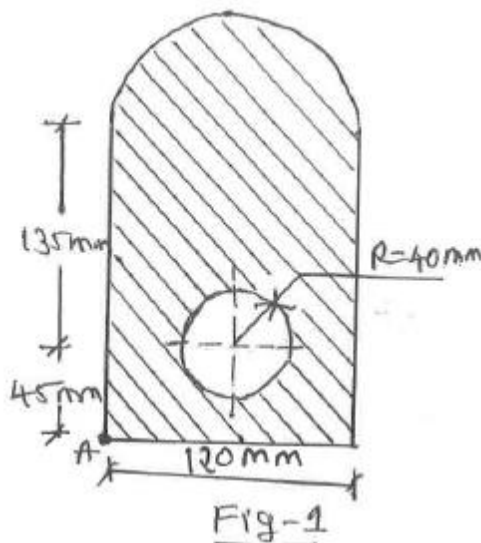|			
Q.1	**(a)**	Explain following terms (i) Rigid body (ii) Deformable body (iii) Elastic body.	**03**
	(b)	State and explain parallelogram law of forces.	**04**
	(c)	Determine the location of centroid of plane lamina shown in **Figure 1** with respect to point A.	**07**
Q.2	**(a)**	Write the assumptions 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 road 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 **07** bending moment of 20 kN.m. Find the bending stress at the top and bottom of beam.

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 **04** diameter and 70 mm internal diameter if maximum shear stress is not exceed 80 N/mm^2.

(c) A beam of T shaped cross section is shown in **Figure 8.** is subjected to shear **07** force of 50 kN. Find the maximum shear stress in section.

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 **04** tension of 40 kN. Determine the average tensile stress in bar.

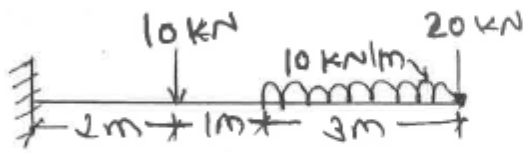**(c)** Determine normal and tangential stress on plane AB, in a strained material **07** shown in **Figure 9.**
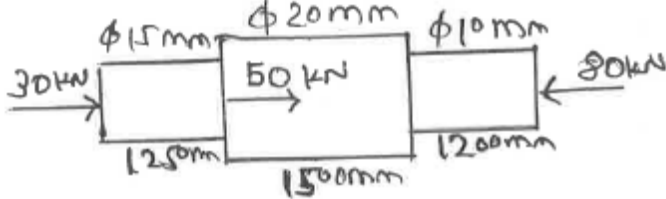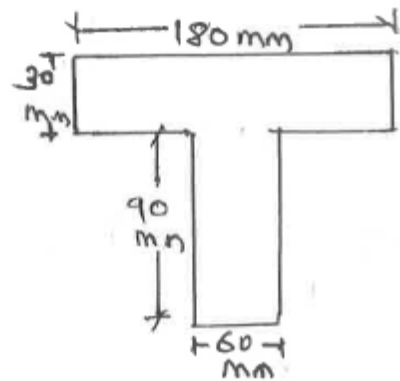

Fig-1

Fig-2

Fig-3

Fig-4

Fig-5

Fig-6

Fig-7

Fig-8

Fig-9

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