

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III (NEW) EXAMINATION – WINTER 2023

Subject Code:3132005

Date:23-01-2024

Subject Name:Engineering Mechanics

Time:10:30 AM TO 01:00 PM

Total Marks:70

Instructions:

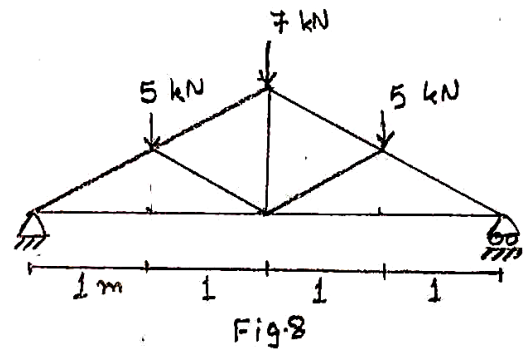
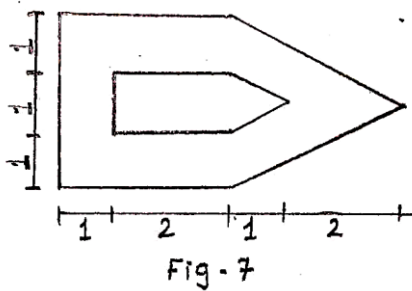
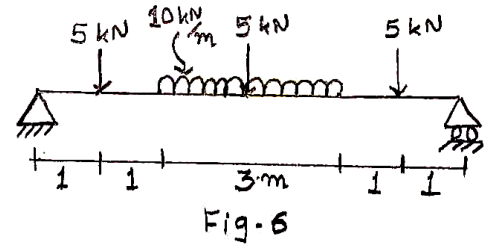
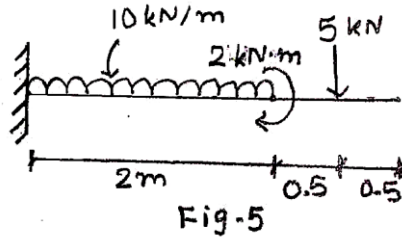
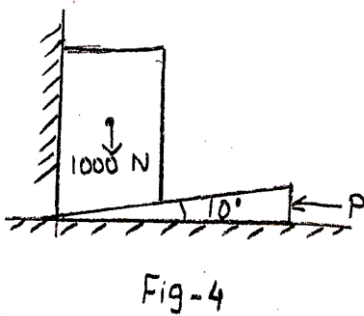
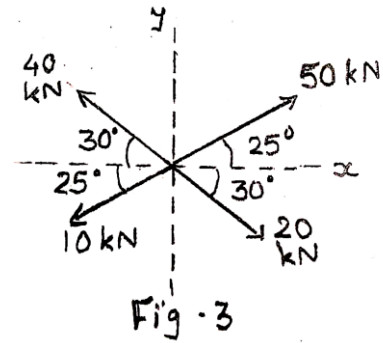
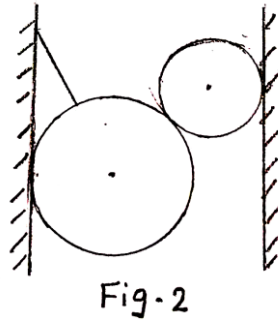
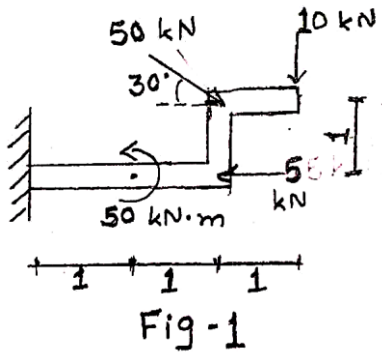
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

Marks

- Q.1** (a) Define equilibrium conditions for coplanar concurrent and non-concurrent force system. **03**
- (b) Derive the relation between angle of friction and coefficient of friction. **04**
- (c) Convert the given system of forces shown in fig-1 into a single force system with respect to point 'O'. **07**
- Q.2** (a) Draw free-body diagram of system shown in fig-2. **03**
- (b) Find resultant force and its angle for concurrent force system shown in fig-3. **04**
- (c) Find the force 'P' required to shift the cupboard in upward direction with help of wedge shown in fig-4. Consider coefficient of friction same for all surfaces i.e. 0.2. **07**
- OR**
- (c) Analyze the beam shown in fig-5 for shear force and bending moment. **07**
- Q.3** (a) Write center of gravity for semi-circle ring, semi-circle surface and hemisphere. **03**
- (b) Explain all type of indeterminacies in truss with figure. **04**
- (c) Analyze the beam shown in fig-6 and draw shear force and bending moment diagram. **07**
- OR**
- Q.3** (a) Define point of zero shear and point of contra-flexure, also write its importance. **03**
- (b) Find $\bar{x}$ for shape shown in fig-7. **04**
- (c) Analyze the truss shown in fig-8 by joint method. **07**
- Q.4** (a) Find reaction of the beam shown in fig-9 **03**
- (b) For the same beam (fig-9), find maximum bending moment. **04**
- (c) Find moment of inertia for the section shown in fig-10. **07**
- OR**
- Q.4** (a) Explain strain hardening. **03**
- (b) Explain parallel axis theorem with help of rectangular cross section. **04**
- (c) For a composite bar shown in fig-11 find the stresses generated in each material. **07**
Tensile force is 50 kN, $E_s = 200$ GPa, $E_c = 100$ GPa.
- Q.5** (a) For the bar with cross section 'A', length 'l' and modulus of elasticity 'E', formulate the change in length if the bar is loaded with force 'P'. **03**
- (b) Explain why and how thermal stresses are generated. **04**
- (c) For a beam loaded with 20 kN/m UDL with length 6 m, width 230 mm and height 450 mm, find maximum bending stress. **07**

OR

- Q.5 (a) Explain linear strain, lateral strain and Poisson's ratio. 03
- (b) Write a formula to find shear stress distribution along the depth of section and define each term. 04
- (c) Draw Mohr circle to find the value of major and minor principal stresses for the object under vertical 60 MPa compressive stress and 25 MPa shear stress. Also find stresses on a plane making an angle 30° with the horizontal plane. 07



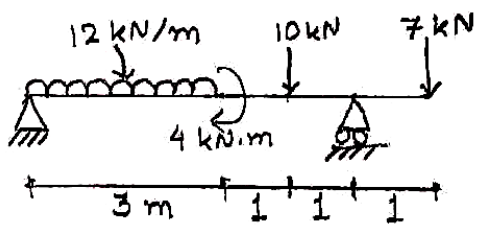


Fig-9

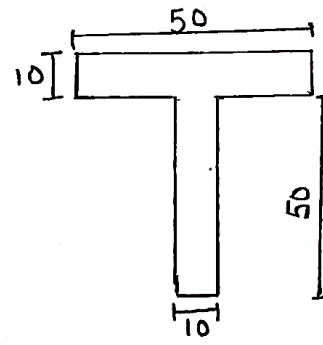


Fig-10

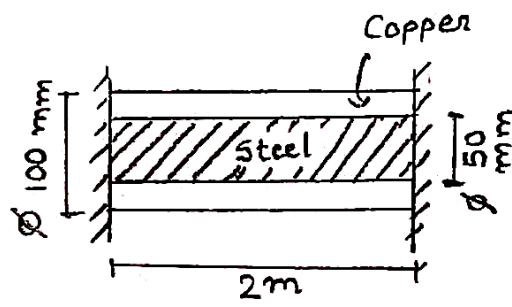


Fig-11