

Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering - SEMESTER - III EXAMINATION - SUMMER 2025

Subject Code: 3132005

Date: 04-06-2025

Subject Name: Engineering Mechanics

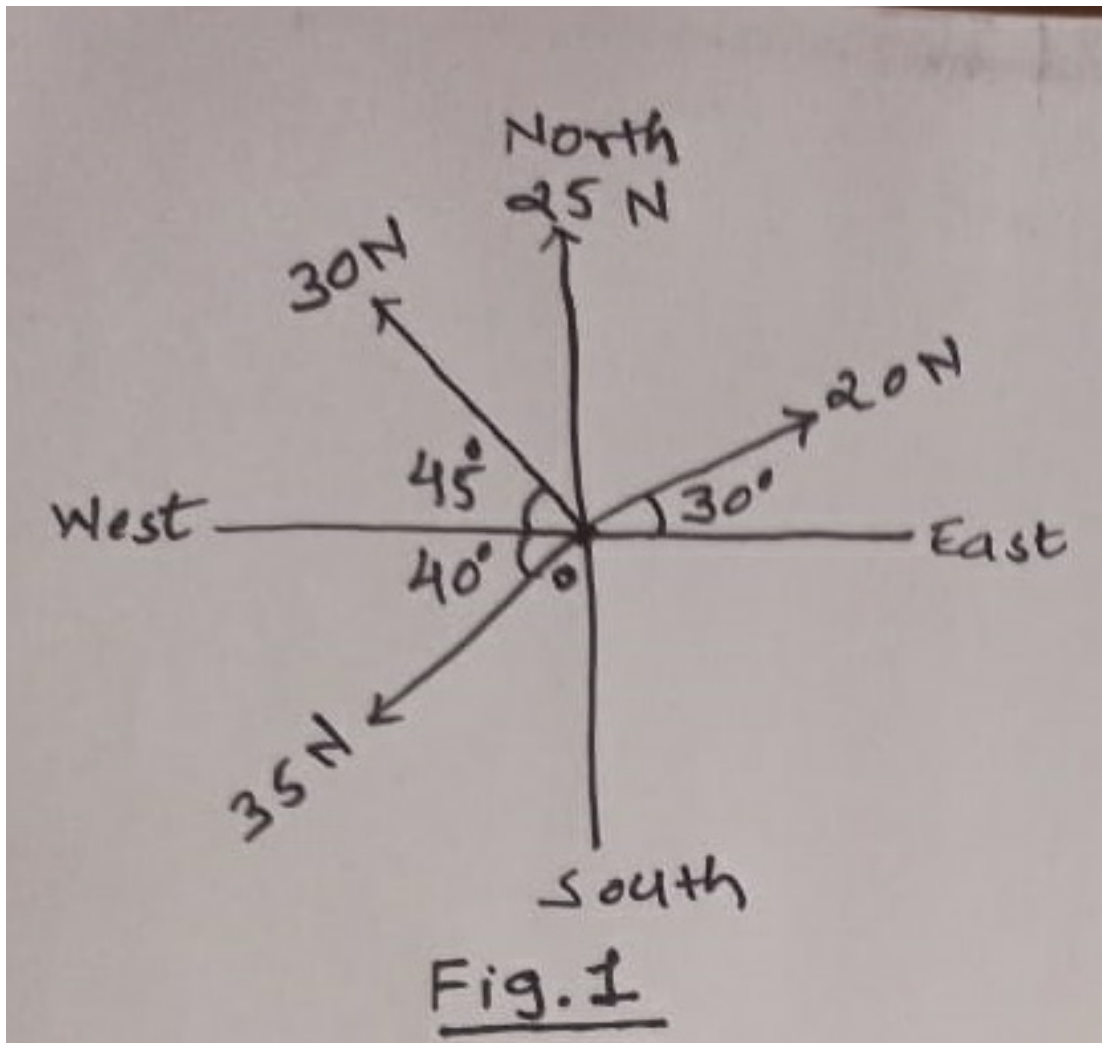
Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

	Marks
Q.1 (a) Define force. Write the characteristics of force.	03
(b) A body of weight of 300 N is lying on a rough horizontal plane having coefficient of friction as 0.4. Find the magnitude of the force, which can move the body, while acting at an angle of 30° with horizontal.	04
(c) Identify the system of force as shown in Fig.1. and find the magnitude and direction of resultant force.	07



Q.2 (a) Enlist the system of forces with neat sketch.

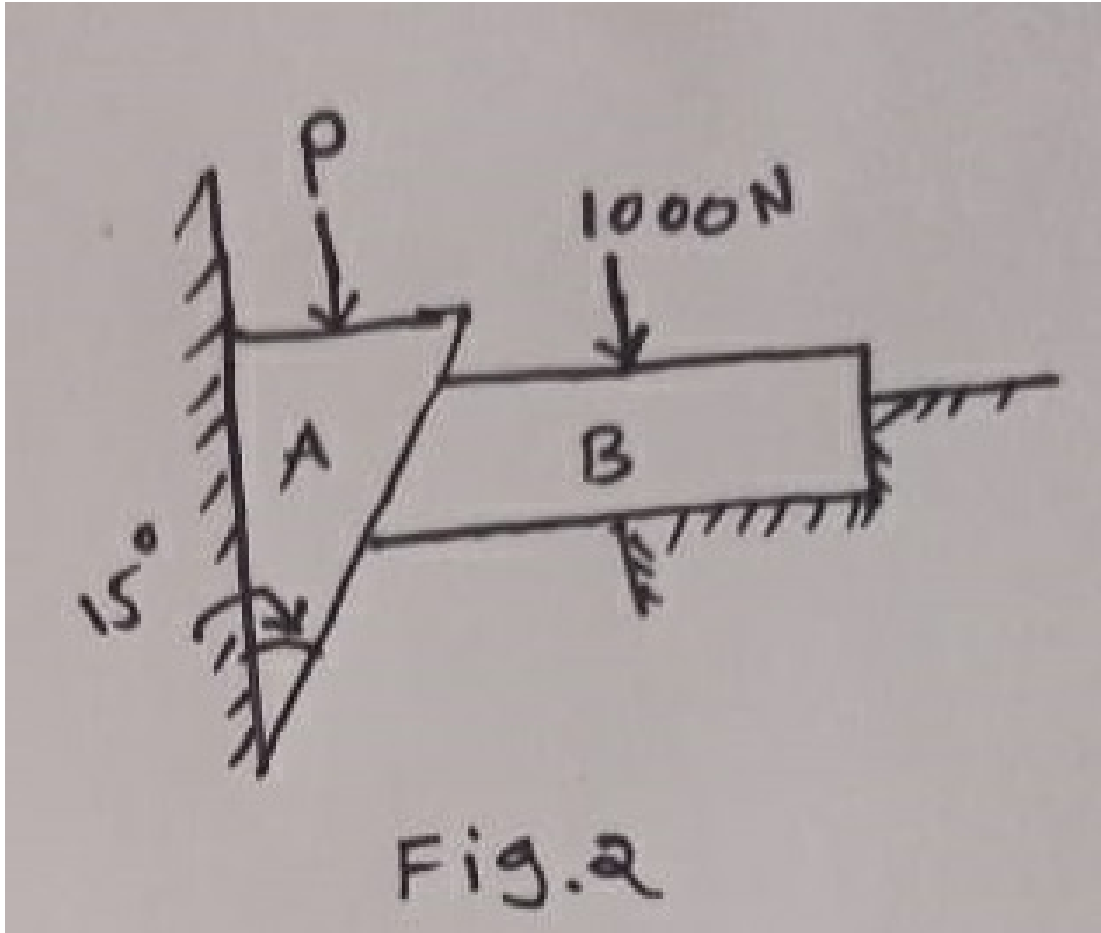
03

(b) State and explain the polygon of forces with neat sketch.

04

(c) A 15° wedge(A) has to be driven for tightening a body(B) loaded with 1000 N weight as shown in Fig.2. If the angle of friction for all the surfaces is 14° , find the force(P), which should be applied to the wedge.

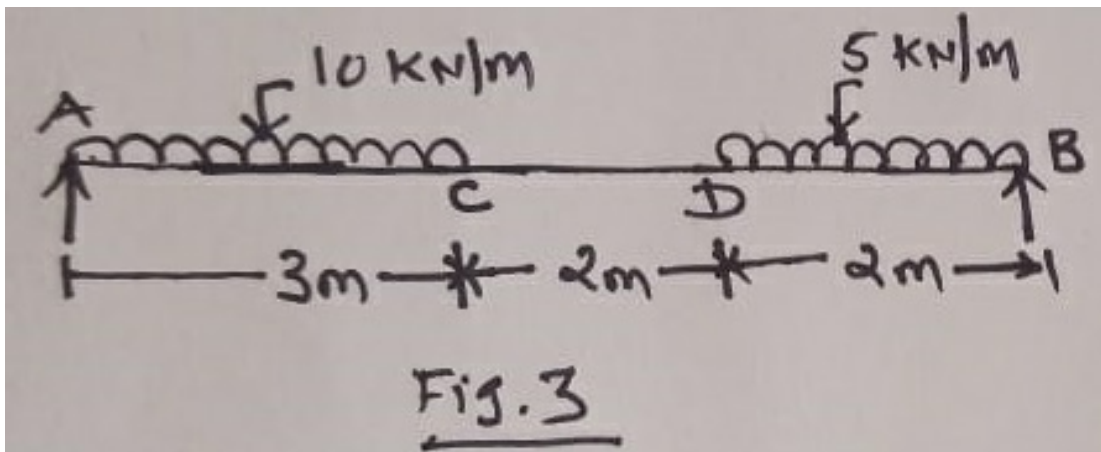
07



OR

(c) Analyse the beam as shown in Fig.3 for shear force and bending moment and draw the neat diagrams.

07

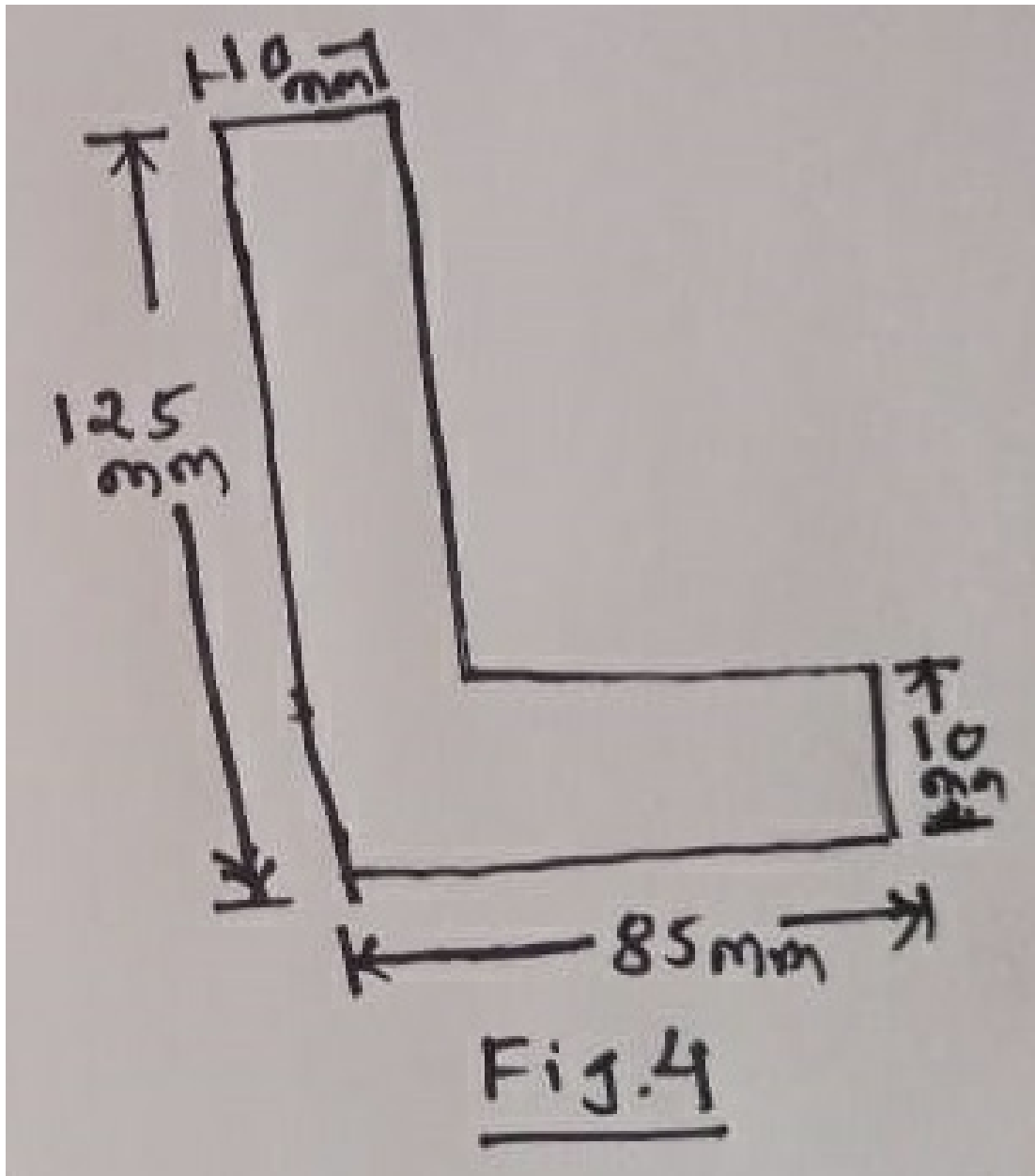


Q.3 (a) Enlist types of beams and types of supports.

03

(b) Determine the center of gravity for plane Fig.4.

04



(c) Determine the moment of inertia for the Fig.4 about X-X and Y-Y axes.

07

OR

(a) Enlist conditions of equilibrium and types of equilibrium.

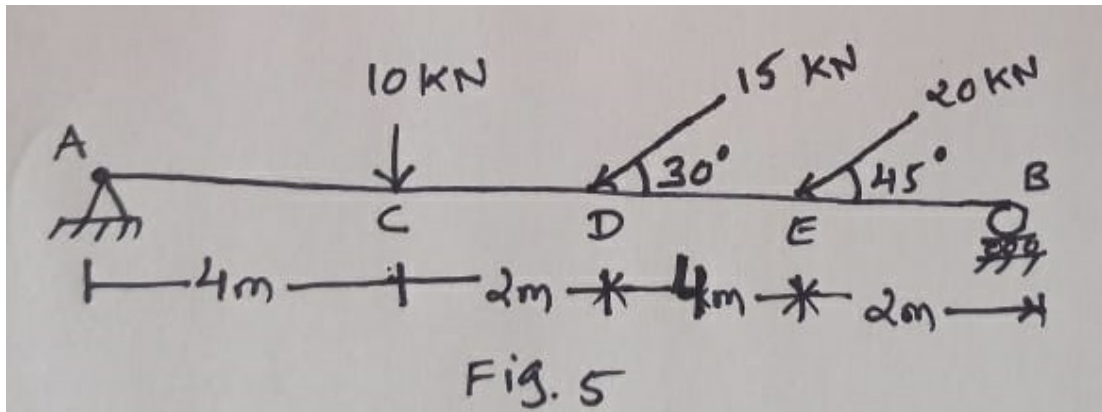
03

(b) State and explain parallel axes theorem.

04

- (c) The beam AB of span 12 m as shown in Fig.5 is hinged at A and is on roller at B. D determine the support reactions developed.

07



- Q.4 (a) State and explain Hook's law.

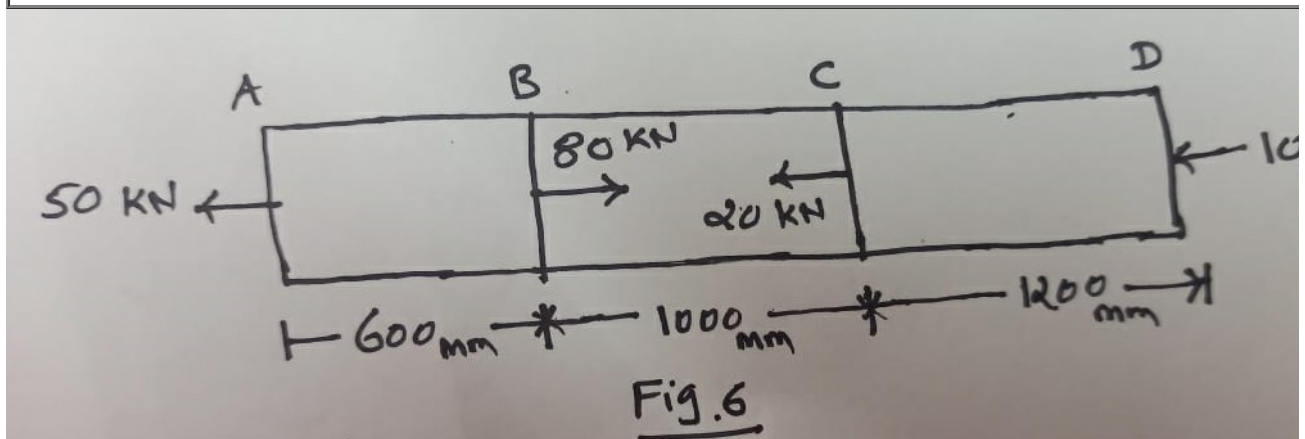
03

- (b) Derive the equation of section modulus(Z) for rectangular and circular section.

04

- (c) A brass bar, having cross sectional area of 1000 mm^2 is subjected to axial force as shown in Fig.6. Find the total elongation of the bar. Take $E = 1.05 \times 10^5 \text{ N/mm}^2$.

07



OR

- (a) Enlist types of stresses generated in deformable body.
- (b) Write the assumptions made in the theory of simple bending of beam.
- (c) A square beam 20 mm x 20 mm in section and 2m long is supported at the ends. The beam fails when a point load of 400 N is applied at the center of beam. What uniformly distributed load per meter length will break a cantilever of same material 40mm wide, 60mm deep and 3m long?

03

04

07

- Q.5 (a) Define, (1) Poisson's ratio (2) Bulk modulus (3) Modulus of rigidity.

03

- (b) A tensile test was conducted on a mild steel bar. Following data was obtained from the test (1) Diameter of mild steel bar = 30mm (2) Gauge length of bar = 200mm (3) Load at elastic limit = 250 kN (4) Extension at a load of 150 kN is 0.21mm. Determine (a) The Young's modulus (b) The stress at elastic limit.

04

- (c) Write the steps to draw Mohr Circle for stress condition with two normal stresses and one tangential stress.

07

OR

- (a) Discuss about the brittle materials and ductile materials.

03

- (b) Explain about the thermal stress induced in deformable bodies. 04
- (c) A rod is 2m long at a temperature of 100 C. Find the extension of rod, when the temperature is raised to 800 C. If this expansion is prevented, find the stress induced in the material of rod. Take $E = 1.0 \times 10^5 \text{ N/mm}^2$. $\alpha = 0.000012$ per degree centigrade. 07
