

Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 3 – EXAMINATION – SUMMER 2026

Subject Code: 3132005

Date: 24/06/2026

Subject Name: Engineering Mechanics

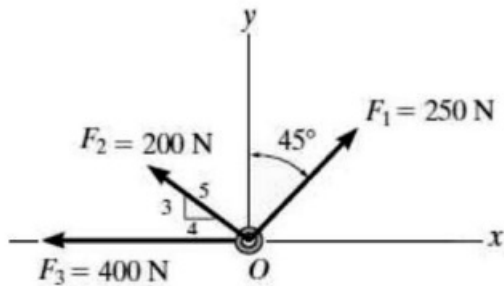
Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions:

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

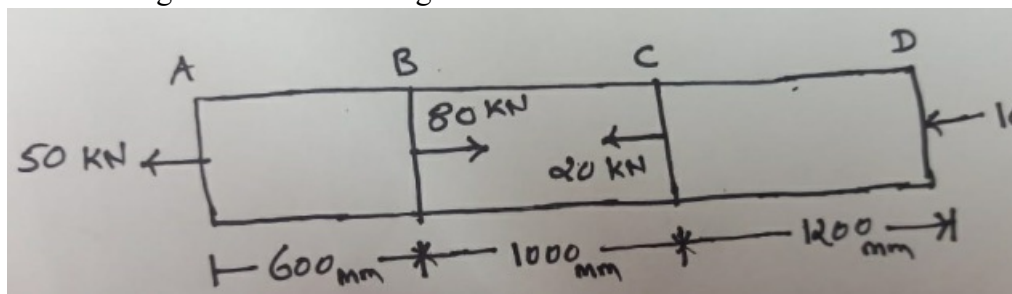
- Q.1** (a) Define 1) Poisson's ratio, 2) bulk modulus, 3) modulus of rigidity 03
- (b) A copper bar is 0.8 m long and it can expand by 0.48 mm under thermal expansion. Will any stress be generated if temperature is increased to 40°C from current temperature 24°C? $\alpha_c = 16 \times 10^{-6} / ^\circ\text{C}$, $E = 100 \text{ GPa}$ 04
- (c) Find magnitude and direction of resultant of force system shown in fig. 07



- Q.2** (a) Explain pure bending. 03
- (b) Define 1) static friction 2) kinetic friction 3) cone of friction 4) angle of repose. 04
- (c) 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. 07

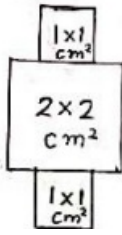
OR

- Q.2** (c) A brass bar, having cross sectional area of 1000 mm^2 is subjected to axial force as shown in Fig. Find the total elongation of the bar. Take $E = 1.05 \times 10^5 \text{ N/mm}^2$ 07



- Q.3** (a) give the difference between centroid and center of gravity. 03
- (b) Determine the centroid of a triangular area using the first principle method 04

- (c) Calculate moment of inertia with respect to X axis passing through the center of the section shown in fig 07



OR

- Q.3** (a) Explain Parallel axis theorem. 03
 (b) Explain shear stress distribution for rectangular section with help of formula 04
 (c) Determine the moment of inertia of a composite section using the parallel axis theorem & also derive the expression for the moment of inertia of a circular section about its diameter. 07
- Q.4** (a) Define Point of Contraflexure 03
 (b) Draw SFD and BMD for a simply supported beam carrying a central point load. 04
 (c) Find the depth of simply supported beam having UDL of 50 kN/m throughout its 8 m long span. Width of beam is 150 mm and maximum stress allowed by the material is 100 N/mm^2 07

OR

- Q.4** (a) What is the significance of shear stress in beam design? 03
 (b) Determine the location and magnitude of maximum bending moment for a simply supported beam carrying :Point load, Uniformly distributed load 04
 (c) A steel bar is 900 mm long; its two ends are 40 mm and 30 mm in diameter and the length of each rod is 200 mm. The middle portion of the bar is 15 mm in diameter and 500 mm long. If the bar is subjected to an axial tensile load of 15 kN, find its total extension. Take, $E = 200 \text{ GN/m}^2$. 07
- Q.5** (a) Explain Hooke's Law and its limitations. 03
 (b) Define Young's Modulus, Bulk Modulus, Modulus of Rigidity, and Poisson's Ratio. Derive the relationship 04
 (c) Write the steps to draw Mohr circle for stress condition with two normal stresses and one tangential stress. 07

OR

- Q.5** (a) Define yield stress and ultimate stress. explain with example. 03
 (b) What is the significance of principal stresses in engineering design? explain with example 04
 (c) Analyse the beam as shown in Fig for shear force and bending moment and draw the neat diagrams. 07

