Name :.....
Roll No:.....

MAR ATHANASIUS COLLEGE OF ENGINEERING

(Government Aided Autonomous Institution)
Kothamangalam, Kerala - 686 666
DEPARTMENT OF MECHANICAL ENGINEERING

B24ME1T02 STATICS AND DYNAMICS FOR ENGINEERS

Second Sessional Examination April 2026

Duration: 1 hour and 30 minutes | S2 ME A & B BATCH | Max mark: 40

Part A

1. What is the physical significance of the area moment of inertia? Using this concept, explain why beams are designed to be deeper rather than wider. (CO3) **(3)**

2. Derive the expression for the centroid of a rectangular area of breadth b and height h. (CO3) **(3)**

3. Differentiate Kinematics and Kinetics. (CO4) **(3)**

4. An electric train starting from rest attains a maximum speed of 100 kmph in 20 seconds. Determine the distance covered during this time period. (CO4) **(3)**

Part B

5. Determine the centroid of the structural steel section shown in Fig.1. (CO3) **(7)**

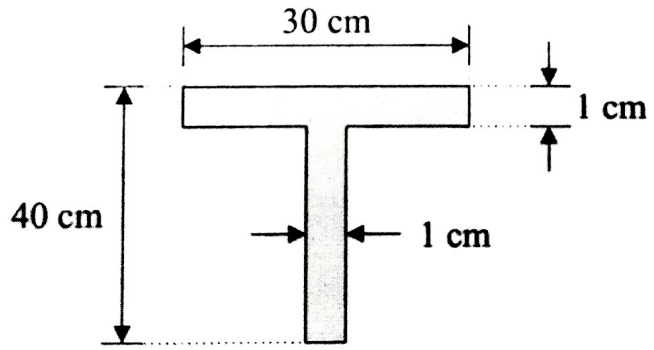
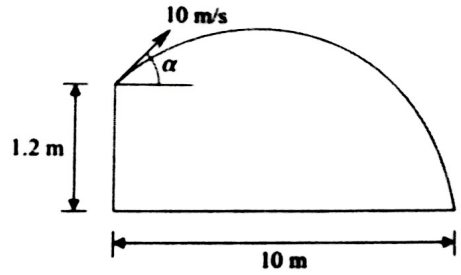


Figure 1: T-section

6. Determine the moment of inertia of the T-section shown in Fig.1 about its centroidal axis and base. (CO3) **(7)**

7. A helicopter used for relief activities drops food packets to the relief camp. If the food packets reach the ground after 3 seconds, determine the height from which they were dropped and the velocity with which they strike the ground. (CO4) **(7)**

8. In a shot-put game, a man throws an iron ball with an initial velocity of 10 m/s. What should be the angle of projection if he has to reach a record of 10 m? Take the height at which the ball is released as 1.2 m. (CO4) **(7)**



Vision

Mentoring to Ensure Excellence

Mission

1. To facilitate comprehensive and integrated development of students by providing quality education that encourages sustainable practices.
2. To mould disciplined and socially committed engineers capable of assuming professional leadership upholding national integrity.

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DEPARTMENT OF MECHANICAL ENGINEERING

B24ME2T01 MECHANICS OF SOLIDS

Second Sessional Examination October 2025

Duration: 1 hour and 30 minutes | S3 ME A BATCH | Max mark: 40

Part A

(1) When a circular shaft is subjected to torsion, what type of stress is induced in an element of the shaft? Draw the distribution of this stress across the cross-section of the shaft.(CO3) **(3)**

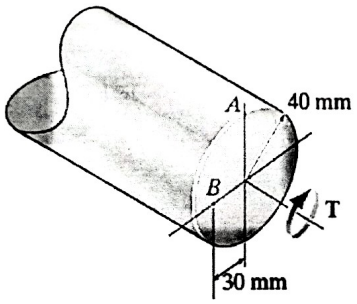
(2) Which one do you recommend for power transmission, hollow or solid shaft? Justify. (CO3) **(3)**

(3) Explain how the slenderness ratio influences the failure mode of columns. (CO3) **(3)**

(4) Draw the shear force and bending moment diagrams for a simply supported beam with a central point load. (CO4) **(3)**

Part B

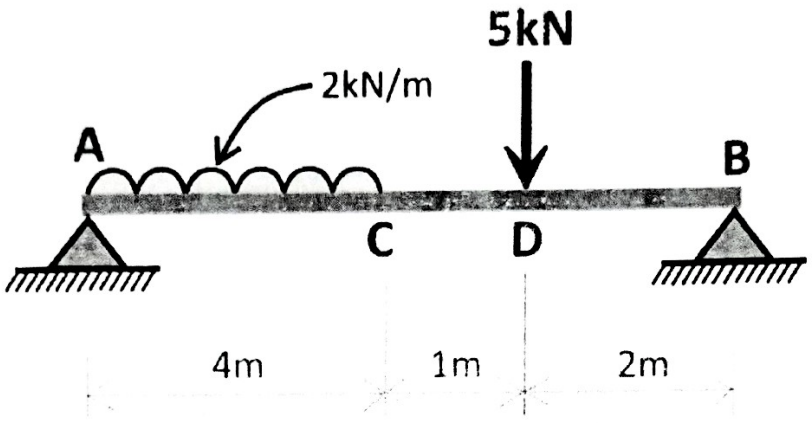
(1) a. The solid circular shaft is subjected to an internal torque of T = 5 kNm. Determine the shear stress developed at points A and B. Represent each state of stress on a volume element. (CO3) **(7)**



b. Compare the strength of a hollow shaft and a solid shaft of the same material and weight subjected to torsion.(CO3) **(7)**

(2) a. Determine the buckling load of a solid round bar, which has a length of 5 m and a diameter of 70 mm. The modulus of elasticity is given as $E = 2.0 \times 10^5 N/mm^2$. Calculate the effective length in each case.
(i) When the column is fixed at one end while free at the other end.
(ii) When the column is fixed at both ends.
(iii) When the column is fixed at one end and hinged at the other end.(CO3) **(7)**

b. For the simply supported beam shown, find the support reactions, and draw the shear force and bending moment diagrams.(CO4) (7)



(7)

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