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)**

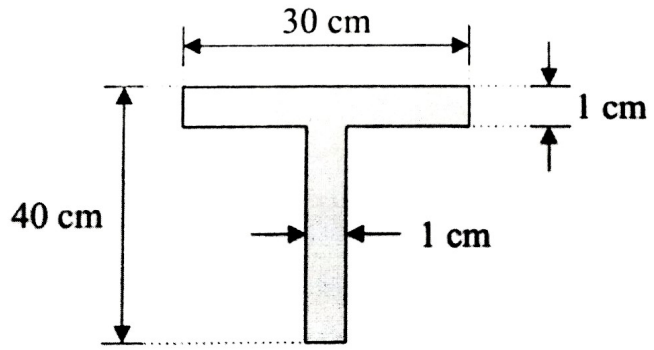
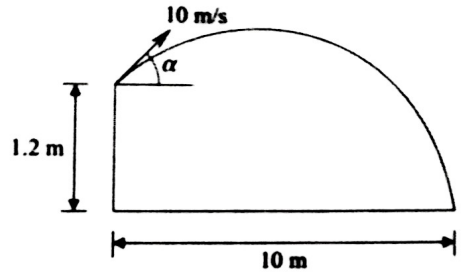


Figure 1: T-section

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

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2. To mould disciplined and socially committed engineers capable of assuming professional leadership upholding national integrity.

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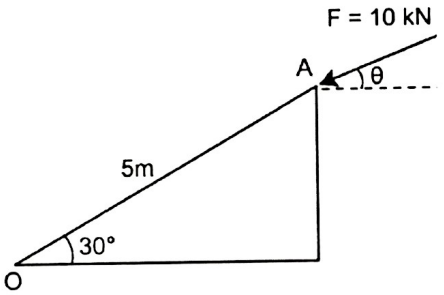
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Part A

1. Explain the Principle of Transmissibility. Why is it valid only for rigid bodies? (CO1) **(3)**

2. Calculate the moment of the force about O. A force $F = 10\,\text{kN}$ is acting at point A as shown in the figure when the angle $\theta = 0°$, $\theta = 30°$, and $\theta = 90°$. (CO1) **(3)**

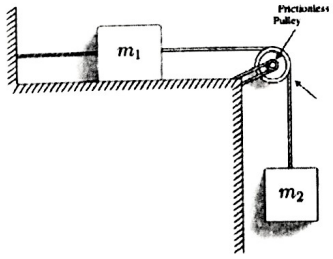


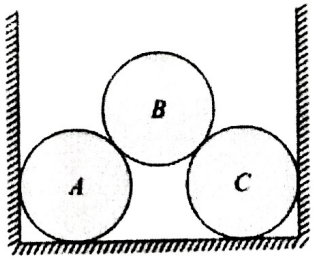
3. Explain the concept of angle of repose and show how it is used to determine the coefficient of friction between two surfaces. (CO2) **(3)**

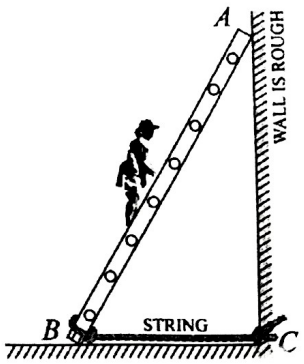
4. Explain the stability of a plane truss with a suitable example. (CO2) **(3)**

Part B

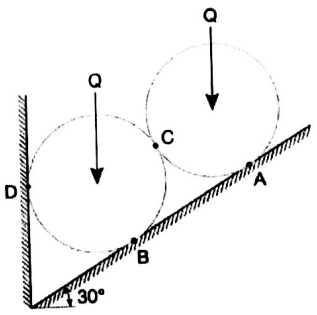
5. Draw the free-body diagram (FBD) of the system shown in the Figure. (CO1) **(7)**



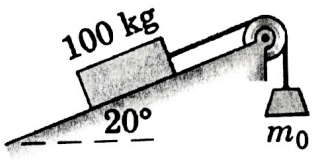




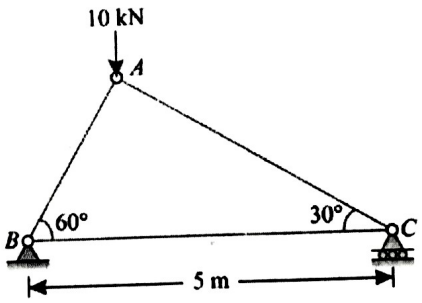
6. Two identical rollers, each with a weight of Q = 500 N, are supported by an inclined plane and a vertical wall, as shown in the figure. Assuming smooth surfaces, find the reactions induced at the points of support A, B, C and D. (CO1) (7)



7. Determine the range of values which the mass m_0 may have so that the 100-kg block shown in the figure will neither start moving up the plane nor slip down the plane. The coefficient of static friction for the contact surfaces is 0.30 (CO2) (7)



8. The truss ABC shown in Figure is carrying a load of 10 kN at its apex. Find the forces in the members AB, AC and BC and indicate whether the members are in tension or compression. (CO2) (7)



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