

Reg No :

Name :

**MAR ATHANASIOUS COLLEGE OF ENGINEERING, KOTHAMANGALAM**

(Govt. Aided Autonomous Institution)

Second Semester B.Tech. Degree Examination, May, 2026

Course Code: B24ME1T02

Course Name: STATICS AND DYNAMICS FOR ENGINEERS

Max. Marks: 100

Duration:3 Hours

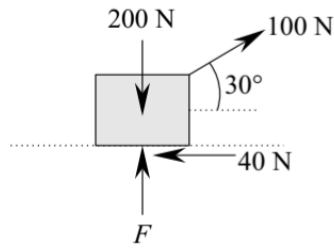
PART - A: 30 Marks (10 Qns x 3 Marks)**Answer all questions**

1. The resultant of the two forces, when they act at an angle of 60° is 14 N. If the same forces are acting at right angles, their resultant is $\sqrt{137}$ N. Determine the magnitude of the two forces.
2. State and prove parallelogram law of forces.
3. What is meant by angle of repose?
4. Discuss about the classification of beams with neat sketches.
5. Define mass moment of inertia and explain its physical significance.
6. State and explain the Parallel Axis Theorem. Illustrate it with a suitable example.
7. Distinguish between rectilinear motion and curvilinear motion with a suitable example.
8. A car moves along a straight road with an initial velocity of 20 m/s. If the car decelerates at a constant rate of 2 m/s^2 , calculate the time required for the car to stop.
9. Calculate the angular velocity of a wheel after 5 seconds if it starts from rest with a constant angular acceleration of 2 rad/s^2 .
10. Show that the energy of a freely falling body is constant.

PART - B: 70 Marks (5 Qns x 14 Marks)**Answer any One full question from each module.****Module 1**

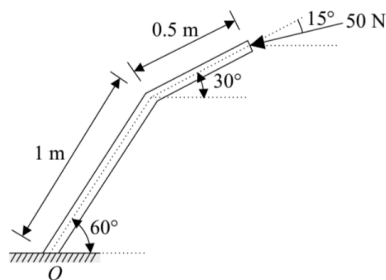
11. The system of forces acting on a block lying on a horizontal plane is shown in the figure. Determine the resultant force if the component of resultant along the y-direction is zero. Also, determine the

unknown force F . Assume all the forces are concurrent at a point.



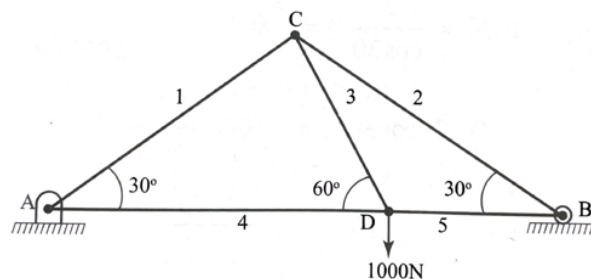
OR

12. Find the moment of a 50 N force applied on a bent handle as shown in the figure about the base O.



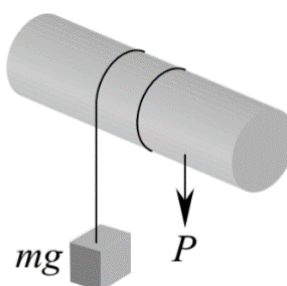
Module 2

13. Calculate the axial forces in each member of the truss shown in the figure. The triangle ACB has equal sides AC and BC, and the angles at A and B are 30° each.



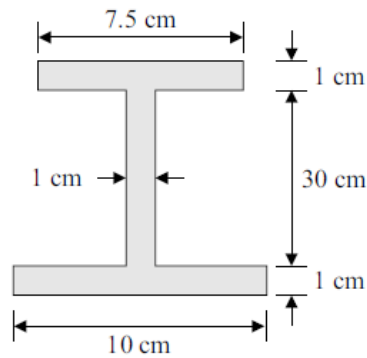
OR

14. A 150 kg block is supported by a rope wrapped $1\frac{1}{2}$ times around a horizontal rod. If the coefficient of static friction between the rope and the rod is 0.16, determine the range of values of P for which equilibrium is maintained.



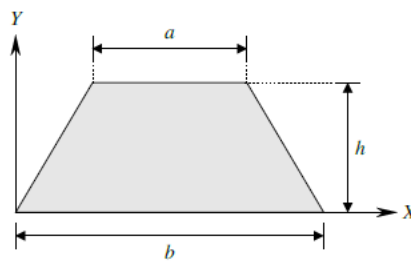
Module 3

15. Determine moments of inertia of the I-section shown in figure about centroidal axes.



OR

16. Find the centroid of the shaded area (trapezium) shown in the figure.



Module 4

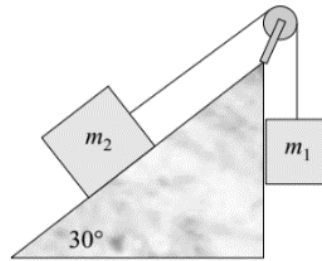
17. A missile is fired with a velocity of 60 m/s at an angle of 45° to the horizontal so as to hit a highrise building at the highest point of its trajectory. If it has to be fired at 60° to the horizontal to hit the same point, determine how much further must it move toward the building.

OR

18. A ball thrown vertically upwards reaches a maximum height of 15 m. If it is thrown at an angle of 60° to the horizontal with the same initial velocity, (i) determine the maximum height reached, (ii) determine the initial velocity of the ball, if it has to reach the same height as when thrown vertically upwards.

Module 5

19. Determine the acceleration of the system of blocks shown in the figure. The coefficient of kinetic friction between block 2 and the inclined plane is 0.2. Also, determine the tension in the string. Take: $m_1=6$ kg, $m_2=8$ kg. Assume the pulley to be massless and frictionless.



OR

20. A block of 10 kg mass rests on a rough horizontal surface, whose coefficient of kinetic friction is 0.2. It is being pulled by a constant force of 50 N magnitude inclined at 30° to the horizontal. Determine the velocity and the distance travelled by the block after 5 seconds.
