

Code No: **R231210**

R23

SET - 1

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM

I B. Tech II Semester Supplementary Examinations Dec-2025/Jan 2026

ENGINEERING MECHANICS

(Common to CE, MECH and AME)

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part A & Part B.
Part A is compulsory, Answer all questions.
In Part B, Answer any one question from each unit.*

PART –A (20 Marks)

1. a) Define coefficient of friction. [2M]
- b) List out different types of force systems. [2M]
- c) Define principle of transmissibility. [2M]
- d) State the triangular law of forces. [2M]
- e) Define centroid and centre of gravity. [2M]
- f) Create the centroidal distances of a sector of radius 'r' [2M]
- g) Differentiate linear and angular momentum. [2M]
- h) Write down the applications to particle motion. [2M]
- i) A force of 100 N acts on a body having a mass of 4 kg for 10 seconds. If the initial velocity of the body is 5 m/sec, determine the acceleration produced in the direction of force and distance moved by the body in 10 seconds. [2M]
- j) Differentiate the kinematics and kinetics. [2M]

PART – B (50 MARKS)

UNIT-I

2. Determine and locate the resultant R of the two forces and one couple acting on the I-beam as shown in figure.1 [10M]

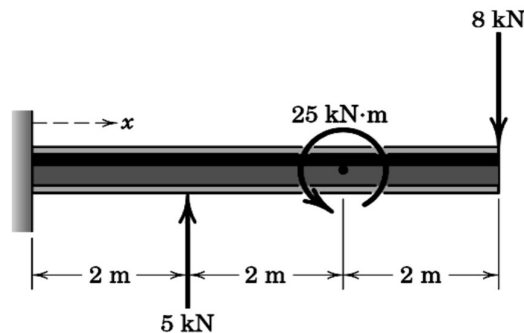


Figure:1

(OR)

3. A ladder 5 meters long rests on a horizontal ground and leans against a smooth vertical wall at an angle 70° with the horizontal. The weight of the ladder is 900 N and acts at its middle. The ladder is at the point of sliding, when a man weighing 750 N stands on a rung 1.5 metre from the bottom of the ladder. Calculate the coefficient of friction between the ladder and the floor. [10M]

UNIT-II

4. Find the forces in the members of a truss as shown in figure.2 [10M]

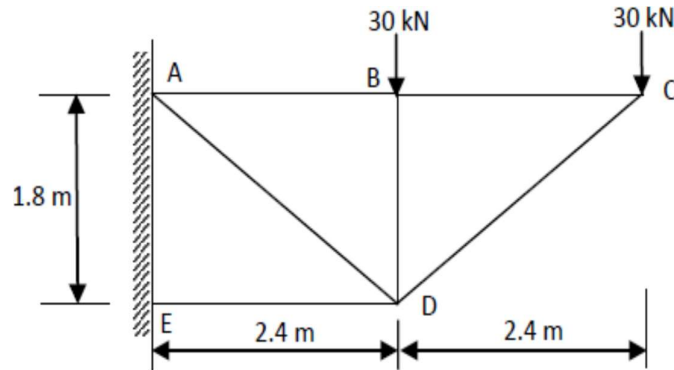


Figure:2

(OR)

5. Two beams AB and CD are shown in figure.3, A and D are hinged supports. B and C are roller supports. Sketch the free body diagram of the beam AB and CD and determine the reactions at the supports A, B, C & D. [10M]

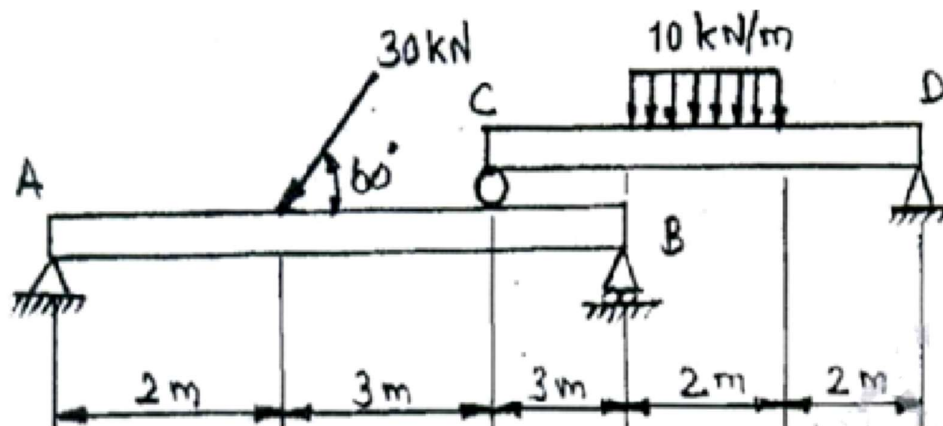


Figure:3

UNIT-III

6. Find the M.I of the given section shown in Figure.4, about the horizontal axis through centre of gravity of the section. [10M]

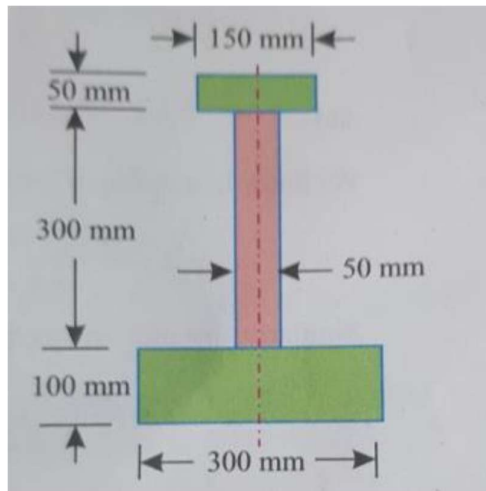


Figure:4

(OR)

7. a) Find out the mass moment of inertia of a right circular cone of base radius R and mass M about the axis of the cone. [5M]
- b) Find the moment of inertia of the area in the given Figure.5, about the axis 'AB' [5M]

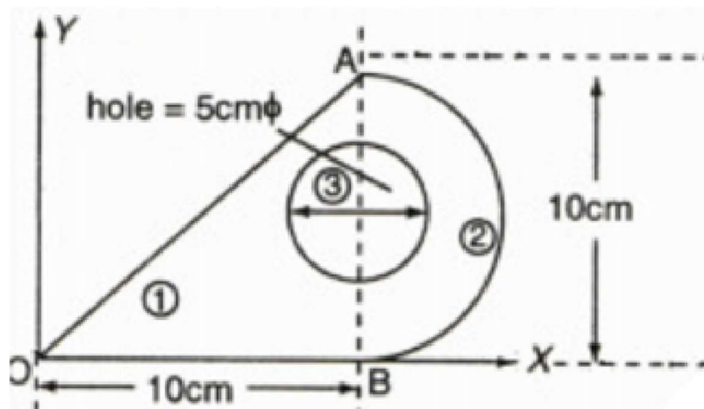


Figure:5

UNIT-IV

8. Two bodies of weights 40N and 25N are connected to the two ends of a light in extensible spring passing over a smooth pulley. The weight of 40N is placed on a rough horizontal surface while the weight of 25N is hanging free in air. The angle of plane is 150° . Determine a) the acceleration of the system b) The tension ($\mu=0.2$) in the string. c) The distance moved by the weight 25N in 3 seconds starting from rest. [10M]

(OR)

9. The driver of a car moving at a constant speed of 18 kmph realizes that if he moves at this speed, he will reach the office late by 10 seconds. Hence, he accelerates at a constant rate of 2m/s^2 so that he reaches the office right in time. Determine the time taken to reach the office and the distance covered during time. [10M]

UNIT-V

10. A train of weight 1800 kN ascends a slope of 1 in 100 with a uniform speed of 40 kmph. If the track resistance is 5 N per kN of superimposed load, find the power spent by the engine. [10M]

(OR)

11. A 10g bullet is shot horizontally in a wood block of mass 1kg. The bullet gets embedded in the block and the block is displaced on a rough horizontal surface of a table with $\mu=0.2$ through 1m. What was the velocity of bullet? [10M]
