Name: **Enrolment No:**	

UPES

End Semester Examination, May 2025

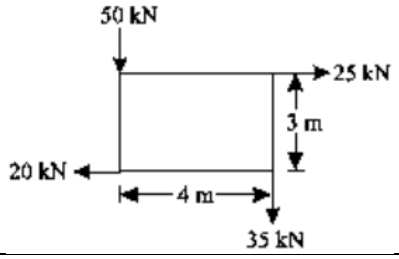
Course: Engineering Mechanics **Semester : II**

Program: B. Tech ASE/AE/FSE/SE/Civil **Time : 03 hrs.**

Course Code: MECH 1002 **Max. Marks: 100**

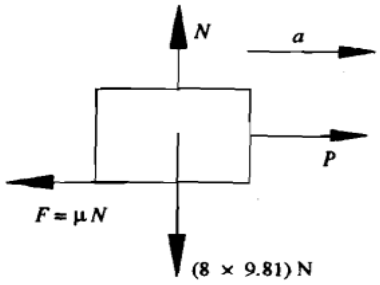
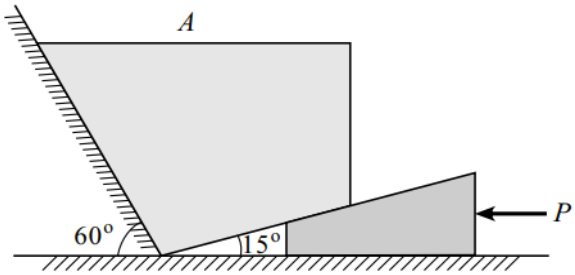
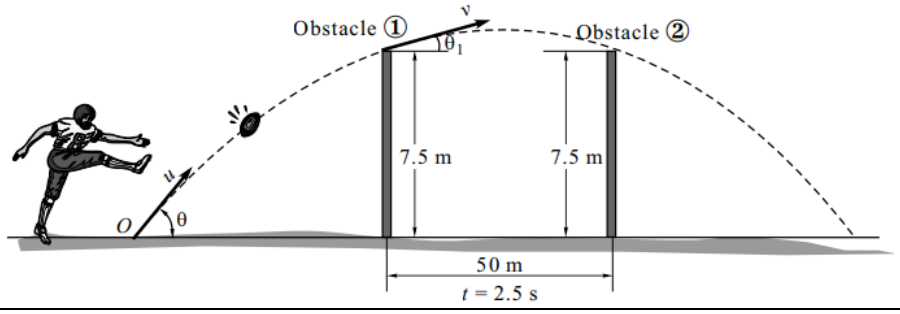
Instructions: Assume data wherever necessary. Show all calculations clearly. Use of a scientific calculator is permitted.

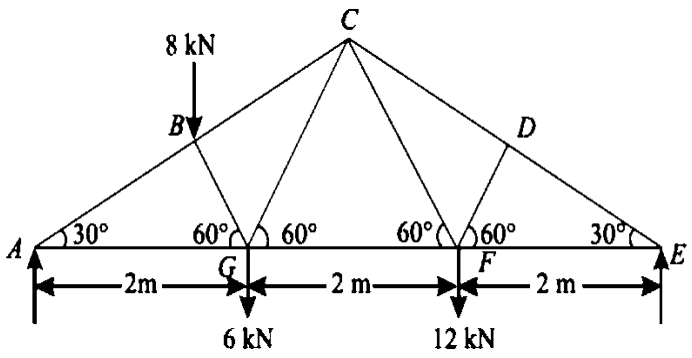
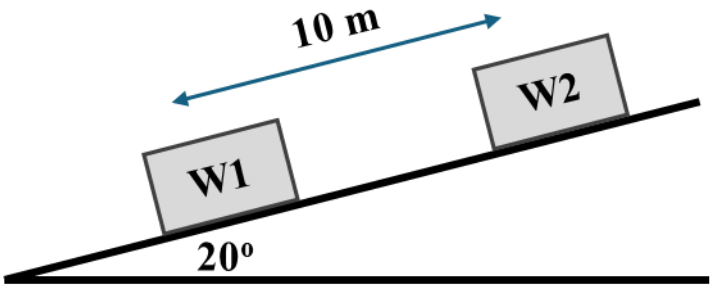
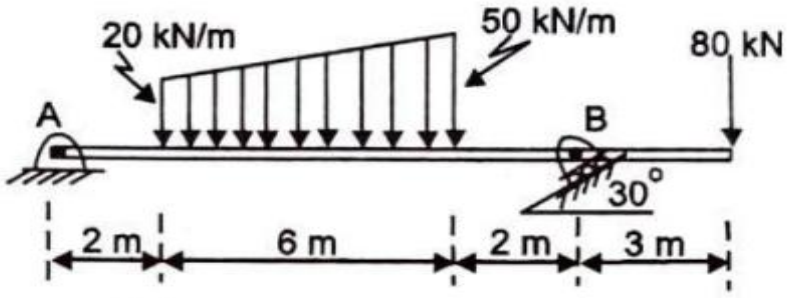
SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	State and prove the parallel axis theorem.	**4**	**CO1**
Q 2	A system of forces is acting at the corners of a rectangular block as shown in the Figure. Determine the magnitude and direction of the resultant force. 	**4**	**CO2**
Q 3	Explain the following: (i) Angle of friction, angle of repose & kinetic friction. (ii) Steps followed in the analysis of the truss by the method of section.	**4**	**CO1**
Q 4	Explain the Cone of Friction with a neat sketch.	**4**	**CO2**
Q 5	State and explain Lami's Theorem.	**4**	**CO1**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Explain the types of beams and types of loads acting on a beam with the help of a neat sketch.	**10**	**CO2**
Q 7	Determine the time required for a car to travel 1 km along a road if the car starts from rest, reaches a maximum speed at some intermediate point, and then stops at the end of the road. The car can accelerate or decelerate at 1.5 m/s^2.	**10**	**CO3**
Q 8	A particle having a mass of 8 kg starts from rest and attains a speed of 1.5 m/sec at a horizontal distance of 10 m. Assuming a coefficient of friction of 0.2 and uniformly accelerated motion, what is the smallest	**10**	**CO3**

	value of a constant horizontal force P that may be required to get this motion? Refer to the figure given below.  		
Q 9	Determine the force P required to move the block A of 5000 N weight up the inclined plane. The coefficient of friction between all contact surfaces is 0.25. Neglect the weight of the wedge, and the wedge angle is 15 degrees.  **OR** An object is projected so that it must clear two obstacles, each 7.5 m high, which are situated 50 m from each other, as shown in Fig. If the time of passing between the obstacles is 2.5 s, calculate the complete range of projection and the initial velocity of projection.  	**10**	**CO4**
SECTION-C (2Qx20M=40 Marks)			
Q 10	Evaluate the forces in all the members of the truss and state whether the force in member is tension/compression.	**20**	**CO4**

			
Q 11	Two bodies directly in line and 10 m apart are held stationary on an inclined plane having an inclination of 20°. The coefficient of friction between the plane and the lower body is 0.08, and that between the plane and the upper body is 0.05. If both bodies are set in motion at the same instant, calculate the distance through which each body travels before they meet together.  **OR** For the beam loaded as shown in the Figure, calculate support reactions at A and B. 	**20**	**CO3**