Name: **Enrolment No:**	

UPES

End Semester Examination, May 2024

Course: Engineering Mechanics **Semester: II**

Program: B. Tech ASE, B. Tech ADE, B. Tech FSE,
B. Tech Civil and B. Tech Mechanical

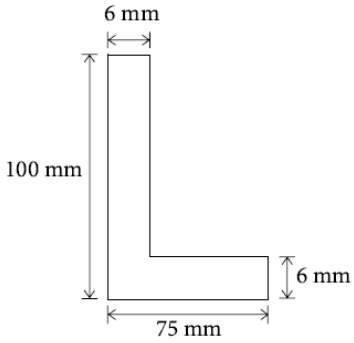
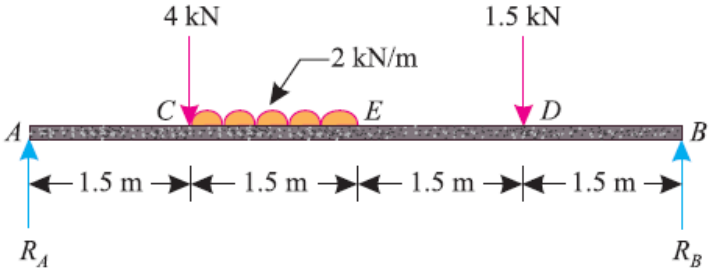
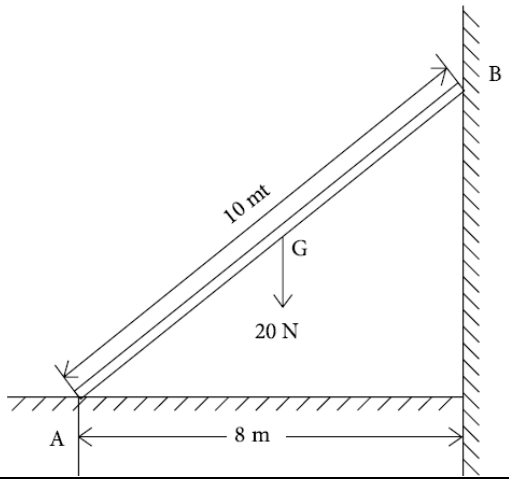
Time : 03 hrs.

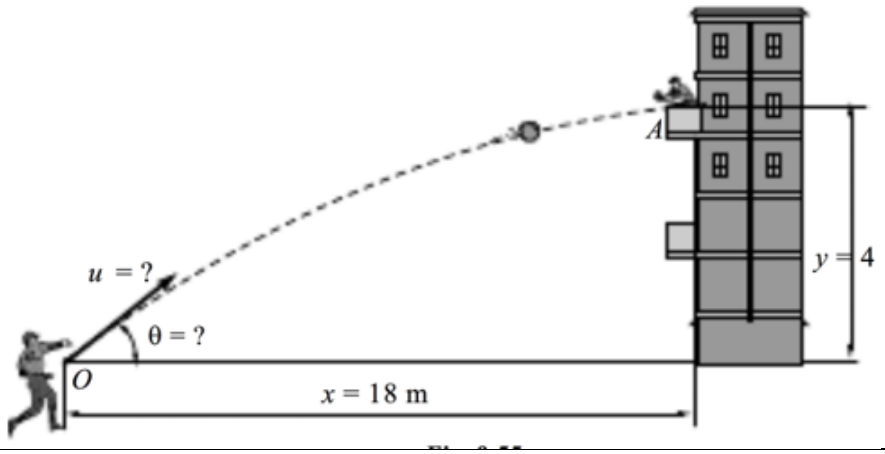
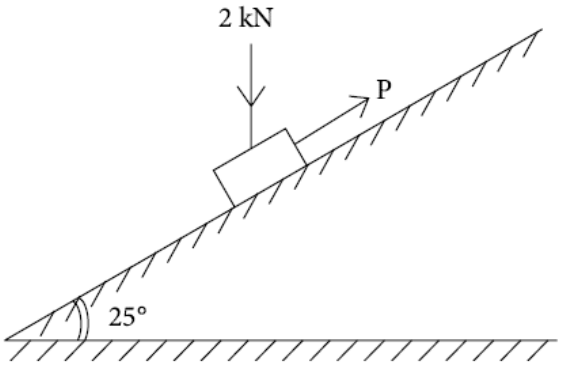
Course Code: MECH 1002 **Max. Marks: 100**

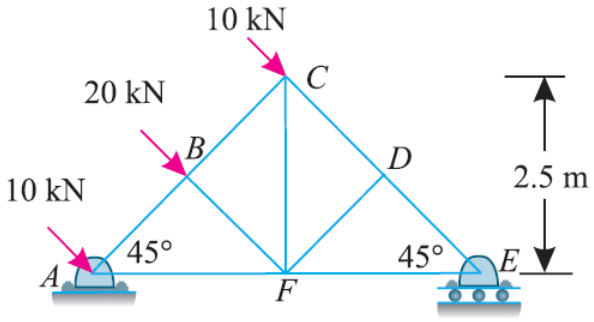
Instructions: Assume any suitable value for the missing data

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	**True/False**. a) If the sum of forces is zero and the sum of moments about the origin O is zero, then the system is in equilibrium. b) The resultant of concurrent forces has no moment about the concurrent point.	**4**	**CO1**
Q2	**True/False**. a) There is the application of Newton's third law of motion in the free body diagrams of friction calculations. b) The normal forces and the forces of friction are collinear.	**4**	**CO1**
Q3	**True/False**. **a)** Moment of Inertia is the integration of the square of the distance of the centroid and the del area along the whole area of the structure. **b)** The parallel axis theorem can add any angle varied moment of inertias to give the perpendicular moment of inertia.	**4**	**CO1**
Q4	What do you understand by the term 'acceleration ? Define positive acceleration and negative acceleration.	**4**	**CO2**
Q5	At what angle, the projectile should be projected in order to have maximum range ? Justify your answer by calculations.	**4**	**CO2**

SECTION B **(4Qx10M= 40 Marks)**			
Q 6	Determine moment of inertia of the below cross section (L- section) about its centroidal axis XX and YY  	**10**	**CO2**
Q7	A simply supported beam, AB of span 6 m is loaded as shown in Figure. Determine the reactions R_A and R_B of the beam.  	**10**	**CO2**
Q8	A uniform ladder of length 10 m and weighting 20 N is placed against a smooth vertical wall with its lower end 8m from the wall as shown in Figure. In this position the ladder is just to slip. Determine: (i) Co-efficient of friction between the ladder and the floor. (ii) Frictional force acting on the ladder at the point of contact between ladder and floor.  	**10**	**CO3**

Q9	A ball is thrown by a boy in the street is caught by another boy on a balcony 4 m above the ground and 18 m away after 2 sec. Calculate the initial velocity and the angle of projection. 	**10**	**CO3**
	SECTION-C **(2Qx20M=40 Marks)**		
Q10	i) A car starts from rest and accelerates uniformly to a speed of 72 km.p.h. over a distance of 500 m. Find acceleration of the car and time taken to attain this speed. If a further acceleration rises the speed to 90 km.p.h. in 10 seconds, find the new acceleration and the further distance moved. ii) A block of 2 kN is placed on an inclined plane and pulled by a force P as shown in the Figure. If block attains a velocity of 6 m/sec in 4 sec and kinetic friction between contact surfaces is 0.24 then determine force P causing motion by using D'Alembert's principle. 	**20**	**CO3**
Q11	Draw the free body diagram of above truss and find out the support reactions. Find out force in the all members using method of joints and state whether the force in member is tension/compression .	**20**	**CO3**



OR

Draw the free body diagram of above truss and find out the support reactions. Find out force in the all members using method of joints and state whether the force in member is tension/compression