Name:

Enrolment No:

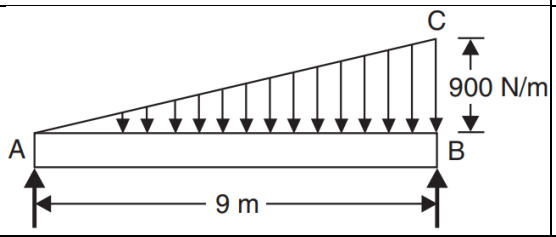
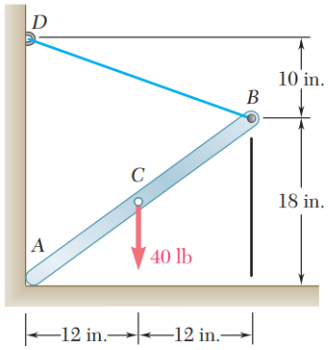
UPES

End Semester Examination, December 2023

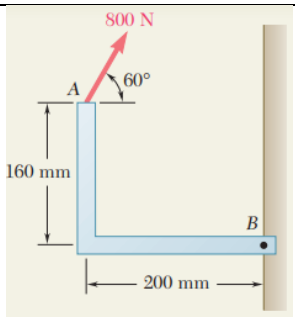
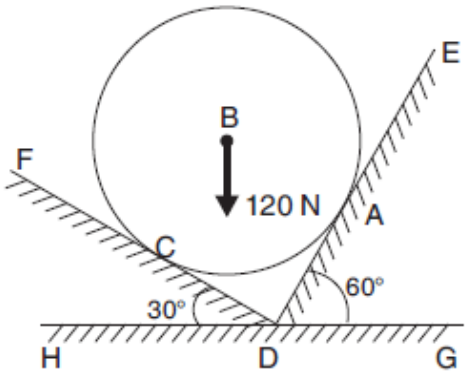
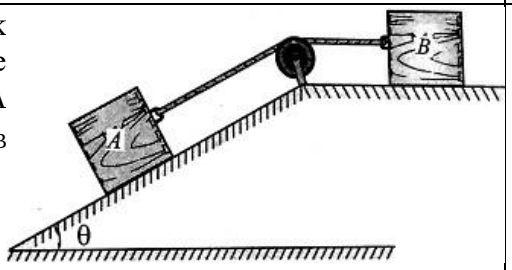
Course:	**Engineering Mechanics**	**Semester**	**: 3rd SEM**
Program:	**B. Tech (Fire and Safety Engineering)**	**Time**	**: 03 hrs.**
Course Code:	**MECH2032**	**Max. Marks**	**: 100**

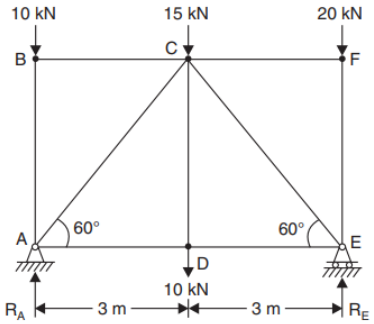
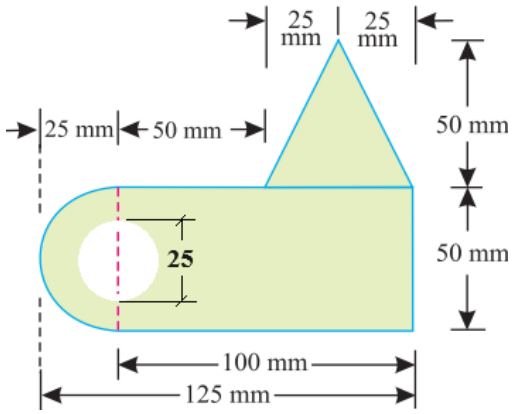
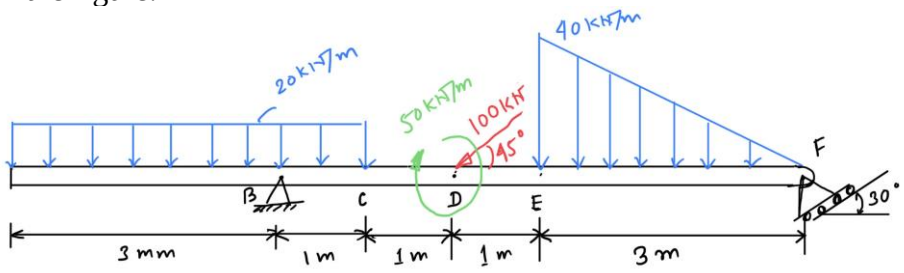
Instructions:
Attempt all questions. One question from section C has an internal Choice. Assume any missing data if required.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	(a) Differentiate perfect frame and imperfect frame. (b) list the assumptions made in finding out the axial forces in a frame.	**2** **2**	**CO1**
Q 2	(a) Define Moment of a force and Couple. (b) Differentiate between Truss and Frame.	**2** **2**	**CO1**
Q 3	A simply supported beam of span 9 m carries a uniformly varying load from zero at end A to 900 N/m at end B. Calculate the reactions at the two ends of the support. 	**4**	**CO2**
Q4	Draw the Free Body diagram for Bar AB. 	**4**	**CO2**
Q 5	A scooter starts from rest and moves with a constant acceleration of 1.2 m/s^2. Determine its velocity, after it has travelled for 60 meters.	**4**	**CO1**

SECTION B
(4Qx10M= 40 Marks)

Q 6	(a) Discuss Coulomb's Laws of Friction. (b) A force of 800 N acts on a bracket as shown. Determine the moment of the force about B. 	**5** **5**	**CO1**
Q 7	A ball weight 120 N rests in a right-angled groove, as shown in Fig. The sides of the groove are inclined to an angle of 30° and 60° to the horizontal. If all the surfaces are smooth, then determine the reactions at the points of contact. 	**10**	**CO1**
Q 8	A bomb is dropped on an enemy post by an airplane flying with a horizontal velocity of 60 km/ hr and at a height of 490 m. How far the airplane must be from the enemy post at time of dropping the bomb so that it may directly hit the target?	**10**	**CO3**
Q 9	Find the value of 'θ' if the block 'A' and 'B' shown in have impending motion. Given block A = 20 kg, block B = 20 kg, $\mu_A = \mu_B = 0.25$. 	**10**	**CO2**
SECTION-C (2Qx20M=40 Marks)			
Q 10	A truss is shown in Fig. Find (a) The reaction at the supports. (b) The forces in all the members of the truss and indicate it is in tension or Compression.	**20**	**CO3**

			
Q11	A uniform lamina shown in Fig. Determine the centre of gravity of the lamina. All dimensions are in mm.  Or Find the support reactions for the beam loaded and supported as shown in the figure. 	**20** **20**	**CO2**