Name: Enrolment No:	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

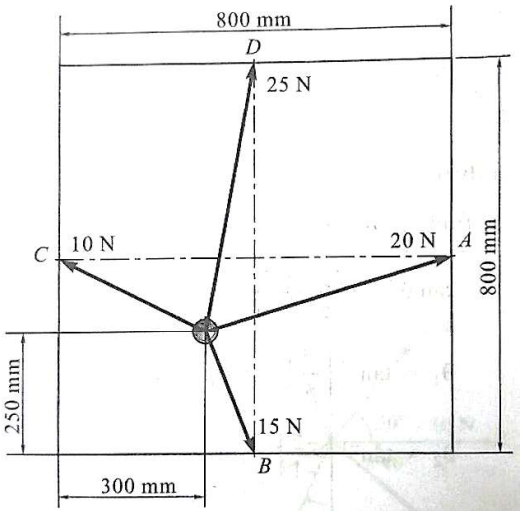
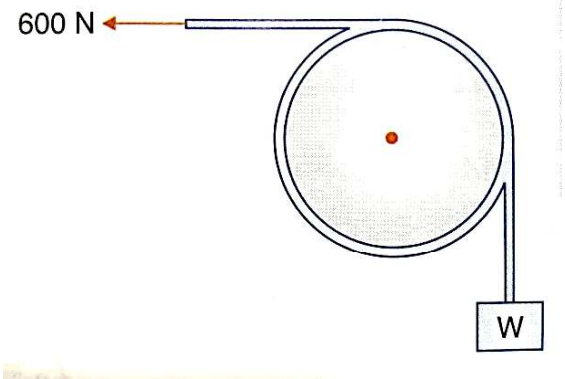
End Semester Examination, December 2019

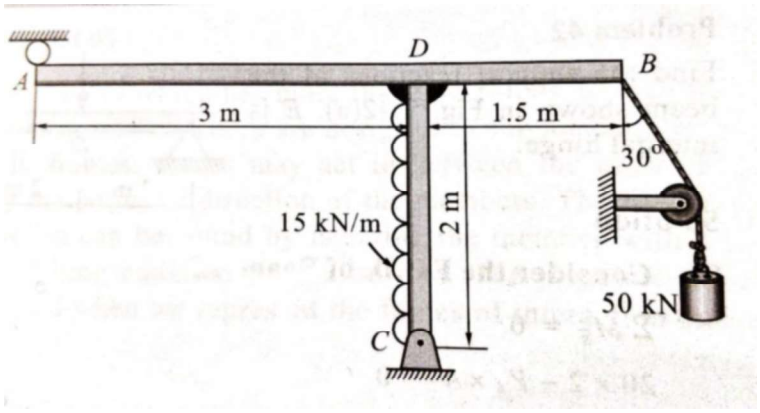
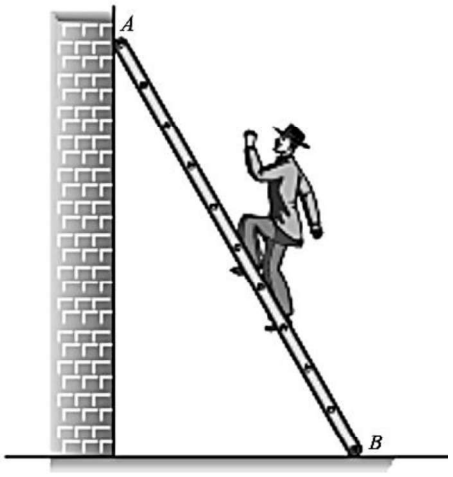
Course: Engineering Mechanics **Semester: III**

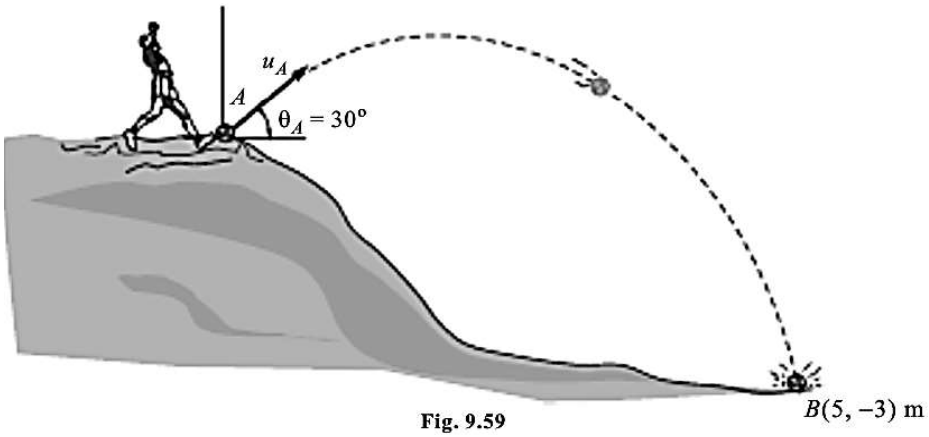
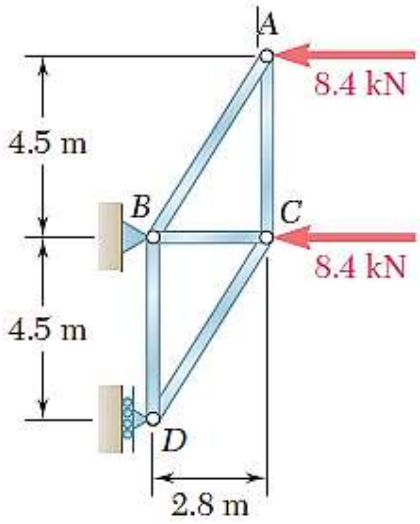
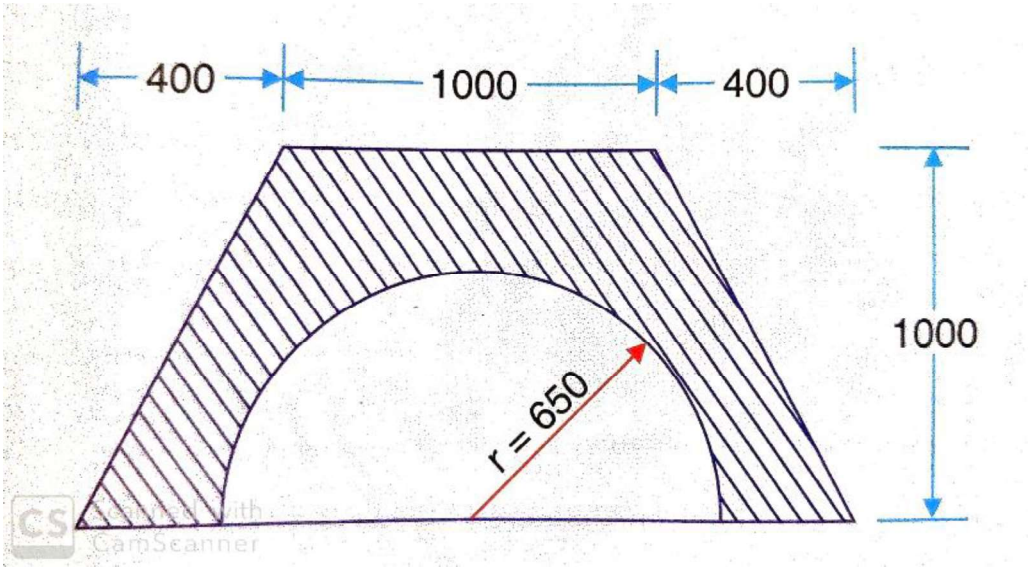
Program: B.Tech ADE, ASE, ASE+AVE, ECE, FSE **Time 03 hrs.**

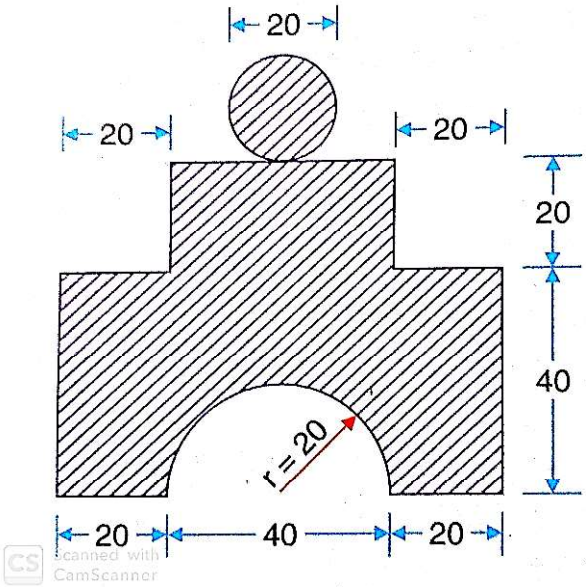
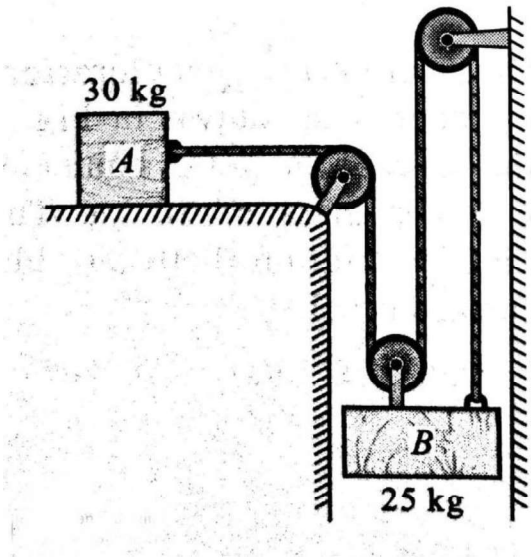
Course Code: MECH1002 **Max. Marks: 100**

SECTION A

S. No.	Statement of Question	Marks	CO
1	The striker of carom board laying on the board is being pulled by four players as shown in Fig. The players are sitting exactly at the centre of the four sides. Determine the resultant of forces and the direction of resultant. 	5	CO1
2	A rope making $1\frac{1}{4}$ turns around a stationary horizontal drum is used to support a weight W. If the coefficient of friction is 0.3, Identify the range of values of weight that can be supported by exerting a 600N force at the other end of the rope. 	5	CO1
3.	Prove that the centroid of a quarter circle of radius R is given by $\left[\frac{4R}{3\pi}, \frac{4R}{3\pi}\right]$ using integration method.	5	CO2

4.	A stone is dropped from a height. After falling 5s from rest, the stone breaks the glass window and in breaking, the stone loses 20% of its velocity. Find the distance travelled by the stone in the next second.	**5**	**CO3**
	SECTION B (Q7 has an option)		
5.	For the beam shown in the Fig. Determine the support reactions at A and C. 	**10**	**CO1**
6.	A uniform ladder weighing 100N and 5m long is resting as shown in fig. The inclination of the ladder with horizontal is 60°. If the coefficient of friction at all surfaces of contact is 0.25, locate the distance up along the ladder a man weighing 600N can ascent without causing it to slip. 	**10**	**CO2**
7.	A projectile is aimed at a mark on a horizontal plane falls 12m short when the angle of projection is 15^0, while it overshoots the mark by 24m when the angle of projection is 45^0. Find the angle of projection to hit the mark. **OR** A ball at A is kicked such that $\theta_A = 30^o$. The point B where it strikes the ground has co-ordinates (x,y) = (5,-3)m. Determine the speed at which it is kicked and the velocity at which it strikes the ground.	**10**	**CO3**

	 **Fig. 9.59**		
8.	Determine the forces in the Truss as shown in Fig using method of joints 	**10**	**CO2**
	SECTION-C (Q9 has an option)		
9.	Find the area moment of Inertia of shaded portion as shown in the fig about centroidal x-axis and y-axis. All the dimensions are in mm.  **OR**	**20**	**CO2**

	Find the area moment of inertia of the shaded portion as shown in fig. about centroidal horizontal and vertical axis. All the dimensions are in mm.  Scanned with CamScanner		
10.	The two blocks shown in the fig are originally at rest .Determine the acceleration of each block and the tension in the cable. Assume the pulleys to be massless and frictionless.  	**20**	**CO3**