ACE Engineering College
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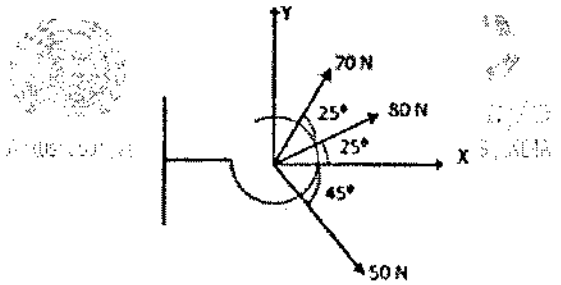
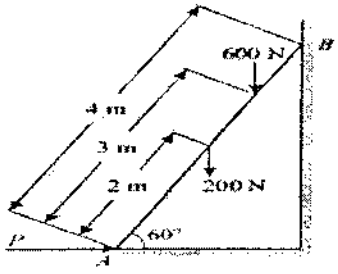
Question Paper Code: ME203ES | ACE-R20

Semester End Examination
I B. Tech- II Semester Supply - JUNE-2022
ENGINEERING MECHANICS
(Common to CE, MECH)

Time: 3 Hours **Max. Marks: 70**

H. T. No										

Answer any 5 Questions out of 8 Questions from the following

Q.No	Question	Marks
1. a)	Find the magnitude of forces F_1 and F_2 if they act at right angle, their resultant is $\sqrt{34}$ N. If they act at 60^0, their resultant is 7 N.	7
b)	Determine the resultant of three forces acting on hook as shown in fig.1  **Fig.1**	7
2. a)	A ladder of length 4 m, weighing 200 N is placed against a vertical wall as shown in Fig.2 The coefficient of friction between the wall and the ladder is 0.2 and that between floor and the ladder is 0.3. The ladder, in addition to its own weight, has to support a man weighing 600 N at a distance of 3 m from A. Calculate the minimum horizontal force to be applied at A to prevent slipping.  **Fig.2**	7
b)	The cylinders P and Q weigh 20kN and 10kN respectively. The corresponding diameters are 2.8m and 1.6m as shown in figure3. Determine the reactions at A, B, C and D.	7

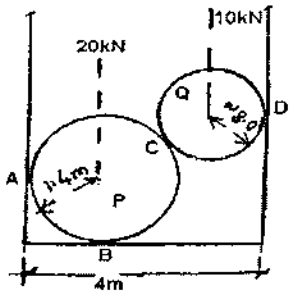


Fig.3

3. a)	For the plane area as shown in Fig.4, determine the location of centroid	7

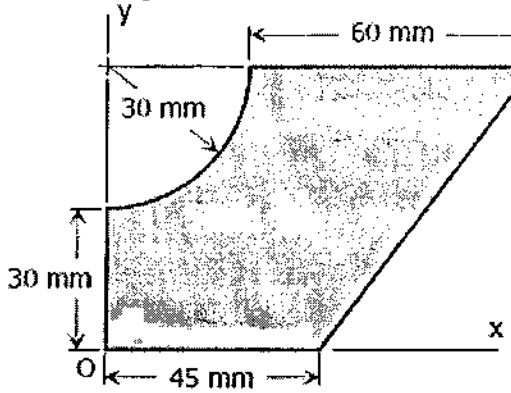


Fig.4

b)	Locate the centroid of given plane area as shown in Fig.5.	7

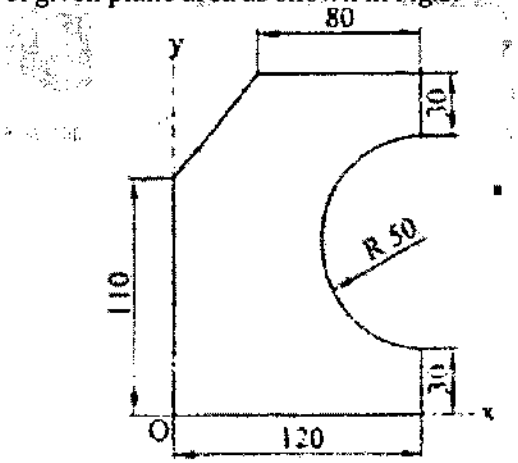


Fig.5

4. a)	Find the area moment of inertia of a T-section shown in Fig.6 about its centroidal X-X axis.	7

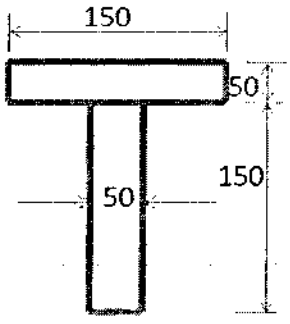
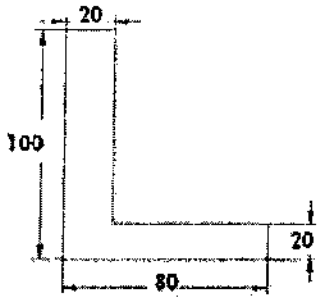
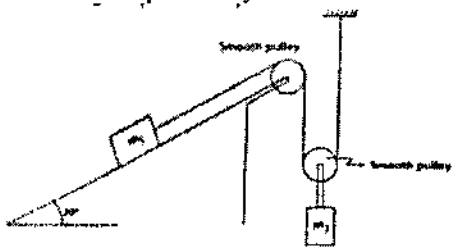
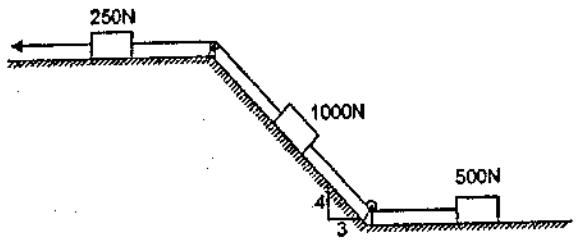


Fig.6

b)	Derive an expression for the moment of inertia of a Semi-circular section about the centroidal axis	7

5. a)	Find the moment of inertia about the centroidal axis XX and YY of the section shown in Fig.7  **Fig.7**	7
b)	Determine the mass moment of inertia of a circular plate of uniform thickness, about centroidal axes.	7
6. a)	Derive an expression for horizontal range and time of flight by a projectile	7
b)	In the system of blocks shown in Fig.8, m1=3kg and m2=5kg, determine the velocities of blocks after the block of mass m_2 displaces by 2m. Take coefficient of friction as 0.15.  **Fig.8**	7
7. a)	A ball is thrown from the ground with a velocity of 20 m/s at an angle of 30° to the horizontal. Determine: i. The velocity of the ball at t = 0.5 s and t = 1.5 s ii. Total time of flight of the ball iii. Maximum height reached iv. Range of the ball v. Maximum range	7
b)	Define and derive an expression for coefficient of restitution.	7
8.	Determine the constant force P that will give the system of bodies shown in Figure 9. A velocity of 3m/sec after moving 4.5m from rest. Coefficient of friction between the blocks and the plane is 0.3. Pulleys are smooth  Figure :9	14