

Code No: 121AC

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, September/October - 2021

ENGINEERING MECHANICS

(Common to CE, ME, AE)

Time: 3 Hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

1. Three forces acting at a point are shown in Figure 1. The direction of the 300 N forces may vary, but the angle between them is always 40° . Determine the value of θ for which the resultant of the three forces is directed parallel to b-b. [15]

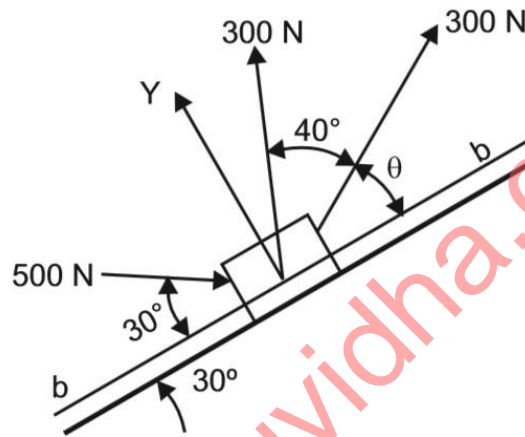


Figure: 1

2. Two cylinders P and Q rest in a channel as shown in the figure 2, the cylinder P has diameter of 100 mm and weighs 200 N, whereas the cylinder Q has diameter of 180 mm and weighs 500 N. If the bottom width of the box is 180 mm, with one side vertical and other is inclined at 60° , determine the forces acting at all the four points of the contact. [15]

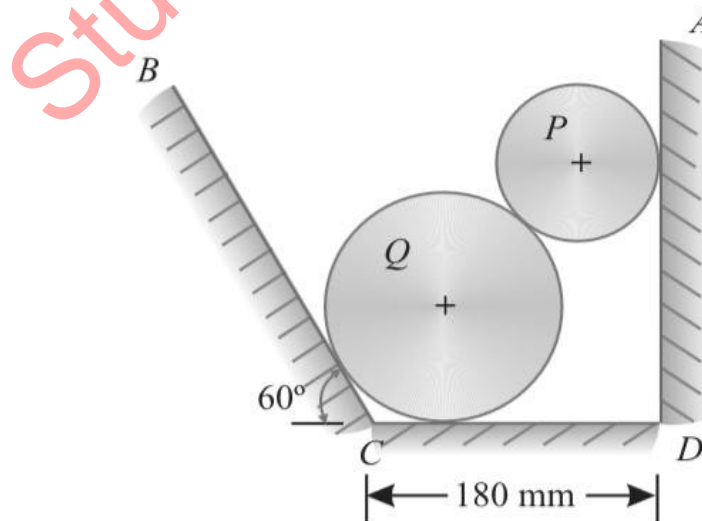


Figure: 2

3. Two cylinders A of weight 4000 N and B of weight 2000 N rest on smooth inclines as shown in figure 3. They are connected by a bar of negligible weight hinged to each cylinder at its geometric centre by smooth pins. Find the force P to be applied as shown in figure, such that it will hold the system in the given position. [15]

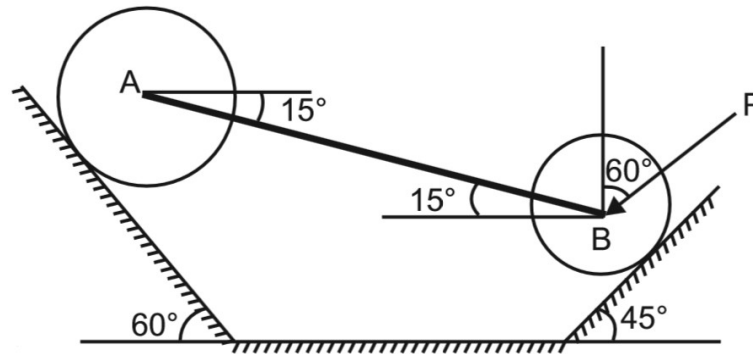


Figure: 3

4. A homogeneous ladder 6 m long and weighing 400N rests against a smooth wall. The angle between the ladder and the floor is 70° . The coefficient of friction between the floor and the ladder is 0.25. How far up the ladder can a man weighing 80 kg walk before the ladder slips? [15]
5. What is the effect of centrifugal tension on the tight and slack sides of a belt drive? Show that it is independent of the tight and slack side tensions and depends only on the velocity of the belt over the pulley. [15]
6. Find the centroid of the lamina shown in figure 4. [15]

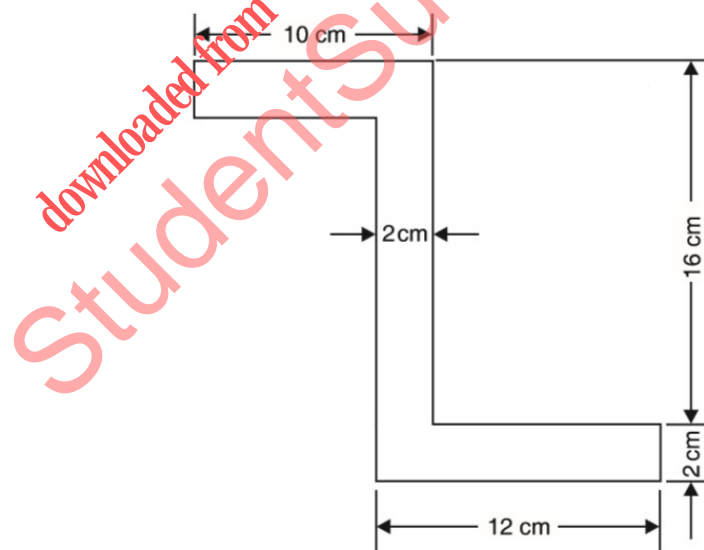


Figure: 4

7. A swing bridge turns through 90° in 120 sec. The bridge is uniformly accelerated from rest for the first 40 seconds. Subsequently, it turns with a uniform angular velocity for the next 60 seconds. Now the motion of the bridge is uniformly retarded for the last 20 seconds. Find:
 a) Angular acceleration
 b) Maximum angular velocity
 c) Angular retardation of the bridge. [5+5+5]

- 8.a) Find the distance travelled by 'A' in changing its velocity from 1m/s to 2m/s. Assume weight of pulley as 100 N and its radius of gyration about centroid axis k as 2 as shown in figure 5. The disk rolls on horizontal surface without slipping.

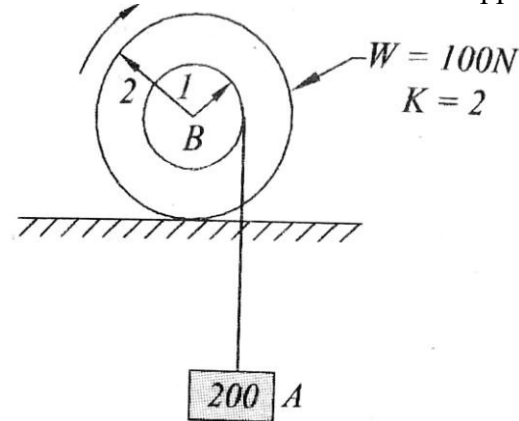


Figure: 5

- b) In a mechanism, a cross head moves in a straight guide in SHM. At distances 100 mm and 200 mm from its mean position, it has velocities of 4 mps and 2 mps respectively. Find the amplitude, maximum velocity and period of vibration. [8+7]

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