Code No: R05010302

Set No. 1

I B.Tech Supplimentary Examinations, Aug/Sep 2008
ENGINEERING MECHANICS
(Common to Mechanical Engineering, Mechatronics, Metallurgy &
Material Technology, Production Engineering, Aeronautical Engineering
and Automobile Engineering)
Time: 3 hours   Max Marks: 80
Answer any FIVE Questions
All Questions carry equal marks
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1. Find the reactions R_a and R_b induced at the supports A and B of the right angle
   bar ACB supported as shown in Figure 1 and subjected to a vertical load P applied
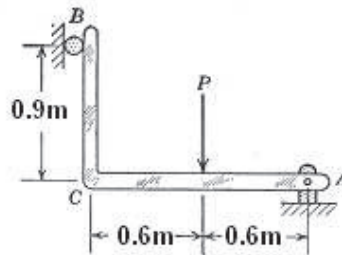   at the mid-point of AC.   [16]

Figure 1

2. (a) A 108 N block is held on a 40^0 incline by a bar attached to a 150 N block on
   a horizontal plane Figure 2a. The bar which is fastened by smooth pins at
   each end, is inclined 20^0 to the horizontal. The co-efficient of friction between
   each block and its plane is 0.325. For what horizontal force P, applied to 150
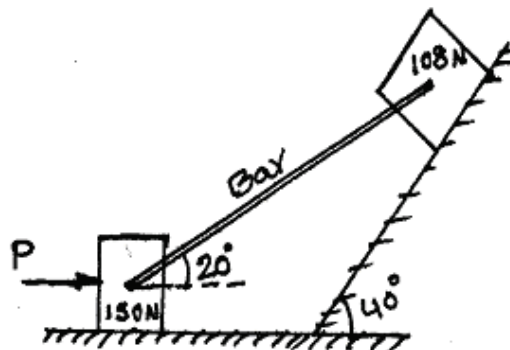   N block will motion to the right be impending?

Figure 2a

   (b) A block weighing 100 N is resting on a rough plane inclined 20^0 to the hor-
   izontal. It is acted upon by a force of 50N directed upward at angle of 14^0
   above the plane. Determine the friction. If the block is about to move up the
   plane, determine the co-efficient of friction.   [10+6]

3. (a) Distinguish between quarter turn and compound belt drives.

 (b) Determine the maximum power that can transmitted using a belt of
 100 mm × 10 mm with an angle of lap of 160^0 . The density of belt is
 $1000 kg/m^3$ and coefficient of friction may be taken as 0.25. The tension in
 the belt should not exceed $1.5 N/mm^2$. [6+10]

4. (a) Differentiate between centroid and center of gravity.

 (b) Determine the product of inertia of shaded area as shown in Figure 4b about
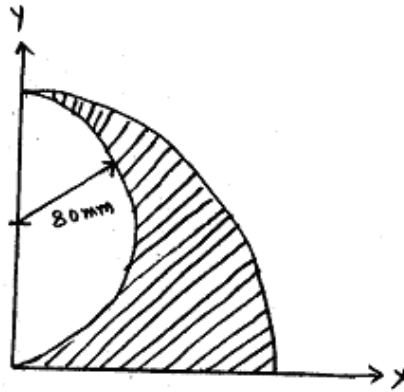 the x-y axis. [6+10]

Figure 4b

5. A thin plate of mass 'm' is cut in the shape of a parallelogram of thickness 't' as
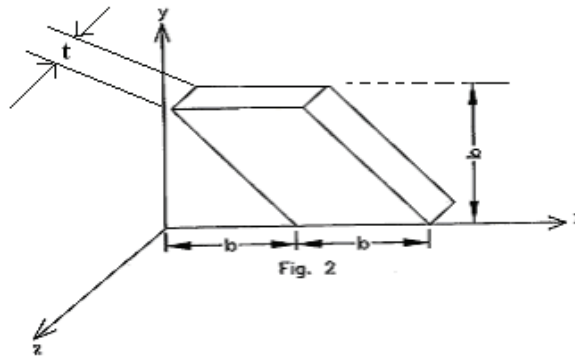 shown in figure5. Determine the mass moment of inertia of the plate about the
 x-axis. [16]

Figure 5

6. (a) A particle is projected with a velocity of 10 m/s at an angle of elevation of
 60^0.
 Find

  i. The equation of the path of motion.

  ii. The length of latus rectum of the path of motion

  iii. Time required to cover the range.

  iv. The length of range.

(b) An electric train which starts from one station is uniformly accelerated for the first 10 seconds, during which period it covers 150 metres. It then runs with constant speed until it is finally retarded uniformly in the last 40 metres. Calculate the maximum speed and the time taken over the journey to the next stopping station which is 600 m form the previous station.   [8+8]

7. (a) A homogeneous sphere of radius of a=100 mm and weight W=100 N can rotate freely about a diameter. If it starts from rest and gains, with constant angular acceleration, an angular speed n=180rpm, in 12 revolutions, find the acting moment. .

   (b) A block starts from rest from'A'. If the coefficient of friction between all surfaces of contact is 0.3, find the distance at which the block stop on the horizontal plane. Assume the magnitude of velocity at the end of slope is same as that at the beginning of the horizontal plane.
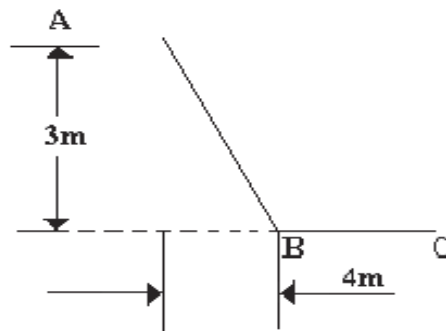   As shown in the Figure7b   [8+8]

Figure 7b

8. A weight of 10N attached to a spring oscillates at a frequency of 60 oscillations per minute. If the maximum amplitude is 30mm, find the tension induced in the spring. Also find the spring constant and the maximum velocity in the spring. [16]

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