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BME-016

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING) / B.Tech. AEROSPACE ENGINEERING (BTAE)

00453 **Term-End Examination**

December, 2018

BME-016 : ENGINEERING MECHANICS

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **five** questions. All questions carry equal marks. Use of calculator (non-programmable) is permitted. Assume missing data, if any, suitably.*

1. (a) Find x and y components of resultant of forces acting on a body as shown in Figure 1. 7

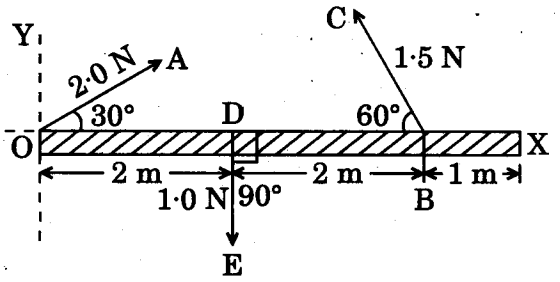

Figure 1

(b) Discuss the laws of transmissibility with the help of an example. 7

2. Figure 2 shows two blocks connected by a light string placed on the two inclined parts of a triangular structure. The co-efficients of static and kinetic friction are 0·28 and 0·25 respectively at each of the surfaces.

(i) Find the minimum and maximum values of m for which the system remains at rest.

(ii) Find the acceleration of either block if m is given the minimum value calculated in the first part and is gently pushed up the incline for a short while. *14*

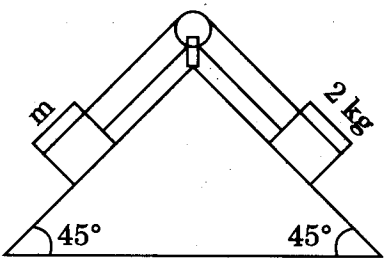

Figure 2

3. Determine the area moments of inertia and the radius of gyration of the shape shown in Figure 3 with respect to the x and y axes. *14*

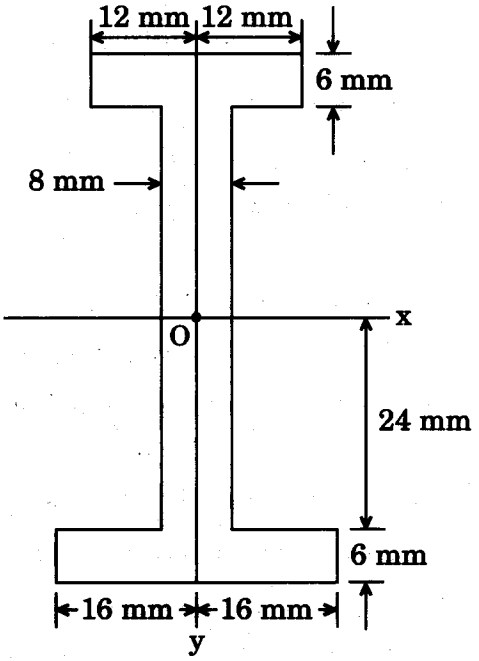

Figure 3

4. (a) A cylindrical bucket with water is revolving in a circular path of radius r in vertical plane. What can be the minimum speed at the top of the path if water does not fall out from the bucket ? If it continues with this speed, what normal contact force will the bucket exert on water at the lowest point of the path ? *7*

(b) A wheel rotating with uniform angular acceleration covers 50 revolutions in the first five seconds after the start. Find the angular acceleration and the angular velocity at the end of five seconds. *7*

5. (a) A particle executing simple harmonic motion has an angular frequency 6·28 s^{-1} and amplitude 10 cm. Find

(i) The time period,

(ii) The maximum speed,

(iii) The maximum acceleration,

(iv) The speed when the displacement is 6 cm from the mean position, and

(v) The speed at t = 1/6 s assuming that the motion starts from rest at t = 0. *10*

(b) A particle is subjected to two simple harmonic motions in the same direction having equal amplitudes and equal frequency. If the resultant amplitude is equal to the individual motions, find the phase difference between the individual motions. *4*

6. (a) A block of mass m moving at a velocity v collides head on with another block of mass 2m at rest. If the co-efficient of restitution is 1/2, find the velocities of the blocks after collision. *7*

(b) A block of mass 1·2 kg moving at a speed of 20 cm/s collides head on with a similar block kept at rest. The co-efficient of restitution is 3/5. Find the loss of kinetic energy during the collision. 7

7. Write short notes on the following : *2×7=14*

(a) Law of simple lifting machine, with the help of an example.

(b) Principle of virtual work, with the help of example.