Code: 9A01101

R09

B.Tech I Year (R09) Supplementary Examinations December/January 2015/2016
ENGINEERING MECHANICS
(Common to AE, BT, CE, ME & MCTE)

Time: 3 hours   Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1   A ball of weight W rests upon a smooth horizontal plane and has attached to its center two strings
       AB and AC which pass over frictionless pulleys at B and C and carry loads P and Q, respectively,
       as shown in Figure. If the string AB is horizontal, and the angle α that the string AC makes with the
       horizontal when the ball is in a position of equilibrium. Find the pressure R between the ball and the
       plane.
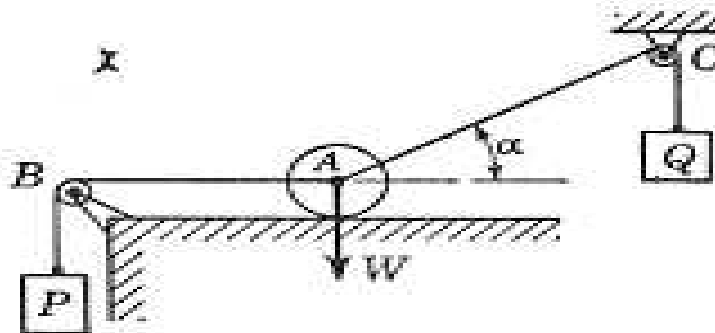
2   Determine the forces in all the members of the frame shown in below figure. Indicate the nature of
       forces also (Tension as +ve and Compression as -ve).
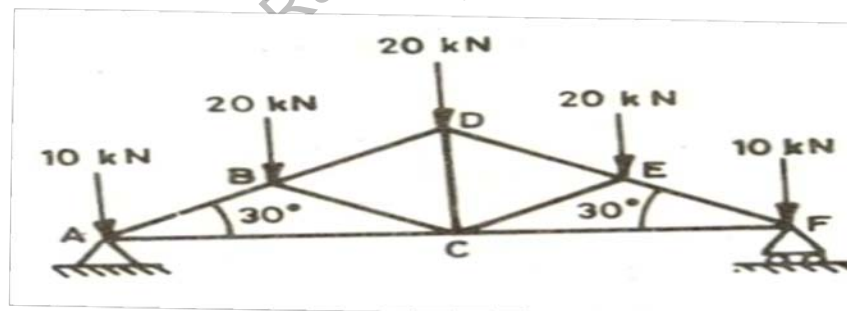
3   Determine the vertical force P required to drive wedge B downwards as shown in the figure below.
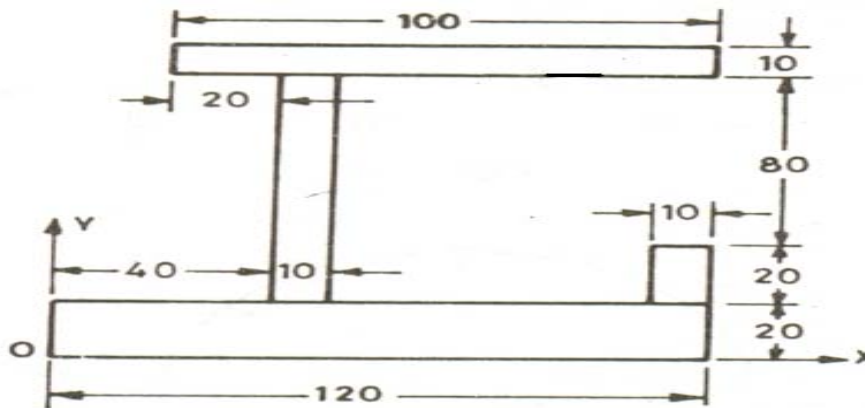   The angle of friction is 12^0 at the all faces.

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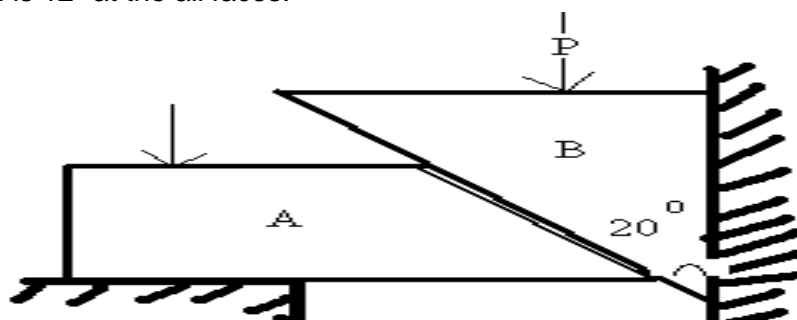
4   Determine the centroid of the built up section in the below figure. Express the coordinates of centroid with respect to x and y axes shown. All the dimensions are shown in mm

5   (a)   Show that the moment of inertia of a thin circular ring of mass 'M' and mean radius 'R' with respect to its geometric axis is MR^2.
    (b)   Find the mass moment of inertia of a right circular cone of base radius 'R' and mass 'M' about the axis of the cone.

6   (a)   A fighter plane is directly over an aircraft gun at time t = 0 and an altitude of 1800 m. The plane is moving with a speed of 600 kmph. A shell is fired at a time t = 0 in an attempt to hit the plane. If the muzzle velocity is 1000 m/sec, Find out the angle at which the gun should be held.
    (b)   A 600 mm diameter flywheel is brought uniformly from rest to a speed of 350 rpm in 20 seconds. Determine the velocity and acceleration of a point on the rim 2 seconds after starting from rest.

7   A slender bar of weight W and length L is supported at one end and at a distance b from its mass center G. If the support at B is suddenly removed, determine b so that the bar attains a maximum angular velocity after a 90⁰ rotation.
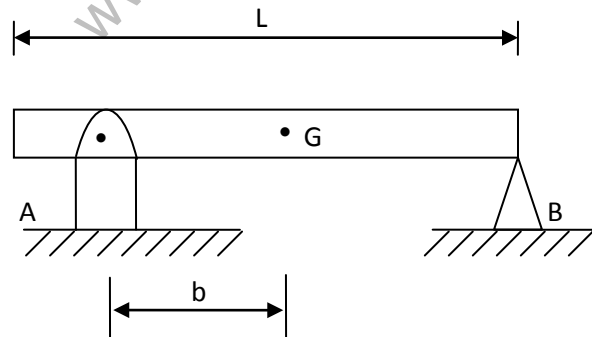
8   A pendulum having a time period of one second is installed in a lift. Determine its time period when:
    (a)   The lift is moving upwards with an acceleration of g/10.
    (b)   The lift is moving downwards with an acceleration of g/20.

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