BACHELOR OF COMPUTER Sc. ENGG. EXAMINATION, 2009

(1st Year, 1st Semester)

ENGINEERING MECHANICS

Time : Three hours | Full Marks : 100

Answer any *five* questions taking
at least two from each group.
All questions carry equal marks.

GROUP–A

1. A 200-kg cylinder is hung by means of two cables AB and AC, which are attached to the top of the vertical wall as shown in fig. Q1. A horizontal force P perpendicular to the wall holds the cylinder in the position shown. Determine the magnitude of P and the tension in each cable.

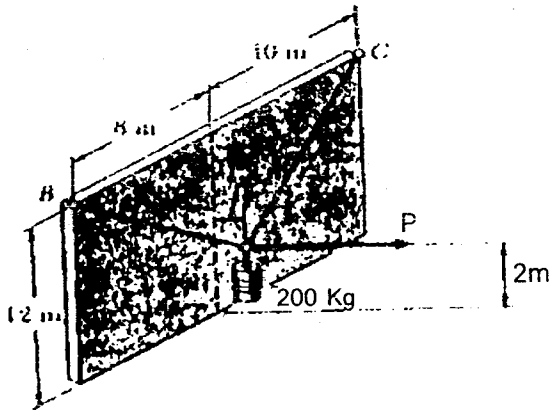

Fig. Q1

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2. Replace the couple and force shown in fig. Q2 by an equivalent single force applied to the lever. Determine the distance from O to the point of application of this single equivalent force on lever.

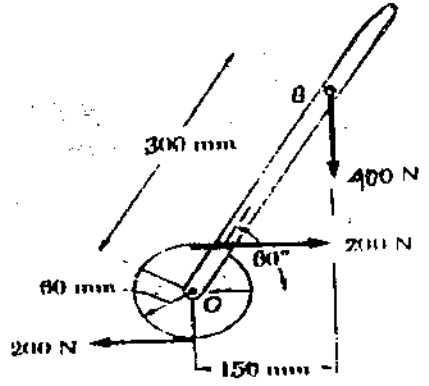

Fig. Q2

3. A uniform rod AB of length / and weight W is suspended from two cords AC and BC of equal length as shown in fig. Q3. Determine the angle 0 corresponding to the equilibrium position when a couple M is applied to the rod.

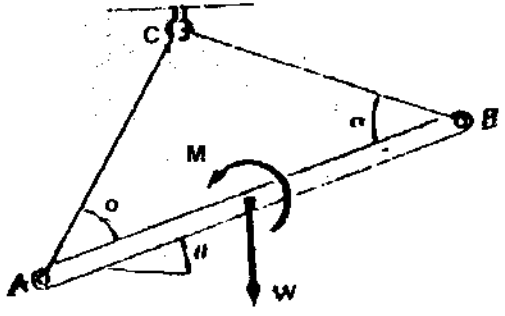

Fig. Q3

8. A 15-kg block B is suspended from a 2.5 m cord attached to a 20-kg cart A, as shown in fig. Q8. Neglecting friction, determine (a) the acceleration of the cart, (b) the tension in the cord, immediately after the system is released from rest in the position shown.

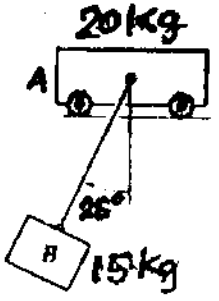

Fig. Q8

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4. For the plane area shown in fig. Q4, determine (a) the first moment with respect to the x and y axes, (b) the location of the centroid.

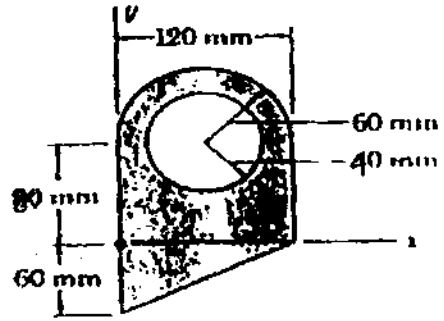

Fig. Q4

GROUP–B

5. The brake mechanism used to reduced recoil in certain types of guns consists essentially of piston which is attached to the barrel and may move in a fixed cylinder filled with oil. As the barrel recoils with an initial velocity v_0 the piston moves and oil is forced through orifices in the piston, causing the piston and barrel to decelerate at a rate proportional to their velocity that is $a = -Kv$. Express (a) v in terms of t, (b) x in terms of t, (c) v in terms of x. Draw the corresponding motion curves. [See fig. Q5].

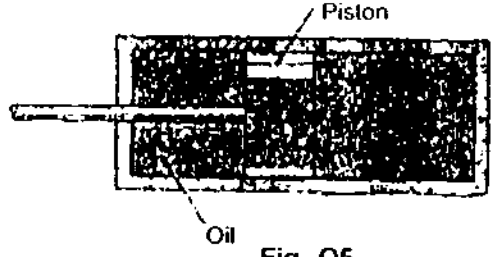

Fig. Q5

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6. A projectile is fired from the edge of a 150 m cliff with an initial velocity of 180 m/s, at an angle of 30° with the horizontal as shown in fig. Q7. Neglecting air resistance, find (a) the horizontal distance x (b) the greatest elevation above the ground reached by the projectile (c) the minimum radius of curvature of the trajectory described by the projectile.

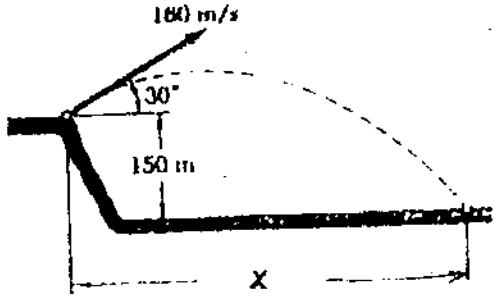

Fig. Q6

7. The path of a particle P is an Archimedean spiral as shown in fig. Q7. The motion of the particle is defined by the relation $r = 10\,t$ and $\theta = 2\pi t$, where r in cms, t in secs, and θ in radians. Determine the velocity and acceleration of the particle when (a) t = 0, (b) t = 0.25 secs.

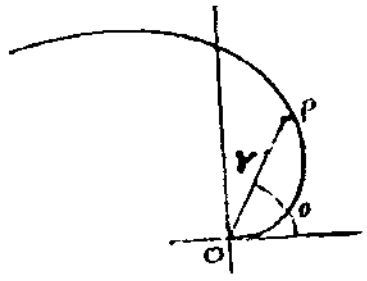

Fig. Q7