PVP 14

Code: ME2T4, AE2T4

I B.Tech - II Semester – Regular Examinations – JULY 2015

ENGINEERING MECHANICS-II
(Common for ME & AE)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11x 2 = 22 M

1. a) How a uniform motion differs from a uniformly accelerated motion.
   b) Write an expression showing that path of a projectile is a parabola.
   c) Distinguish between perfectly elastic impact and perfectly plastic impact.
   d) Derive an expression for the moment of inertia of an area of a circle of radius 'r' about the centroidal axis.
   e) Write the equations of motion for a rigid body in plane motion.
   f) A man of height 1.8 m walks away from a lamp hanging at a height of 6 m above the ground level. If the man walks with a speed of 2.1 m/sec. Find the speed of the tip of the man's shadow.
   g) A cricket ball of mass 175 gm is moving with a speed of 36 km/hr. What average force will be required to stop the ball in 0.2 second?
   h) Write the impulse-momentum equation and mention its application.

i) A boy can throw a ball 15 m vertically upwards. Find the greatest horizontal distance he can throw it. Take g = 9.81 m/sec^2.

j) Find the mass moment of inertia of a rectangular lamina of mass m, length l and width b.

k) Find the kinetic energy of a body of mass 2 kg when it falls under gravity distance of 2 m from rest.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks. 3 x 16 = 48 M

2. a) The rectilinear motion of a particle is defined by displacement time relationship $x = x_o\left[2e^{-kt} - e^{-2kt}\right]$, where x_o is the initial displacement. Find the time at which the velocity is maximum and also find the maximum velocity. 8 M

b) An automobile enters a curved road at 30 KMPH and then leaves at 48 KMPH. The curved road is in the form of quarter of a circle and has a length of 400 m. If the car travels at constant acceleration along the curve, find the magnitude and direction of resultant acceleration at both ends of the curve. 8 M

3. a) A body of weight 400 N slides along an inclined plane making an angle of 30° with horizontal having initial velocity of 2 m/sec. The distance travelled along the plane is 2 m and after it strikes the spring whose stiffness is 100 N/mm. Taking $\mu = 0.2$, find the compression of the spring. 8 M

b) A simple pendulum AB, released from rest in the horizontal position as shown in Figure-1, falls under gravity and strikes a vertical wall at C. If the coefficient of restitution between the ball and the wall is 1/2, find the angle β defining its total rebound. 8 M

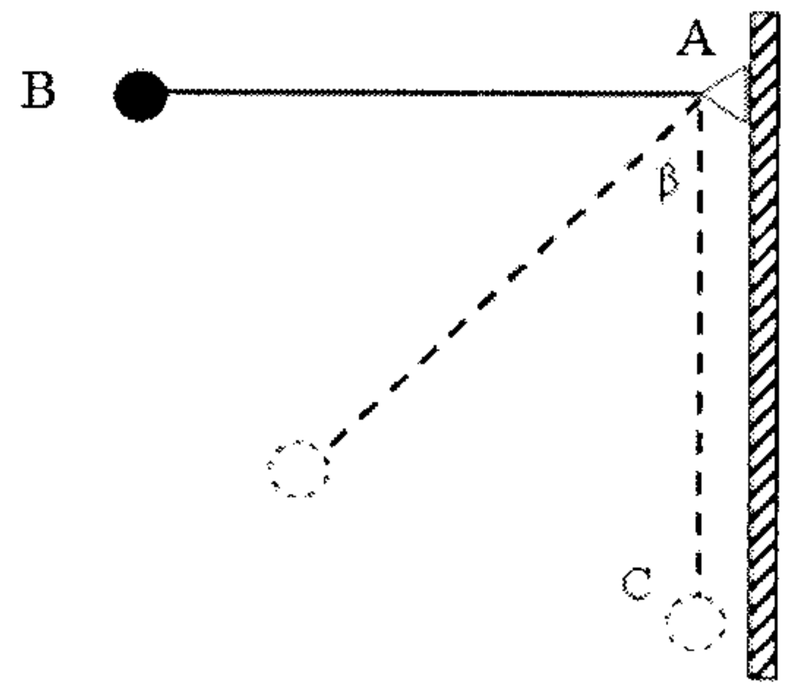

Figure-1

4. a) Find the moment of inertia of shaded area about ox axis as shown in Figure-2. 8 M

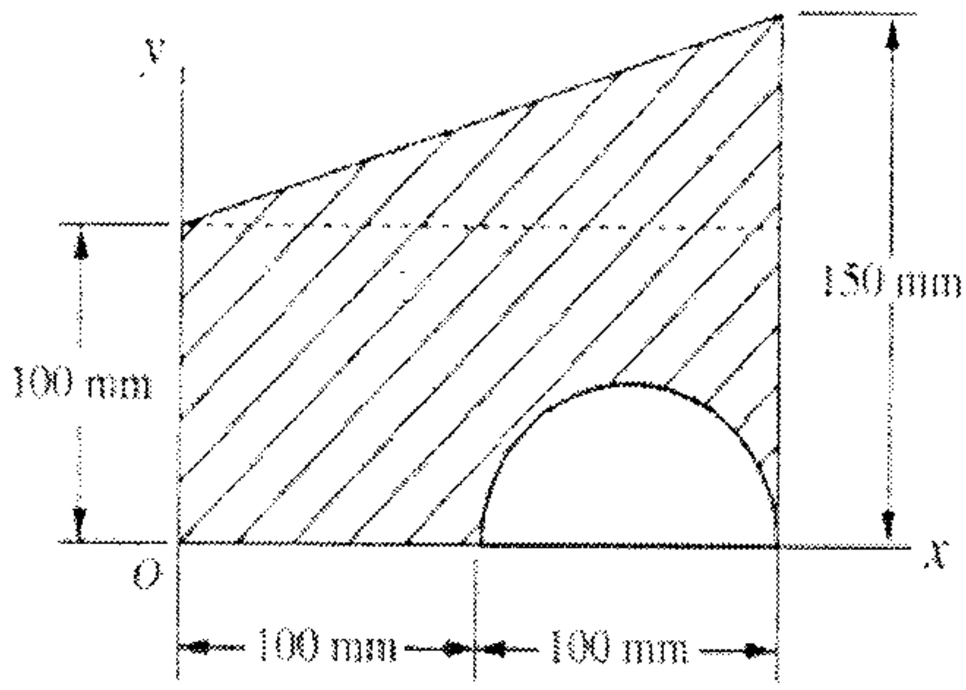

Figure-2

b) Determine the mass moment of inertia of a solid cone of radius R and mass m and height h about centroidal axis parallel to base. 8 M

5. a) A fly wheel 0.5 m in diameter accelerates uniformly from rest to 360 rpm in 12 seconds. Determine the velocity and acceleration of a point on the rim of the fly wheel 0.1 second after it has started from rest. 8 M

b) The motion of the gear is defined by the relation $\theta = 2t^3 - 5t^2 + 8t + 20$ where θ is in radians and t in seconds. Determine the angular displacement, angular velocity and angular acceleration at time t=3 seconds. 8 M

6. A right solid circular cylinder of weight 100 N and radius 600 mm is pulled up a 30° inclined plane by a constant force F = 50N. The force F is applied to the end of a string wound around the circumference of the cylinder as shown in Figure-3. Find the acceleration of the centre of mass G of the cylinder assuming no slip at the point of contact A. 16 M

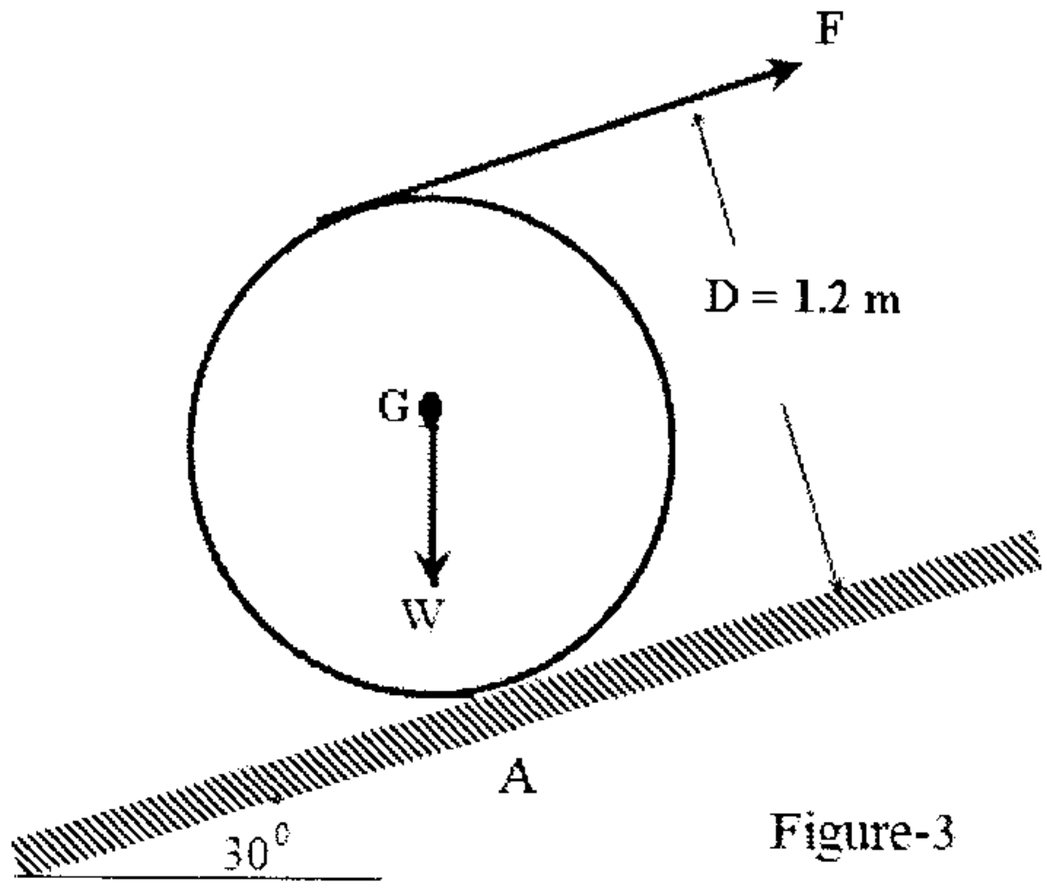

Figure-3