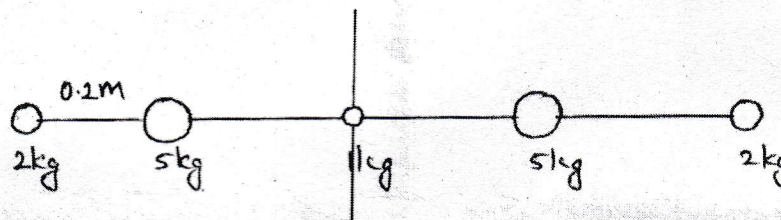


- (c) Five masses 2 kg, 5 kg, 1 kg, 5 kg and 2 kg are placed on a mass less rod as shown in figure. The distance between consecutive masses is 0.2 m. Find the moment of inertia about the perpendicular axis passing through the centre of mass.



6

OR

- IV (a) A string can sustain a maximum tension of 100N without breaking. A mass of 1 kg is attached to the end of the string 1m long and is rotated in a horizontal plane. Find out the maximum number of revolutions possible per second. 3
- (b) Show that the centripetal force for a particle of mass m moving along the circle of radius R is $m\omega^2 R$ 6
- (c) A body of mass M is attached to a string of length L and is revolved in a horizontal plane. If the string can withstand a maximum tension F , show that the maximum angular velocity with which it can be revolved is given by the equation

$$\omega = \left(\frac{F}{ML}\right)^{1/2}$$

6

UNIT — II

- V (a) The acceleration due to gravity at a height h above the earth's surface is 9.1 m/s^2 . Find h if the surface value of g is 9.8 m/s^2 and radius of earth is 6400 km. 3
- (b) Obtain an expression for the orbital velocity and period of revolution of an artificial satellite revolving close to the surface of the earth. 6
- (c) Explain the concept of geostationary satellite. Derive an expression for its height above the earth. 6

OR

- VI (a) Prove that first cosmic velocity $V_0 = \sqrt{gR}$ 3
- (b) State Newton's Law of Universal Gravitation. Show that the acceleration due to gravity $g = \frac{4}{3} \pi G \rho R$ where ρ is the mean density of earth and R is the radius of earth. 6
- (c) Two iron spheres each of radius 50cm are placed at a distance 2m between their centres. If the force of attraction between them is $2.923 \times 10^{-4} \text{ N}$, Determine the gravitational constant G . Density of iron is 8000 kg/M^3 . 6