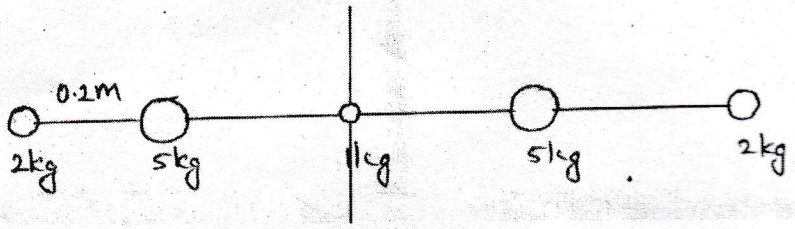
Marks

(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

$\omega = \left(F/ML\right)^{1/2}$ 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 n 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 $g = 4/3\ \pi G\rho r$ 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 2.923×10^{-4} N, Determine the gravitational constant G. Density of iron is 8000 kg/M^3. 6