LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**B.Sc.** DEGREE EXAMINATION – **MATHEMATICS**

SIXTH SEMESTER – **APRIL 2012**

# MT 6604/MT 5500 - MECHANICS - II

 Date : 18-04-2012 Dept. No. Max. : 100 Marks

 Time : 1:00 - 4:00

**PART – A**

**Answer ALL the questions: (10 x 2 =20)**

1. State the conditions for non-existence of centre of gravity.
2. Mention the differences between center of gravity and centre of mass.
3. Define the work done by the tension in an elastic string.
4. Define Suspension bridge.
5. A particle executing simple harmonic motion makes 100 complete oscillations per minute and its maximum speed is 15 ft/sec. What is the length of its path and maximum acceleration?
6. Define Centripetal force.
7. Define Central Orbit.
8. An insect crawl at a constant rate u along the spoke of a earth wheel of radius a starting from centre, the wheel moving with velocity v. Find the accelerations along and perpendicular to the spoke.
9. State Parallel axis theorem.
10. Write down the formula for Moment of Inertia of a solid sphere and hollow sphere.

**PART –B**

 **Answer any FIVE questions: (5 x 8 = 40)**

1. Find the Centre of gravity of a uniform circular angle.
2. Derive the intrinsic equation of the catenary.
3. A particle executing simple harmonic motion in a straight line has velocities 8,7,4 at three points distant one foot from each other. Find the period.
4. ABCD is a trapezium in which AB and CD are parallel and of lengths a and b. Prove that the distance of the centre of mass from AB is $\frac{h}{3}\left(\frac{a+2b}{a+b}\right)$ where h is the distance between

AB and CD.

1. A particle describes the orbit *rn*=Acos*nθ*-Bsin*nθ* under a central force, the pole being the centre. Find the law of force.
2. Derive the p-r equation of a central orbit.
3. Find the moment of Inertia of a thin uniform parabolic lamina bounded by the parabola *y*2=4*a*(*h*-*x*) about the *y*-axis.
4. State and prove D’Alemberts Principle.

**PART –C**

**Answer any TWO questions: (2 x 20 = 40)**

1. a) Find the centre of gravity of a hollow hemisphere.

b) Find the centre of gravity of the arc of the cardiod r = a(1+cos*θ*) lying above the initial

 line. (8+12)

1. State and prove Principle of virtual work for a system of coplanar forces acting on a body.
2. a) Find the resultant of two simple harmonic motions of the same period in the same

 straight line.

b) The speed *v* of a particle moving along the x-axis is given by 

 Show that the motion is simple harmonic with centre at *x* = 4*b* and amplitude 2*b*.

 Find the time from *x* = 5*b* to *x* = 6*b*. (12+8)

 22. a) If the law of acceleration is  and the particle is projected from an apse

 at a distance *c* with velocity , prove that the equation of the orbit is 

 b) Find the moment of inertia of an elliptic lamina. (10 + 10)

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