LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

SIXTH SEMESTER – NOVEMBER 2012

# MT 6604 / MT 5500 – MECHANICS - II

Date :5/11/2012 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. Write down the co-ordinates of center of gravity for a solid cone.
3. Define catenary.
4. Define suspension bridge.
5. A particle executing simple harmonic motion makes 100 complete oscillations per minute and its maximum speed is 15 feet per sec. What is the length of its path and maximum acceleration?

6. Write down any two applications of simple harmonic motion.

7. A point P describes with a constant angular velocity about O the equiangular

spiral *r* = *a* *eθ*. O being the pole of the spiral. Obtain the radial and transverse

acceleration of P.

8. Define central orbit.

9. Define Moment of Inertia of a particle about a straight line.

10. Find the work that must be done on a uniform flywheel of mass 50 lbs and radius

6״ to increase its speed of rotation from 5 to 10 rotation per second.

**PART –B**

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

11. Find the center of gravity of a hollow right circular cone of height *h*.

12. Prove that if a dynamical system is in equilibrium, then the work done by the

applied forces in a virtual displacement is zero.

13. Discuss the motion of a particle executing two simple harmonic motions in

perpendicular directions with same period.

14. A square hole is punched out of a circular lamina of radius as its diagonal. Show

that the distance of Centre of gravity of the remainder from the centre of the circle

is *a*/(4π-2).

15. Derive the pedal p-r equation of a central orbit.

16. 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

.

17. Find the moment of Inertia of a thin uniform parabolic lamina bounded by the

parabola  and y axis about the *y*-axis.

18. Derive the equation of motion of a rigid body about a fixed axis.

**PART –C**

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

19. (a) From a solid cylinder of height h, a cone whose base coincides with the base

of the cylinder is scooped out so that the mass centre of the remaining solid

coincides with the vertex of the cone. Find the height of the cone.

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

the initial line. (10 + 10)

20. (a) Derive the equation to the common catenary in the form *y* = *C* *cosh x*/*c*.

(b) A chain of length 2l is to be suspended from two points A and B in the same

horizontal level so that either terminal tension is n times that at the lowest

point. Show that the span AB must be 

1. + 10)

21. (a) 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.

(b) Find the resultant of two simple harmonic motions of the same period in the

same straight line. (10 + 10)

22. (a) State and prove Perpendicular axis theorem

(b) Show that the moment of inertia of the part of the parabola  cut off

by the double ordinate  is about the tangent at the vertex and

 about its axis, *M* being the mass. (6 + 14)

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