LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

SIXTH SEMESTER – APRIL 2011

# MT 6604/MT 5500 - MECHANICS - II

Date : 07-04-2011 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

**PART – A**

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

1. What is the Centre of Gravity of a compound body?
2. Where does the C.G of a uniform hollow right circular cone lie?
3. Define virtual work.
4. What is common catenary?
5. Show that frequency is the reciprocal of the periodic time in a simple harmonic motion.

6. If the maximum velocity of a particle moving in a simple harmonic motion is

2ft/sec and its period is 1/5 sec, prove that the amplitude is  feet.

7. What is the *p*-*r* equation of a parabola and an ellipse?

8. What are the radial and transverse components of acceleration?

9. Define moment of inertia?

10. Explain the conservation of angular momentum.

**PART –B**

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

11. A homogenous solid is formed of a hemisphere of radius *r* soldered to a right circular cylinder of

the same radius. If h be the height of the cylinder, show that the center of gravity of the solid from

the common base is .

12. Find the center of gravity of a uniform trapezium lamina.

13. A uniform rod AB of length 2*a* with one end A against a smooth vertical wall being supported by

a string of length 2*l*, attached to the other end of the rod B and to a point C of the wall vertically

above A. Show that if the rod rests inclined to the wall at an angle θ, then cos2 θ =.

14. Derive the intrinsic equation of the common catenary.

15. A second pendulum is in a lift which is ascending with uniform acceleration  . Find the number of seconds it will gain per hour. Calculate the loss if

the lift were descending with an acceleration of .

16. Show that the composition of two simple harmonic motions of the same period

along two perpendicular lines is an ellipse.

17. Prove that the areal velocity of a particle describing a central orbit is constant.

Also show that its linear velocity varies inversely as the perpendicular distance

from the centre upon the tangent at P.

18. Show that the Moment of inertia of a truncated cone about its axis, the radii of its

ends being *a* and *b*, (*a*<*b*) is .

**PART –C**

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

19. (a) Find the centre of gravity of the area in the first quadrant bounded by the co-

ordinate axes and the curve .

(b) AB and AC are two uniform rods of length 2a and 2b respectively. If

, prove that the distance from A of the Centre of gravity of two the

rods is  (10 + 10)

20. (a) Show that the length of a chain whose ends are tied together and hanging over

a circular pulley of radius *a*, so as to be in contact with two thirds of the

circumference of the pulley is a  .

(b) Derive the expression for velocity and acceleration of a particle moving on a

curve. (10 + 10)

21. (a) A particle P describes the orbit  under a central force. Find the

law of force.

(b) The law of force is  and a particle is projected from an apse at a distance

Find the orbit when the velocity of projection is  . (10 + 10)

22. (a) State and prove Parallel axis theorem.

(b) Find the lengths of the simple equivalent pendulum, for the following:

i) Circular wire ii) Circular disc. (10 + 10)

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