

DYNAMICS

Time : 3 Hours

Max. Marks: 75

SECTION – A (10 x 2 = 20)

Answer ALL the questions.

1. Define relative velocity.
2. Define angular velocity.
3. Define Trajectory.
4. Define envelope of trajectories.
5. Explain epoch.
6. When the impact of spheres is said to be oblique?
7. Define Central orbit.
8. Define Centre of force.
9. Define moment of inertia of a particle.
10. Define radius of Gyration.

SECTION – B (5 x 5 = 25)

Answer any FIVE of the following questions.

11. A vessel which can steam in still water with a velocity of 48 km per hour is steaming with its bow pointed due east and it is carried by a current which flows northward with a speed of 14 km per hour. Find the distance it would travel in 12 minutes.
12. Find the height of the directrix of path of a projectile.
13. In the equation of simple harmonic motion, if the particle is projected from a point instead of being at rest, with a velocity v , find the amplitude of the motion.
14. Two equal balls are in contact on a table. A third equal ball strikes both symmetrically and remains at rest after impact. Show that $e = \frac{2}{3}$.
15. The velocities of a particle along and perpendicular to the radius vector from a fixed origin are 'a' and 'b'. Find the path and the acceleration along and perpendicular to the radius vector.

16. Find the moment of inertia of circular lamina about the line through the centre of the circle and perpendicular to the plane of the circle.
17. A smooth sphere of mass m_1 impinges obliquely on a smooth sphere of mass m_2 at rest. Find the relation connecting m_1 and m_2 , if the directions after the impact are at right angles.
18. When a particle is projected from a point o on a plane of inclination β with a velocity u making an angle α with the horizontal. Find the maximum range on the plane.

SECTION – C (3 x 10 = 30)

Answer ALL the questions.

19. (a) Derive three formulas pertaining to the motion of a particle moving along a straight line with a constant acceleration.

(Or)

(b) Prove that the path of a projectile is a parabola.

20. (a) Show that the resultant of two simple harmonic motions of same period along the same straight line is also simple harmonic with the same period.

(Or)

(b) Find the velocities of two smooth spheres after a direct impact between them.

21. (a) Obtain the differential equation of a central orbit in polar coordinates.

(Or)

(b) Find the moment of inertia of a solid right circular cone about the axis of cone.

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