B.Sc DEGREE EXAMINATION,APRIL 2019
III Year V Semester
Dynamics

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. A particle has two velocities $\overrightarrow{v_1}$ and $\overrightarrow{v_2}$. Its resultant velocity is equal to $\overrightarrow{v_1}$ in magnitude. Show that when the velocity $\overrightarrow{v_1}$ is doubled, the new resultant is perpendicular to $\overrightarrow{v_2}$.

2. Define Angular Velocity of a particle.

3. Define Simple harmonic motion.

4. If the distance x of a point moving on a straight line measured from a fixed point on it and its velocity v are connected by the relation $4v^2 = 25 - x^2$, show that the motion is simple harmonic.

5. Define maximum height and horizontal range of a projectile.

6. Define a projectile.

7. Define impulsive force.

8. State the principle of conservation of linear momentum.

9. Define Moment of Inertia.

10. Find the moment of inertia of a circular ring.

11. A boat which can steam in still water with velocity of 48km.ph is steaming with its bow pointed due eat when it is carried by a current which flows northward with a speed of 14km.ph. Find the actual distance it would travel in 12 minutes.

12. A particle is executing a Simple harmonic motion with O as the mean position and a as the amplitude . When it is at a distance a/2 from O, its velocity is quadrupled by a blow. Show that its new amplitude is 7a/2.

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. A ship sails north-east at 15 km.ph and to a passenger on board, the wind appears to blow from north with a velocity of $15\sqrt{2}$ km.ph . Find the true velocity of the wind.

14. If a point moves in a straight line with uniform acceleration and covers successive equal distances in times $t_1, \ t_2, \ t_3$ then show that $\dfrac{1}{t_1} - \dfrac{1}{t_2} + \dfrac{1}{t_3} = \dfrac{3}{t_1 + t_2 + t_3}$.

15. Show that in a simple harmonic motion the sum of Kinetic energy and potential energy is a constant.

16. Show that the path of a projectile is a parabola.

17. Two spheres A and B of same size lie on a smooth, horizontal circular groove at opposite ends of a diameter . A is projected along the groove and after a time t it impinges upon B. Show that, if e is the coefficient of restitution, it then the second impact will occur after a time.

18. A small ball A impinges directly u[on an equal ball B. Then B strikes a cushion which is at right angles to the direction of motion of B and after rebounding, meets A at a point exactly halfway between the sushion and its own initial position. If the coefficient of restitution between the balls is e and that between the ball and the cushion is e' then show that $e' = \dfrac{1 - e}{3e - 1}$.

19. Find the moment of inertia of a solid right circular cone.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. A vertical circular disc of radius a rolls on a ground without slipping along a straight line with a linear velocity u. Find the velocity of any point on its rim.

21. Two bodies of masses m and m' are attached to the lower end of an elastic string whose upper end is fixed and hang at rest. m' falls off. Show that the distance of m from the upper end of the string at time t is $a + b + c \; cos\sqrt{\dfrac{g}{b}} \; t$, where a is the unstretched length of the string and b and c are the distances by which it would be stretched when supporting m and m'.

22. A particle is projected over a triangle from one end of its horizontal base to graze the vertex and fall at the other end of the base. If B and C are the base angles and α, the angle of projection, show that tan α = tan B + tan C.

23. Find the velocities of two smooth spheres after a direct impact between them.

24. State and prove Parallel axis theorem.

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