

D.K.M. COLLEGE FOR WOMEN (AUTONOMOUS), VELLORE-1
SEMESTER EXAMINATIONS
JUNE – 2022
DYNAMICS

19CMA6B

Time : 3 Hrs

Max. Marks : 75

SECTION-A (10 x 2 = 20)

Answer ALL the questions.

1. Define Rectilinear motion.
2. Define angular velocity.
3. Define Projectile.
4. Define Horizontal range.
5. Define Simple Harmonic motion.
6. Define Impulsive force.
7. Define Central orbit.
8. Write down the pedal equations of the central orbit.
9. State Perpendicular axis theorem.
10. What is meant by radius of gyration?

SECTION-B (5 x 5 = 25)

Answer ALL the questions.

11. (a) A particle has two velocities \vec{v}_1 and \vec{v}_2 . Its resultant velocity is equal to \vec{v}_1 in magnitude. Show that, when the velocity \vec{v}_1 is doubled, the new resultant is perpendicular to \vec{v}_2 .

(Or)

- (b) 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 $\frac{1}{t_1} - \frac{1}{t_2} + \frac{1}{t_3} = \frac{3}{t_1+t_2+t_3}$.

12. (a) If v_1 and v_2 are the velocities of a projectile at the ends of a focal chord of its path and v , the horizontal component of its velocity, then show that $\frac{1}{v_1^2} + \frac{1}{v_2^2} = \frac{1}{v^2}$.

(Or)

- (b) Find the maximum range of a projectile projected on an inclined plane.

13. (a) Show that, in a simple harmonic motion, the sum of the kinetic energy and potential energy is a constant.

(Or)

- (b) A gun of mass M firing a shot of mass m recoils with a velocity V . Show that, if the mass of the shot is increased to $2m$, the Kinetic energy of the explosion remaining the same, then the velocity of the

recoil becomes $V\sqrt{\frac{2(M+m)}{M+2m}}$.

14. (a) 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 accelerations along and perpendicular to the radius vector.

(Or)

- (b) Find the orbit of a particle moving under an attractive force varying as the distance.

15. (a) Find the M.I of a spherical shell.

(Or)

(b) Show that the M.I of a rectangular lamina of mass M and sides $2a$ and $2b$ about a diagonal is

$$M \frac{2a^2b^2}{3(a^2+b^2)}.$$

SECTION-C (3 x 10 = 30)

Answer any THREE of the following questions.

16. Find the components of velocity and acceleration of a particle in the radial and transverse directions.

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

18. Two elastic spheres of mass m and m' impinge each other obliquely. Find

i. the impact of m on m'

ii. the impact of m' on m .

iii. the loss in kinetic energy.

19. Find the pedal equation of a central orbit.

20. State and prove Parallel axis theorem.

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