

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)

(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.

B.Sc.Mathematics - END SEMESTER EXAMINATIONS - APRIL 2025

SEMESTER - V

20UMACT5011 - Dynamics

Total Duration : 2 Hrs.30 Mins.

Total Marks : 60

Section B

Answer any **SIX** questions ($6 \times 5 = 30$ Marks)

1. Two ends of a train moving with constant acceleration pass a certain point with velocities u and v . Show that the velocity with which the middle point of the train passes the same point is $\sqrt{\frac{u^2 + v^2}{2}}$.
2. Show that the path of the projectile is a parabola.
3. Two equal balls are in contact on a table. A third equal ball strikes both symmetrically and remains at rest after impact. Show that $e = 2/3$.
4. Find the moment of inertia of a solid sphere of radius a about a diameter.
5. A particle is executing a simple harmonic motion with O as the mean position and a is the amplitude. When it is at a distance $a/2$ from O its velocity is quadrupled by a blow. Show that the new amplitude is $7a/2$.
6. A bomb was released from an airplane, moving horizontally with speed of 180 km/h. When it was vertically at a height of 360 m. above a place A on the ground. Find the distance from A of the point where the bomb struck the ground.
7. Two balls impinge directly and they inter change their velocities after impact. Show that they are perfectly elastic and of equal mass.
8. Find the moment of inertia of a circular lamina of radius a .

Section C

Answer any **THREE** questions ($3 \times 10 = 30$ Marks)

9. Find the components of velocity and acceleration of a particle in the radial and transverse directions.
10. The displacement x of a particle moving along a straight line is given by $x = A \cos nt + B \sin nt$, where A , B , n are constant. Show that its motion is *S.H.* If $A = 3$, $B = 4$, $n = 2$. Find period, amplitude, Maximum velocity, maximum acceleration.

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11. A particle is projected from a point O on the ground with a velocity u inclined to the horizontal at angle, it hits the ground at A . To find
- Maximum height H attain by the particle.
 - Time taken to attain the maximum height.
 - Time of flight.
 - Horizontal Range.
 - Velocity at time t .
12. Obtain the loss of kinetic energy due to direct impact of two smooth spheres.
13. State and prove parallel axis theorem for moment of Inertia.
