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. END SEMESTER EXAMINATIONS APRIL-2022
SEMESTER - V
08UMACT5011 & UMA/CT/5011 - Dynamics

Total Duration : 3 Hrs.   **Total Marks : 60**

Section A

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

1. A point moves with uniform acceleration and V_1, V_2, V_3 denote the average velocities in three successive intervals of times t_1, t_2, t_3. Show that,
$$\frac{v_1 - v_2}{v_2 - v_3} = \frac{t_1 + t_2}{t_2 + t_3}.$$

2. Show that, the composition of two simple harmonic motions of same period along same straight lines, is also simple harmonic.

3. If V_1 and V_2 are the velocities at the ends of a focal chord of the projectile and v is the horizontal component of the velocity, then show that $\frac{1}{v_1^2} + \frac{1}{v_2^2} = \frac{1}{v^2}$

4. Two smooth spheres of masses m_1 and m_2 impinges directly with velocities u_1 and u_2 respectively, find the loss of kinetic energy due to impact.

5. State and prove perpendicular axes theorem.

6. Derive the following (i) v=u+at (ii) $s = ut + \frac{1}{2} at^2$

7. A particle is projected from the point O on the ground with a velocity u inclined to the horizontal at an angle α. Find the horizontal range and time of flight of the projectile.

8. Find the Moment of Inertia of an elliptic lamina about its major axis.

Section B

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

9. Find the components of velocity and acceleration in tangential and normal direction.

10. A particle is executing a simple harmonic motion of period T with O as the mean position. The particle passes through a point P with velocity V in the direction of OP. Show that, the time which lapses before its return to P is $\frac{T}{\pi} \tan^{-1} \left(\frac{VT}{2\pi OP} \right)$.

11. Show that, the path of the projectile is a parabola.

12. Two smooth spheres of masses m_1 and m_2 impinges directly, find the velocities after impact and impulse imparted to each sphere due to impact.

13. State and prove parallel axes theorem.

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