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.
M.Sc. - END SEMESTER EXAMINATIONS NOVEMBER - 2022
SEMESTER - III
20PAMCT3009 - Classical Mechanics

Total Duration : 2 Hrs 30 Mins. **Total Marks : 60**

Section A

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

1. (i)Find the expression for kinetic energy of a system of particles.
   (ii) State Conservation Theorem for the linear momentum of a particle.
2. State and prove D' Alembert's principle.
3. Prove that the shortest distance between two points in a plane is a straight line.
4. Compute the paths followed by a particle in sliding from one point to another in the absence of friction in the shortest time.
5. Obtain the derivation of Coriolis force.
6. Define scalar dot product and double dot product of dyads.
7. Derive the Hamilton's equation from Lagrange's equation by means of Legendre transformation.
8. Define Poisson bracket and prove that the Poisson bracket is invariant with respect to a canonical transformation.

Section B

Part A

Answer any **TWO** questions $(2 \times 10 = 20$ Marks)

9. (i)Show that if the forces acting on a particle are conservative, then the total energy of the particle is conserved.
   (ii) Derive Lagrange's equation of motion for Atwood's machine
10. Derive Euler Lagrangian differential equation.
11. Prove that the real orthogonal matrix specifying the physical motion of a rigid body with one point fixed always has the eigen value $+1$.
12. Compute the equation of moment of inertia about the axis of rotation.

Contd...

Part B

Compulsory question $(1 \times 10 = 10$ Marks)

13. Solve the problem of simple harmonic oscillator in one dimension by considering the Hamiltonian equation H=$\frac{\left(p^2 + m^2\omega^2 q^2\right)}{2m}$ using canonical transformation.

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