

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.(Appl.Maths) END SEMESTER EXAMINATIONS NOVEMBER - 2023

SEMESTER - III

20PAMCT3009 - Classical Mechanics

Total Duration : 2 Hrs. 30 Mins.

Total Marks : 60

Section B

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

- (i) State and prove energy conservation theorem for a particle.
(ii) Define Scleronomic and Rheonomic constraints.
- Describe holonomic and non holonomic constraints with suitable example.
- Derive Lagrangian equation of motion from Hamilton's principle.
- Find the curve $y=y(x)$ for which the surface area is minimum, when the surface of revolution is formed by a curve between two fixed points (x_1, y_1) and (x_2, y_2) and revolving it about the y-axis.
- (i) State Euler's theorem on the motion of a rigid body.
(ii) Find the eigen values, determinant and trace of a matrix $\begin{pmatrix} 5 & 0 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 11 \end{pmatrix}$
- Compute canonical equations of Hamilton.
- Discuss the following.
(i) Dyad (ii) Scalar dot product and double dot product of a dyad (iii) Dyadic
- Explain Δ -variation in configuration space and obtain the principle of least action equation.

Section C

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

- (i) State and prove D' Alembert's principle
(ii) Discuss the motion of one particle using Cartesian coordinates.
- Compute the stationary value of a definite integral $\int_{x_1}^{x_2} f(y, \dot{y}, x) dx$
- Obtain the matrix elements of the general rotation matrix in terms of Euler angles by performing the multiplication of the successive component rotation matrices.

Contd...

12. (i) Derive Euler's equation for a rigid body about a fixed point through Newtonian approach.
(ii) Illustrate with example How Legendre transformation is used in thermodynamics.

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

13. (i) Define Poisson bracket and prove that all Poisson brackets are canonical invariants.
(ii) Discuss some algebraic properties of Poisson bracket.
