

M.Sc. I Semester Degree Examination, April/May - 2024

PHYSICS

Classical Mechanics

(NEP)

Time : 3 Hours

Maximum Marks : 70

Note : Answer **any five** of the following questions with Question No. **1 (Q.1)** is **Compulsory**.
Each question carries **equal** marks.

1. (a) Derive the equation of the orbit for the motion of a particle under a central force field where the force field obeys the inverse square law. **9**
(b) State Kepler's laws of planetary motion and deduce Kepler's third law. **5**
2. (a) Discuss the concept of particle motion in rotating coordinate systems and identify the various forces involved in this motion. **9**
(b) Write a note on Coriolis force. **5**
3. (a) What are constraints ? Explain their types. **5**
(b) Derive the Lagrangian equation of motion from D' Alembert's principle. **9**
4. (a) State Hamilton's principle and derive Hamilton's canonical equations of motion using the Hamiltonian function. **9**
(b) Write a brief note on phase space. **5**
5. (a) Derive Rutherford's formula for the scattering of α -particles by atomic nuclei. **9**
(b) Discuss inelastic scattering briefly in the laboratory frame of reference. **5**
6. (a) Obtain the expression for angular momentum and kinetic energy of rigid body when one point is fixed. **9**
(b) What are generalized coordinates and cyclic coordinates ? Explain. **5**
7. (a) What are Poisson brackets ? Explain their properties. **9**
(b) Obtain the canonical equations using Poisson bracket notation. **5**
8. (a) Obtain the normal modes for small oscillations of particles on a string. **5**
(b) Obtain expressions for generalized velocity, virtual work, and generalized force in terms of generalized coordinates. **5**
(c) State and prove Euler's theorem. **4**