

1589/MP2

MAY 2008

Paper II — CLASSICAL MECHANICS AND
STATISTICAL MECHANICS

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

All questions carry equal marks.

1. (a) (i) What are degrees of freedom generalised co-ordinates, generalised velocity and generalised momentum? Explain.
(ii) State D'Alembert's principle. Deduce Lagrange equation of motion from D'Alembert's principle for non-conservative system.

Or

- (b) (i) Explain Hamilton's principle. Derive Lagrange equations from Hamilton's principle.
(ii) Write in detail the conservation theorems and symmetry properties.
2. (a) (i) State and prove virial theorem.
(ii) Explain inverse square law and motion in time in the Kepler's problem.

Or

(b) (i) Explain in detail matrix transformation.

(ii) What are Euler's angles? Explain their role in rigid body dynamics.

3. (a) (i) Discuss the cyclic co-ordinates and conservation theorems.

(ii) Explain Routh's procedure.

Or

(b) (i) State and prove the principle of least action.

(ii) Obtain the Hamiltonian for a charged particle in an electromagnetic field.

4. (a) (i) Derive the canonical transformation equations.

(ii) Apply Hamilton Jacobi equation to solve harmonic oscillator problem.

Or

(b) Explain action angle variables. Solve the Kepler-problem in action angle variable.

5. (a) (i) Explain the types of statistics.

(ii) Derive the Sackur-tetrode equation for a mono atomic ideal gas.

Or

(b) Explain :

(i) Para magnetism and

(ii) Random walk in detail.