Or

(*b*) Explain the significance of Hamilton's principal function and discuss the Kepler's problem using Hamilton-Jacobi method.

6. (*a*) Discuss method of small oscillations and using this method derive an equation for the frequency of a two coupled oscillator.

Or

(*b*) Give the general theory of Small oscillators and discuss the normal modes of vibration.

M.Sc.—Phy-IS(102)

2019

(January)

Time : 3 hours

Full Marks : 80

Answer from **both** the Sections as per direction

The figures in the right-hand margin indicate marks

Candidates are required to answer in their own words as far as practicable

(CLASSICAL MECHANICS)

SECTION – A

1. Answer any *four* of the following : 4 × 4

(*a*) Write a note on infinitesimal rotations.

(*b*) Explain torque free motion of a rigid body.

(*c*) State and explain variational principle.

(*d*) Explain the principle of least action.

(*e*) Explain Hamilton-Jacobi theory.

(*f*) Discuss the normal coordinates of vibration.

Or

2. Answer *all* questions from the following : 2×8

(*a*) Define Eulerian angles.

(*b*) Define symmetrical top.

(*c*) Give the importance of Legendre transformations.

(*d*) Define inertia tensor.

(*e*) What do you mean by integral invariance ?

(*f*) Explain action angle variables.

(*g*) Define small oscillations.

(*h*) Explain the terms normal modes and normal coordinates.

SECTION – B

Answer **all** questions : 16×4

3. (*a*) Define coriolis force and obtain the kinetic energy of rotations of a rigid body with respect to the principal axes in terms of the Euler's angles.

Or

(*b*) Discuss in detail the motion of heavy symmetrical top having a fixed point and obtain the condition for a slipping top.

4. (*a*) Explain the techniques of calculus of variations Lagrange's equations from Hamilton's principle.

Or

(*b*) Give the physical significance of Hamiltonian and obtain the Hamilton's equations of motion from a variational principle.

5. (*a*) State and explain Poisson's theorem and show that the poisson bracket is invariant under canonical transformation.