



K21P 4197

Reg. No. :

Name :

I Semester M.Sc. Degree (C.B.S.S. – Reg./Supple./Imp.)

Examination, October 2021

(2018 Admission Onwards)

PHYSICS

PHY1C02 – Classical Mechanics

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer both questions (either **a** or **b**) :

1. a) Derive Lagrange's equation of motion from Hamiltonian principle.

OR

- b) Obtain Lagrange's equation of motion for small oscillations.

2. a) Derive Hamilton Jacobi differential equation. Work out Harmonic oscillator problem as an example of Hamilton Jacobi method.

OR

- b) Account for the vibrations of a linear triatomic molecule.

(2×12=24)

SECTION – B

Answer **any four** questions :

3. a) What are cyclic coordinates ?

- b) Show that generalized momentum conjugate to a cyclic coordinate is conserved.

- c) Discuss Liouville's theorem.

4. a) Define degrees of freedom.

- b) Derive Hamilton's canonical equations of motion.

- c) Find the Lagrangean of a spherical pendulum and obtain the equations of motion.

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5. a) Define Poisson's bracket.
b) Give the fundamental Poisson bracket.
c) Show that the transformation defined by $q = \sqrt{2P} \sin Q$ and $p = \sqrt{2P} \cos Q$ is canonical.
6. a) Define Lagrangean.
b) Discuss the superiority of Lagrangean approach over Newtonian approach.
c) Show that Poisson bracket of two constants of motion is itself a constant of motion.
7. a) What are normal coordinates ?
b) Explain conditions for stable and unstable equilibrium during small oscillations.
c) Account for the free vibrations of a linear triatomic molecule.
8. a) State Hamiltons principle for a conservative system.
b) Explain principle of least action.
c) Express equations of motion in Poisson bracket form.

(4×9=36)