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.

P.T.O.

5. a) Define Poisson's bracket.

b) Give the fundamental Poisson bracket.

c) Show that the transformation defined by $q = \sqrt{2P}\,\text{Sin}Q$ and $p = \sqrt{2P}\,\text{Cos}Q$ 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)**

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