D1APH2501 **(2 Pages)** **Name.....**
Reg.No.....

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2025
(Regular/Improvement/Supplementary)

PHYSICS
FPHY1C01-CLASSICAL MECHANICS

Time: 3 Hours **Maximum Weightage: 30**

Part A: Short answer questions. Answer *all* questions. Each carries *one* weightage.

1. What do you mean by generalized coordinates? Give the generalized coordinate in case of a simple pendulum.
2. Obtain Lagrange's equation in the presence of velocity dependent potential.
3. State and explain Hamilton's principle.
4. Obtain the Lagrange's equation of motion of a simple pendulum. Show that its oscillation is simple harmonic for small oscillations.
5. Under what conditions a transformation will be canonical?
6. How will you transform rate of change of a vector from an inertial frame to rotating frame?
7. Distinguish between Coriolis and Centrifugal forces.
8. When does a system turn chaotic? Give two examples.

(8 × 1 = 8 weightage)

Part B: Essay questions. Answer any *two* questions. Each carries *five* weightage.

9. Obtain Schrodinger equation from Hamilton Jacobi equation.
10. Discuss motion in time in Kepler problem and hence deduce Kepler's third law of motion (Assume the time equation in general central force problem).
11. Explain how rigid body motion can be described in terms of direction cosines and Euler angles.
12. Discuss various types of singular points of phase space trajectories with examples.

(2 × 5 = 10 weightage)

Part C: Problems. Answer any *four* questions. Each carries *three* weightage.

13. The Hamiltonian of a system is $H = \dot{x}^2 + \dot{x} + 2x$ .Find the corresponding Lagrangian.
14. Check whether the transformations $Q = \left(\frac{1}{q}\sin p\right)$ and P = (q *cos p)* is canonical or not.

(P.T.O.)

15. Obtain Lagrange's equation from D'Alembert's principle.
16. Explain normal frequencies using an example.
17. Obtain Lagrange's equation of a linear triatomic molecule.
18. Show that kinetic energy is conserved in the torque free motion of a rotating rigid body.
19. What is logistic map. Explain with an example.

(4 × 3 = 12 weightage)