Reg. No ..... Name **25P130**

M.Sc. DEGREE END SEMESTER EXAMINATION- NOVEMBER 2025

SEMESTER 1 : PHYSICS

COURSE : **24P1PHYT02 : CLASSICAL MECHANICS**

(For Regular - 2025 Admission and Improvement / Supplementary 2024 Admission)

Time: Three Hours Max. Weights: 30

PART A

Answer any 8 questions **Weight: 1**

1.	Differentiate between conservative and dissipative systems.	(E)
2.	Write the Hamilton - Jacobi equation and mention the terms.	(R)
3.	Distinguish between identical and point canonical transformation.	(A)
4.	Explain the physical significance of Euler-Lagrange's equations.	(U)
5.	Write Lorentz transformation in matrix form.	(U)
6.	Write any two fundamental Poisson Bracket?	(U, CO 2)
7.	Illustrate neutral equilibrium.	(A)
8.	What are rheonomic constraints? Give an example.	(U)
9.	What are Euler angles.	()
10.	Give the energy integrals of motion.	()

(1 x 8 = 8)

PART B

Answer any 6 questions **Weights: 2**

11	Use action-angle variables to obtain the energy levels of the hydrogen atom	(A)
12.	In a spherical pendulum the bob of mass 'm' is constrained to move on a spherical surface of radius R; R being the length of the pendulum. Set up the Lagrangian for the spherical pendulum and obtain the equations of motion.	(A)
13.	Show that the areal velocity is a constant of motion in central force motion.	(U)
14.	Prove that the Poisson bracket is in variant under canonical transformation	(An)
15.	Apply the Hamilton-Jacobi method to study the motion of a freely falling body.	(A)
16.	If the rotation axis of a body is in the direction of principal axis, show that the angular velocity vector and angular momentum will be in the same direction.	()
17.	Discuss homogentity of time and conservation of Hamiltonian.	(An)
18.	For small displacements, the condition for stable equilibrium is that the potential energy is minimum at the equilibrium configuration. Substantiate.	(An)

(2 x 6 = 12)

PART C

Answer any 2 questions **Weights: 5**

19. Obtain the Hamilton - Jacobi equation in terms of Hamilton's characteristic function and show that Q_1 is the only coordinate which is not a constant of motion. Also briefly explain the physical significance of Hamilton's characteristic function. (An)

20. Show that the moment of inertia is a symmetric second rank tensor. ()

21. Consider a system of two harmonic oscillators coupled by a spring of spring constant k_1. The spring constant of the harmonic oscillators is k and the mass connected to each of the harmonic oscillators is m. Find the normal frequencies and the normal co-ordinates of the system. (An)

22. What is Hamilton's principle. Obtain Hamilton's equations of motion for a particle moving in a central force field. (A)

(5 x 2 = 10)

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Wt.
CO 2	understand the physics of small oscillations and the concepts of canonical transformations and Poisson brackets ;	A	6	1

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R - REMEMBER;