Reg. No ..... Name **24P1020**

M.Sc. DEGREE END SEMESTER EXAMINATION- NOVEMBER 2024

SEMESTER 1 : PHYSICS

COURSE : **24P1PHYT02 : CLASSICAL MECHANICS**

(For Regular - 2024 Admission)

Duration : Three Hours Max. Weights: 30

PART A

Answer any 8 questions **Weight: 1**

1.	Prove that a system in which the KE is conserved moves along that path for which the time of transit is extremum.	(A)
2.	Show that if a given co-ordinate is cyclic in Lagrangian it will also be cyclic in Hamiltonian.	(E)
3.	State Poisson's theorem?	(U, CO 2)
4.	Briefly explain the physical significance of Hamilton's characteristic function.	(An)
5.	What do you mean by nutation?	(U)
6.	Write Lorentz transformation in matrix form.	(U)
7.	Explain the unstable equilibrium.	(A)
8.	Give the principle of canonical transformation.	(U)
9.	Give the classification of orbits.	(U)
10.	How will you connect the least action principle to the Fermat's principle in geometrical optics.	(An)

(1 x 8 = 8)

PART B

Answer any 6 questions **Weights: 2**

11.	What are principal axes and principal moment of inertia of a rigid body?	(An)
12.	Distinguish between centrifugal and Coriolis forces.	(An)
13.	Prove the fundamental properties of Poisson bracket i) [F,G+S] = [F,G]+[F,S] and ii) [F,GS] = [F,G]S+G[F,S].	(A)
14.	Obtain the Hamiltonian and Hamilton's equations of motion for a projectile. Neglect earth's rotation and air resistance.	(A)
15.	Determine the frequency of a linear harmonic oscillator using action-angle variables.	(A)
16.	Deduce Hamilton's principle from D'Alembert's principle.	(A)
17.	Discuss the central force problem in plane polar co-ordinates using Hamilton-Jacobi equation.	(A)
18.	Prove that the poisson bracket is invariant under canonical transformation.	(U)

(2 x 6 = 12)

PART C

Answer any 2 questions **Weights: 5**

19.	Obtain Lagrange's equations for a system of two coupled pendulum. Obtain the normal co-ordinates and normal modes.	(An)
20.	Develop matrix representations of the equation $\overrightarrow{dr} = d\vec{w} \times \vec{r}$, in three dimensional cartesian space.	()

21. Discuss with theory the homogeneity of space and conservation of linear momentum. Also obtain Hamilton's equations of motion for a particle moving in a central force field. (A)

22. Discuss seperation of variables in the H-J equation. (An)

(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	3	1

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