Reg. No ..... Name **23P119**

M. Sc. DEGREE END SEMESTER EXAMINATION : NOVEMBER 2023

SEMESTER 1 : PHYSICS

COURSE : **21P1PHYT02 : CLASSICAL MECHANICS**

(For Regular - 2023 Admission and Improvement/Supplementary -2022/2021 Admissions)

Duration : Three Hours Max. Weights: 30

PART A

Answer any 8 questions **Weight: 1**

1. Explain the physical significance of Euler-Lagrange's equations. (U)
2. Prove that the Poisson bracket [F,G+S] = [F,G]+[F,S]. (A)
3. What do you mean by Coriolis forces? (U)
4. What are action angle - variables? (U)
5. Illustrate unstable equilibrium. (A)
6. What are non-holonomic constraints? Give an example. (U)
7. What are holonomic constraints? Give an example. (U)
8. Distinguish between 'δ' variation and 'Δ' varation. (An)
9. Briefly explain the physical significance of Hamilton's characteristic function. (An)
10. Write any two fundamental properties of Poisson bracket. (U)

(1 x 8 = 8)

PART B

Answer any 6 questions **Weights: 2**

11. Express the kinetic and potential energies of a system in terms of normal co-ordinates. (A)
12. Discuss homogeneity of space and conservation of linear momentum. (An)
13. Discuss the central force problem in plane polar co-ordinates using Hamilton-Jacobi equation. (A)
14. Show that the transformations $q = \sqrt{2P}\sin Q$ and $p = \sqrt{2P}\cos Q$ is canonical. (An)
15. Obtain Kepler's law of periods. (A)
16. A bead slides on a smooth rod which is rotatiing about one end in a vertical plane with uniform angular velocity 'w'. Show that the equation of motion is $mr^{¨}=mrw^2-mgsinwt$. (An)
17. Show that the areal velocity is a constant of motion in central force motion. ()
18. Discuss how relativistic Lagrangian can be used to explain motion under a constant force. (An)

(2 x 6 = 12)

PART C

Answer any 2 questions **Weights: 5**

19. Discuss the general features of orbits in central force problem for repulsive and attractive cases. (A)
20. Discuss the Lagrangian formulation of relativistic mechanics. (A)

21. What is Hamiltonian function.Explain its physical significance. Prove that the Hamiltonian of a conservative system is equal to the total energy of the system. (An)

22. Show that for a transformation by a generating function *F* to be canonical, *dF* is an exact differential. (An)

(5 x 2 = 10)

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Wt.

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