QP CODE: 22001487

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Reg No : .....

Name : .....

M Sc DEGREE (CSS) EXAMINATION, JULY 2022

First Semester

CORE - PH010102 - CLASSICAL MECHANICS

M Sc PHYSICS,M.Sc.Space Science

2019 ADMISSION ONWARDS

445192AB

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. What do you mean by constraint motion? Give any two examples for constraint motion?
2. What is D' Alembert's principle?
3. What are Hamilton's canonical equations of motion?
4. Distinguish between stable and unstable equilibrium. Give examples for each.
5. Show that the transformation Q = p and P = - q is canonical.
6. What do you mean by canonical transformations?
7. How will we reduce a two-body problem to a one body problem?
8. What do you mean by Inertia tenser?
9. Briefly explain Hamilton-Jacobi method.
10. Give the matrix form of Lorentz transformation.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. A bead is sliding on a uniformly rotating wire in a force-free field. Obtain the Lagrange's equation of motion.
12. Show that the generalised momentum conjugate to a cyclic coordinate is a constant of motion.
13. Obtain the resonant frequencies of free vibrations of CO_2 molecule.
14. Evaluate the angular momentum Poisson bracket [J_x , J_y] where J_x and J_y are angular momentum along X and Y directions.

15. Obtain the differential equation of orbits under central force.

16. Evaluate the Poisson bracket $[Y,J_Z]$ where J_Z is the angular momentum along the Z direction.

17. What are action-angle variables? Explain the method to determine the frequency of a periodic system using action-angle variables

18. Explain the Lagrangian formulation of relativistic mechanics.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. Discuss Brachistochrone problem to find the path followed by a particle sliding from one point to another in the absence of friction under gravity

20. A)Define poisson brackets of two dynamic variables F and G and give any four properties .B) Derive the expressions for fundamental Poisson brackets.

21. State and prove Kepler's laws of planetary motion.

22. Discuss the motion of a particle in a central force field in plane polar co-ordinates using Hamilton Jacobi theory.

(2×5=10 weightage)