QP CODE: 19002391

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Reg No : .....

Name : .....

M.Sc. DEGREE (C.S.S) EXAMINATION, NOVEMBER 2019

First Semester

Faculty of Science

PHYSICS

Core - PH010102 - CLASSICAL MECHANICS

2019 Admission Onwards

85A5F949

Time: 3 Hours Maximum Weights :30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. What do you mean by configuration space?
2. What are cyclic coordinates?
3. What is Legendre transformation?
4. What do you mean by a small oscillations? Give an example.
5. What do you mean by normal modes?
6. Show that [F,G] = - [G,F]
7. Why do we reduce a two-body problem to a one body problem?
8. What are Euler's equations for the motion of a rigid body with one point fixed under the action of a torque?.
9. Obtain time independent form of Hamilton-Jacobi equation.
10. Explain how relativity affects the motion of a particle under a constant force.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. .Derive the expression for D' Alembert principle.
12. .Derive the Lagrange's equation of motion for the motion of a particle in a plane polar coordinate system.
13. Show that the transformation Q = q tan p and P = ln (Sin p) is canonical.

14. Show that the transformations q= (2P)1/2 Sin Q and p=(2P)1/2 Cos Q is canonical .

15. What are orthogonal transformations? Obtain the orthogonal transformation equations of a rigid body.

16. What are Coriolis force? Obtain the expression for it.

17. Discuss Hamilton-Jacobi method and obtain Hamilton-Jacobi equation.

18. Write down the Lorentz transformation matrix for arbitrary orientation of velocity relative to the axis. Explain the case when velocity is parallel to an axis.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. What is Hamilton's principle? Obtain Lagrange's equation of motion for a conservative system from Hamilton's principle.

20. Obtain the resonant frequencies, normal modes and normal frequencies of free vibrations of CO2 molecule.

21. Derive the differential equation of orbits and obtain Kepler's first and second law of planetary motion.

22. Using action angle-variables, determine the frequency of motion of a harmonic oscillator.

(2×5=10 weightage)