25P106 (Pages: 2) Name: .....

Reg.No: .....

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

(CBCSS - PG)

(Regular/Supplementary/Improvement)

CC19PPHY1C01 - CLASSICAL MECHANICS

(Physics)

(2019 Admission onwards)

Time : 3 Hours Maximum : 30 Weightage

Section A

Answer ***all*** questions. Each question carries 1 weightage.

1. What is meant by Legendre transformation? Give an example to show its applications.
2. Write any four fundamental properties of poisson bracket.
3. Discuss equation of motion in poisson bracket form.
4. What do you mean by normal modes of vibration?
5. Discuss the vibrations of linear triatomic molecule.
6. Discuss about non linear oscillations
7. Write the importance of Bifurcation.
8. Explain the term universality.

(8 × 1 = 8 Weightage)

Section B

Answer any ***two*** questions. Each question carries 5 weightage.

9. State and prove hamiltons principle. Derive lagranges equation from hamilton principle.
10. Define scattering cross section. Derive an expression for scattering cross section in terms of angle of scattering.
11. Solve linear harmonic oscillator using Hamiltonian Jacobi formulation.
12. Derive euler geometrical equations interms of angular velocity components.

(2 × 5 = 10 Weightage)

Section C

Answer any ***four*** questions. Each question carries 3 weightage.

13. Find the lagranges equation of motion for LC Circuit and also deduce the time period.

14. Set up the lagrangian and obtain the lagranges equations for a simple pendulum. Deduce the formula for itstime period.

15. Show that the transformation $P=1/2(p^2+q^2)$, $Q = \tan^{-1}q/p$ is canonical.

16. For a harmonic oscillator show that the hamiltons principle function is equal to the time integral of lagrangian.

17. Calculate the frequency of linear harmonic oscillator by using the method of angle-action variables.

18. Obtain the components of the angular velocity along the body set of axes in terms of Euler angles.

19. (i) In the absence of external torque on a body prove that the kinetic energy is constant.
    (ii) The magnitude of the square of the angular momentum is constant.

(4 × 3 = 12 Weightage)

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