23P106 (Pages: 2) Name: .....

Reg.No: .....

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2023

(CBCSS - PG)

(Regular/Supplementary/Improvement)

CC19P PHY1 C01 - CLASSICAL MECHANICS

(Physics)

(2019 Admission onwards)

Time : 3 Hours Maximum : 30 Weightage

Section A

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

1. Explain holonomic and non holonomic constraints, giving two examples of each.
2. Give the lagrangian for kepler problem.
3. Define the term impact parameter.
4. Define the hamiltonian of the system. Under what conditions, is it the total energy of the system?
5. Write the significance of HJ method in Keplers law.
6. What is the physical significance of direction cosines?
7. Differentiate between stable and unstable equilibrium using potential energy curve.
8. Explain the term universality.

(8 × 1 = 8 Weightage)

Section B

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

9. Define angle of scattering.and deduce an expression for angle of scattering in a central force field
10. Solve linear harmonic oscillator using Hamiltonian Jacobi formulation.
11. Derive euler geometrical equations in terms of angular velocity components.
12. Explain the concept of logistic map using an example. Discuss fixed points and stability.

(2 × 5 = 10 Weightage)

Section C

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

13. Show that the transformation $P=1/2(p^2+q^2)$, $Q = \tan^{-1}q/p$ is canonical.
14. For a harmonic oscillator show that the hamiltons principle function is equal to the time integral of Lagrangian.

15. Find the poisson bracket of $[L_x, L_y]$, where L_x and L_y are angular momentum components.

16. Derive the general solution of harmonic oscillator using HJ method.

17. Deduce an expression for centrifugal force.

18. Find the modes of vibration of a system of two harmonic oscilltors coupled by a spring of spring constant k_1.

19. Obtain the non linear oscillations of a pendulum.

(4 × 3 = 12 Weightage)

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