

D 93250

(Pages : 2)

Name.....

Reg. No.....

**FIRST SEMESTER M.Sc. DEGREE (SUPPLEMENTARY) EXAMINATION
NOVEMBER 2020**

(CUCSS)

Physics

PHY IC 01—CLASSICAL MECHANICS

(2017 Admissions)

Time : Three Hours

Maximum : 36 Weightage

Section A

Answer all questions.

Each question carries 1 weightage.

1. Differentiate Holonomic and non Holonomic constraints with examples.
2. Explain Hamilton's principle.
3. Explain virtual displacement.
4. Show that $P = \frac{1}{2}(p^2 + q^2)$, $Q = \tan^{-1} \frac{q}{p}$ is canonical.
5. Explain Δ -variation. How it differ from δ -variation ?
6. Write the relation between Lagrange and Poisson Brackets.
7. Explain coriolis force.
8. Differentiate body and space co-ordinate system.
9. Explain stable and unstable equilibrium of a system.
10. What are normal vibrations and normal co-ordinates ?
11. What is meant by limit cycle ?
12. What is meant by a strange attractor ?

(12 × 1 = 12 weightage)

Turn over

Section B

*Answer any two questions.
Each question carries 6 weightage.*

13. Discuss the scattering of α -particle under a central force field and hence obtain the expression for Rutherford scattering cross section
14. Discuss Hamilton-Jacobi theory and apply it to solve the problem of harmonic oscillator.
15. Define Euler's angle and obtain an expression for the complete transformation matrix
16. What are normal vibrations and normal co-ordinates? Discuss the small oscillations of CO_2 molecule and obtain the frequencies of their normal modes?

(2 × 6 = 12 weightage)

Section C

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

17. Derive the Lagrangian for a charged particle moving in an electromagnetic field.
18. Show that $[J_x, J_y] = [J_z]$ using Poisson bracket.
19. Show that transformation defined by $q = \sqrt{2P} \sin Q$, $p = \sqrt{2P} \cos Q$ is canonical by using Poisson bracket
20. Find the kinetic energy of rotation of a rigid body with respect to principal axes in terms of Euler's angles
21. Two bodies of mass m and $2m$ are connected by a spring constant k . Find the frequency at normal mode.
22. Write a note on chaotic attractors.

(4 × 3 = 12 weightage)