QP CODE: 25805160

25805160

Reg No : .....

Name : .....

INTEGRATED M.Sc DEGREE EXAMINATION, NOVEMBER 2025

Seventh Semester

INTEGRATED M.Sc BASIC SCIENCE-PHYSICS

CORE - IPH7CR01 - CLASSICAL PHYSICS-II

2021 Admission Onwards

50850A5A

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Whenever the Lagrangian function does not contain coordinate qk explicitly the generalized momentum pk is a constant of motion. Explain.
2. Differentiate Δ and δ variation.
3. What are the algebraic properties of Poisson's bracket?
4. Get the phase space orbits for the simple pendulum.
5. Discuss the applications of adiabatic invariance of action variables.
6. What do you mean by a limit cycle?
7. State van der Pol equation. Discuss the limit cycle of the van der Pol equation.
8. Write a short note on the Logistic equation.
9. What are inertial and non-inertial frames of reference? Give examples.
10. What do you mean by hidden momentum in relativistic mechanics?

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. State and prove the conservation theorem for linear momentum for a system of N particles.
12. Discuss the Hamilton-Jacobi equation for Hamilton's characteristic function.
13. Discuss the Kepler problem as an example of the separation of variables in the Hamilton-Jacobi equation.
14. Write a short note on Poincare maps.

15. Explain with an example the period doubling route to chaos.

16. Show that $x^2 + y^2 + z^2 - c^2t^2$ is invariant under Lorentz transformation.

17. Deduce energy-momentum relation in relativistic mechanics.

18. Two lumps of clay, each of (rest) mass m, collide head-on at $\frac{3}{5}c$. They stick together. What is the mass of the composite lump?

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. Discuss in detail canonical transformations. Solve the problem of harmonic oscillator by using the canonical transformations.

20. Discuss canonical perturbation theory (both time-dependent and time-independent) in classical mechanics.

21. Discuss in detail Henon-Heiles Hamiltonian.

22. Discuss in detail about the structure of spacetime.

(2×5=10 weightage)