



QP CODE: 21002072

21002072

Reg No :

Name :

M Sc DEGREE (CSS) EXAMINATION, NOVEMBER 2021

First Semester

CORE - PH010102 - CLASSICAL MECHANICS

M Sc PHYSICS, M.Sc. Space Science

2019 ADMISSION ONWARDS

2FDD7020

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

Weight 1 each.

1. What do you mean by constraint motion? Give any two examples for constraint motion?
2. Give the Lagrangian equation of motion for a particle in cartesian coordinate system.
3. What is Hamilton's principle?
4. Distinguish between stable and unstable equilibrium. Give examples for each.
5. Give the expression for kinetic energy and potential energy for the vibration of a linear triatomic molecule.
6. Define Poisson brackets of two functions.
7. How will we reduce a two-body problem to a one body problem?
8. What are Euler's equations of motion for the force free motion of a rigid body?
9. Briefly explain Hamilton-Jacobi method.
10. What is Thomas precession?

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

Weight 2 each.

11. Obtain the Lagrange's equation of motion in terms of Rayleigh function.
12. Show that the generalised momentum conjugate to a cyclic coordinate is a constant of motion.
13. Show that the transformation $Q = \ln [(1/q) \sin p]$ and $P = q \cot p$ is canonical.
14. Show that if a function F does not depend on time and is a constant of motion, then its Poisson bracket





with Hamiltonian vanishes.

15. Obtain Kepler's second law of planetary motion.
16. Four mass points each of mass m are placed at $(a, 0, 0)$, $(0, a, 0)$, $(0, 0, a)$ and (a, a, a) . Evaluate the inertia tensor of the system.
17. Apply Hamilton Jacobi theory to determine the equation of motion of a body falling vertically in a uniform gravitational field.
18. Explain the Lagrangian formulation of relativistic mechanics.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

Weight 5 each.

19. A) Discuss the Hamiltonian dynamics and derive the Hamilton's equations of motion. B) Obtain the expression for Hamiltonian for a charged particle in an electromagnetic field.
20. Obtain the resonant frequencies, normal modes and normal frequencies of two coupled pendulum.
21. What are Euler angles? Describe the motion of a body in terms of direction cosines and Euler angles.
22. Discuss Harmonic oscillator problem using Hamilton- Jacobi theory.

(2×5=10 weightage)

