C157

MSCPH-502

Classical Mechanics

M.Sc. PHYSICS(MSCPH-21)

Ist Semester Examination, 2022 (June)

Time : 2 Hours]   **Max. Marks : 80**

Note : This paper is of Eighty (80) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein.

SECTION–A
(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Twenty (20) marks each. Learners are required to answer any Two (02) questions only.

$(2\times20=40)$

1. Derive Lagrange's equations from Hamilton's Principle, when the Lagrangian function L is not an explicit function of time.

2. Derive the canonical transformation equation and give the condition for the canonical transformation.

3. Solve the Harmonic Oscillator problem by using Hamilton-Jacobi Theory.

4. State and prove the Kepler's laws of planetary motion.

5. Derive the equation for orbit of a particle moving under the influence of an inverse square central force field. Also calculate the time period of motion in elliptical orbit.

SECTION–B
(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Ten (10) marks each. Learners are required to answer any Four (04) questions only.   (4×10=40)

1. Obtain the Lagrange's equation of motion for Atwood Machine and Simple Pendulum.

2. Using Lagrangian equation, discuss the motion of particle in polar coordinates.

3. Define Poission Bracket.

4. What are the conditions for transformation to be canonical?

5. What are constraints? Explain the various types of constraints. Give their significance.

6. Write notes on :

    (a)   Dissipation Function.

    (b)   Cyclic Coordinates.

7. Discuss the two-body central force problem. Show that the motion of two interacting particles is equivalent to the motion of a single particle in an external field.

8. State and prove the virial theorem.

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