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M – 5851

Reg. No. :

Name :

First Semester M.Sc. Degree Examination, November 2021
Physics with Specialization in Nano Science/ Physics with Specialization
in Space Physics

PHNS 511/PHSP 511 : CLASSICAL MECHANICS

(2020 Admission)

Time : 3 Hours

Max. Marks : 75

SECTION – A

- I. Answer any **five** questions. Each question carries **3** marks.
- What do you mean by principle of virtual work?
 - Prove that the motion of a particle under central force takes place in a plane.
 - What do you mean by normal modes and normal coordinates?
 - Write a short note on generating function.
 - Obtain Hamilton - Jacobi equation for Hamilton's characteristic function.
 - Write a short note on strange attractor.
 - Obtain the expression for mass energy equivalence.
 - State the postulates of special theory of relativity and principle of equivalence.

(5 × 3 = 15 Marks)

P.T.O.



SECTION – B

Answer **all** questions. Each question carries **15** marks.

- II. A. State D' Alemberts principle and obtain Lagrangian equation from D Alemberts principle.

OR

- B. Explain scattering in a central force field.

- III. A. Explain

(a) Canonical transformation

(b) Generating function and

(c) The conditions of canonical transformations.

OR

- B. Discuss Kepler problem in action angle variable.

- IV. A. Obtain Lorentz transformation equations in matrix form and explain space time diagram.

OR

- B. Define linear and nonlinear systems and discuss the integration on nonlinear equation using quadrature method.

(3 × 15 = 45 Marks)



SECTION – C

Answer any **three** of the following questions. Each question carries **5** marks.

- V. (a) Show that the paths followed by a particle sliding from one point another in the absence of friction under gravity in the shortest time is a cycloid in view of Brachistochrone problem.
- (b) Find the equation of motion of force of constraints in case of simple pendulum by using Lagranges method of undetermined multipliers.
- (c) Show that $q = \sqrt{2P} \sin Q$; $p = \sqrt{2P} \cos Q$ is canonical.
- (d) Show that Lagranges bracket is invariant under canonical transformation.
- (e) Obtain relativistic Lagrangian of a particle.
- (f) Obtain normal frequency and normal modes of longitudinal vibrations of CO_2 molecule.

(3 × 5 = 15 Marks)

