

Reg. No. :

Name :

First Semester M.Sc. Degree Examination, August 2021

Physics

PH 211: CLASSICAL MECHANICS

(2018–19 Admission)

Time : 3 Hours

Max. Marks : 75

PART – A

Answer any **five** questions. Each question carries **3** marks.

- I. (a) What is Hamilton's principle.
- (b) Prove that the motion of a particle under central force takes place in a plane.
- (c) What do you mean by normal modes.
- (d) Write a short note on generating function.
- (e) Write a short note on action angle variable.
- (f) What are Euler's equation of motion.
- (g) Obtain the expression for mass energy equivalence.
- (h) Define linear and non-linear systems.

(5 × 3 = 15 Marks)

P.T.O.



PART – B

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

- II. (a) State D'Alembert's principle and obtain Lagrange's equation from D'Alembert's principle.

OR

- (b) State and explain Kepler's law and obtain law of gravitation from Kepler's law.

- III. (a) State and prove Liouville's theorem.

OR

- (b) Discuss Kepler problem in action angle variable.

- IV. (a) Obtain Lorentz transformation equation in matrix form and explain space time diagram.

OR

- (b) Obtain pendulum equation of nonlinear system.

(3 × 15 = 45 Marks)

PART – C

Answer any **three** questions. Each question carries **5** marks:

- V. (a) Show that the path followed by a particle sliding from one point to another in the absence of friction under gravity in the shortest time is a cycloid in view of Brachistochrone problem.
- (b) Obtain normal frequency and normal modes of longitudinal vibration of CO₂ molecule.



- (c) Show that $q = \sqrt{2P} \sin Q$; $P = \sqrt{2p} \cos Q$ is canonical.
- (d) Derive Hamilton's characteristic function and explain its physical significance.
- (e) Obtain relativistic Lagrangian of a particle.
- (f) Explain Coriolis force and obtain expression for it.

(3 × 5 = 15 Marks)

