



K16P 1297

Reg. No. :

Name :

**First Semester M.Sc. Degree (Reg./Suppl./Imp.)
Examination, November 2016
PHYSICS
(2014 Admission Onwards)
PHY 1CO2 : Classical Mechanics**

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **both** questions (either **a** or **b**). **Each** question carries **12** marks.

1. a) Distinguish between differential and total cross section. Obtain the differential cross section for the scattering of two rigid spheres of the same size. Explain why the variation with angle is independent of the radius.

OR

- b) What is meant by a rigid body ? Is it possible to have a perfectly rigid body ? Justify your answer. Derive the Euler's equation of motion. Explain the significance of the solutions of Euler's equation.

2. a) Distinguish between Lagrangian, Hamiltonian and Newtonian formulations. Explain the advantages and disadvantages of each. Derive the Hamilton's equation of motion.

OR

- b) Explain the terms :
- Orthogonal transformation
 - Canonical transformation
 - Inverse transformation
 - Identity transformation.

Show that the transformations $Q = \log(1/q \sin p)$, $p = q \cos P$ and $Q = p \tan q$,
 $p = \log(\sin P)$ are canonical. (2×12=24)

P.T.O.



SECTION – B

Answer **any four** questions. (1 mark for Part **a**, 3 marks for Part **b** and 5 marks for Part **c**)

3. a) What are constraints ?
b) Explain the meaning of holonomic and non holonomic constraints with examples.
c) State and obtain the mathematical form of D'Alembert's principle.
4. a) What is phase space ?
b) Illustrate the concept of phase space.
c) Prove that the shortest distance between two points in a plane is a straight line.
5. a) What is the significance of Hamilton Jacobi theory ?
b) Obtain the Hamilton Jacobi equations.
c) Discuss the problem of one dimensional harmonic oscillator by the Hamilton Jacobi method.
6. a) Write down the Hamiltonian for a conservative system.
b) Obtain Hamiltonian for a sphere pendulum.
c) Hence derive the Hamilton's equations.
7. a) What is torque free motion ?
b) Distinguish between body cone and space cone.
c) Obtain the Lagrangian equation for the torque free motion of a symmetric rigid body and calculate the motion of the axis of symmetry.
8. a) What is degenerary ?
b) Explain using an example.
c) Investigate the small oscillations of a CO_2 like molecule.

(4×9=36)
