



K15P 0305

Reg. No. :

Name :

I Semester M.Sc. Degree (Reg./Sup./Imp.) Examination, November 2015
PHYSICS (2014 Admin. Onwards)
PHY 1C02 : 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) Derive the Hamilton's equation of motion for a body in a central force field. Prove that the angular momentum for a particle moving in a central force field is conserved.

OR

- b) What is stable, unstable and neutral equilibrium ? Give examples. Show that the eigen vectors corresponding to the two distinct eigen frequencies are orthogonal. Explain the meaning of orthogonality. **(2×12=24)**

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.

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4. a) State Hamilton's principle.
b) Show that the Lagrangian and Newtonian equations are equivalent.
c) Prove Hamilton's principle from Newton's equations.
5. a) Can a canonical transformation reveal symmetry in a physical system ?
b) How can it be used to reduce the number of independent variables ?
c) Prove that the Poisson bracket of two constants of motion is itself a constant of motion even when the constants depend upon time explicitly.
6. 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.
7. a) What is Coriolis force ?
b) Give some phenomena in nature that arises due to Coriolis force.
c) Discuss the effect of Coriolis force on a freely falling particle.
8. a) What is degeneracy ?
b) Explain using an example.
c) Investigate the small oscillations of a CO₂ like molecule. **(4×9=36)**