



K18P 1375

Reg. No. :

Name :

**First Semester M.Sc. Degree (Reg./Suppl./Imp.)
Examination, October 2018
(2014 Admn. Onwards)
PHYSICS
PHY 1C02 : Classical Mechanics**

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **both** questions. (Either **(a)** or **(b)**) :

1. a) Derive Euler-Lagrange equations of motion using the calculus of variation and hence obtain Lagrange's equation of motion for a system of particles.

OR

- b) Enumerate the normal modes of a linear triatomic molecule.

2. a) Write down the Hamilton-Jacobi equation for Hamilton's principal function. Give its complete solution and apply it to the problem of one dimensional harmonic oscillator.

OR

- b) Discuss the free motion of a symmetrical top and hence obtain an equation for its period. (2×12=24)

SECTION – B

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

3. a) Differentiate between holonomic and non holonomic constraints.
b) Explain the principle of least action.
c) A particle of mass m is projected with an initial velocity u at an angle α with horizontal. Use Lagrange's equation to describe the motion of the projectile.

P.T.O.



4. a) What do you mean by Legendre transformation ?
b) Write a note on action angle variables.
c) Show that the transformation
$$P = 2(1 + q^{1/2} \cos p) q^{1/2} \quad Q = \log(1 + q^{1/2} \cos p)$$
 is canonical.
5. a) List out any two properties of Poisson bracket.
b) Write a note on Hamilton's characteristic function.
c) Using Hamilton-Jacobi method, determine the motion of a body falling vertically in a uniform gravitational field.
6. a) Define Euler angles.
b) Write a note on Coriolis force.
c) Derive an expression for the angular velocity of a rigid body in terms of Euler angles.
7. a) Write down the Lagrange's equation of motion for small oscillations.
b) Write a note on small oscillations.
c) Find out the period of oscillation of a compound pendulum using Hamilton's method.
8. a) Define Hamiltonian function.
b) When does the Hamiltonian function represent total energy of a system ?
c) Find out the period of oscillation of a compound pendulum using Hamilton's method. **(4×9=36)**
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