

K21P 0540

Reg. No. :

Name :

**First Semester M.Sc. Degree (CBSS – Reg./Suppl. (Including Mercy
Chance)/Imp.) Examination, October 2020
(2014 Admission Onwards)**

PHYSICS

PHY1C02 – Classical Mechanics

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **both** questions (either **a** or **b**) :

1. a) State and prove Liouville's theorem.

OR

b) Obtain Lagrange's equation of motion for small oscillations.

2. a) Derive Hamilton Jacobi differential equation. Work out Harmonic oscillator problem as an example of Hamilton Jacobi method.

OR

b) Derive Euler's equation of motion for a rigid body.

(2×12=24)

SECTION – B

Answer **any four** questions :

3. a) Define Hamiltonian of a system.

b) Discuss the physical significance of Hamiltonian.

c) Derive Hamilton's canonical equations of motion.

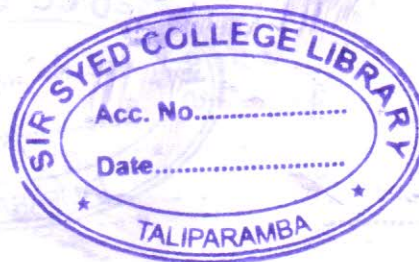
4. a) What is phase space ?

b) Derive equations of motion for a particle moving under the influence of central force.

c) Find the Lagrangean of a spherical pendulum and obtain the equations of motion.

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5. a) Define Poisson's bracket.
b) Give the fundamental Poisson bracket.
c) Derive equations of motion in Poisson bracket form.
6. a) What are constraints ?
b) Discuss the effect of constraints on the degree of freedom of a system.
c) Obtain the Hamiltonian for a charged particle moving in an electromagnetic field.
7. a) What are normal coordinates ?
b) Explain conditions for stable and unstable equilibrium during small oscillations.
c) Account for the free vibrations of a linear triatomic molecule.
8. a) What are canonical transformations ?
b) Give the condition for a transformation to be canonical.
c) Show that the transformation $P = q \cot p$, $Q = \log (1/q \sin p)$ is canonical.

(4×9=36)