Reg. No. : ....

Name : ....

I Semester M.Sc. Degree (CBSS-Reg./Suppl./Imp.)
Examination, October - 2019
(2014 ADMISSION ONWARDS)
PHYSICS
PHY1C02: CLASSICAL MECHANICS

Time : 3 Hours   Max. Marks : 60

SECTION-A

Answer both questions (either a or b)   **(2×12=24)**

1.   (a)   Derive Lagrange's equation of motion from Hamiltonian principle

<p align="center">(OR)</p>

      (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.

<p align="center">(OR)</p>

      (b)   Solve Kepler problem by Hamilton Jacobi method.

SECTION-B

Answer any **Four** questions (**1** mark for a , **3** marks for b, **5** marks for c)

<p align="right">(4×9=36)</p>

3.   (a)   What are cyclic coordinates?
      (b)   Discuss the superiority of Lagrangean approach over Newtonian approach.
      (c)   Show that generalized momentum conjugate to a cyclic coordinate is conserved.

4.   (a)   Define degrees of freedom.
      (b)   Derive Hamilton's canonical equations of motion.
      (c)   Find the Lagrangean of a spherical pendulum and obtain the equations of motion.

<p align="right">P.T.O.</p>

5. (a) Define Poisson's bracket.
   (b) Give the fundamental Poisson bracket.
   (c) For what values of m and n, do the transformation equations $Q=q^m$ Cos np and $P = q^m$ Sin np represent a canonical transformation.

6. (a) Define moment of inertial tensor.
   (b) Derive Euler's equation of motion for a rigid body.
   (c) Solve Euler's equation for force free motion of a symmetric top.

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) State Hamiltons principle for a conservative system.
   (b) Explain principle of least action.
   (c) Derive Jacobi's identity.

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