BR-2522

M. Sc. (Second Semester) Examination,

April-May 2018

PHYSICS

Paper : Second (Classical Mechanics)

Time Allowed : Three hours

Maximum Marks : 40

Note : Attempt questions of all two sections as directed. Distribution of marks is given with sections.

Section-A

(Short Answer Type Questions) 5x3=15

Note : Attempt all five questions. Each question carries 03 marks.

1. What is a cyclic co-ordinate? Show that generalized momentum conjugate to cycle co-ordinate is constant of motion.

Or

Explain holonomic and non-holonomic constraints with one suitable example of cach.

2. What is a central force? Show that angular momentum of a particle moving under a central force is conserved.

Or

Explain centrifugal and corrohis forces.

3. State and explain Hamilton's modified principle.

Or

Obtain thc Hamiltonian of a onc dimensional harmonic oscillator.

4. Draw and discuss various normal modes of oscillations of , CO_2molecule.

or

Write and explain and three fundamental properties of Poisson brackets.

5. Explain gcncralised co-ordinates.

Or

What is the physical significance of llamilton's characteristic function?:

Section-B

(Long Answer Type Questions) 5x5=25

Note : Attempt all five questions. Each question carries 5 marks.

6. Discuss connection between conservation laws and symmetry properties. Show, that homogencity of space implies the conservation of linear momentum.

Or

State and explain D'Alembert's principle. Hence deduce Lagrange's equation of motion.

7. Define differentiatc scattering cross-section and deduce Rutherford's formula of a-particle scattering in a central force field.

Or

Discuss two-body problem. Hence introduce the concept of reduced mass lo simplify the problem.

8. Deduce Hamilton's equations of motion. Hence discuss motion of a simple pendulum.

Or

Explain the principle of least action. How does it lead to Fermat's principle in geometrical optics.

9. Define Poisson brackets. Obtain the equation of motion of a dynamical variable F (9, p. 1) in terms of Poisson bracket.

Or

What is canonical transformation? Obtain canonical transformation equations for various generating functions.

10. Write notes on any two of the followings :

(a) Poisson theorem

(b) A-variation

(c) Kepler's law of planetary motion

(d) Lagrange's equation for a simple pendulum