

(101PHY17)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2017

FIRST SEMESTER

Branch - Physics

Paper I — CLASSICAL MECHANICS AND THEORY OF RELATIVITY

(New Syllabus)

Time : 3 Hours

Max. Marks : 70

**PART - A**

Answer any FOUR questions. All questions carry equal marks.

(Marks :  $4 \times 5$  marks = 20 marks)

1. Define Constraints and classify them with suitable examples.
2. State and explain principle of virtual work.
3. Explain canonical transformations with examples.
4. Obtain the frequency of a harmonic oscillation using action-angle variables.
5. Explain the motion of central force field.
6. Write a note on motion of symmetric top.
7. Explain the relativistic Doppler Effect.
8. Give an account of theory of relativistic dynamics of a single particle.

**PART - B**

(Essay Type)

Answer ALL questions. All questions carry equal marks.

(Marks :  $4 \times 12.5$  marks = 50 marks)

9. (a) Obtain Lagrange's equation from D'Alembert principle for conservative system.  
(b) Set up the Lagrangian for a linear harmonic oscillator and obtain equation of motion.

Or

- (c) Derive the Hamiltonian's equation of motion for a system of particles.
- (d) Obtain the equation of motion for simple pendulum using Hamiltonian equation.
10. (a) Derive the canonical equations for generating functions  $F_1$ ,  $F_2$ ,  $F_3$  and  $F_4$ .  
(b) What are Poisson bracket? And mention its importance properties.

Or

- (c) Describe Hamiltonian-Jacobi method for solving the equation of harmonic oscillator problem.

[P.T.O]

11. (a) State and prove Kepler's Laws of planetary motion.

Or

(b) Define the angular momentum and Torque of a rigid body.

(c) Explain the Euler's angles for the orientation of a rigid body fixed at one point.

12. (a) Derive geometrical representation of Lorentz transformations of space and time.

Or

(b) Explain the motion of a single particle in magnetic field.

(c) Write a note on transformation of momentum and force in relativistic mechanics.