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NY—84—2023

FACULTY OF SCIENCE AND TECHNOLOGY

M.Sc. (First Semester) EXAMINATION

NOVEMBER/DECEMBER, 2023

(New/CBCS Pattern)

PHYSICS

Paper-PHY-102

(Classical Mechanics)

(Thursday, 7-12-2023)

Time : 10.00 a.m. to 1.00 p.m.

Time—3 Hours

Maximum Marks—75

N.B. :- (i) All questions are compulsory and carry equal marks.

(ii) Figures to the right indicate full marks.

1. Discuss the mechanics of system of particles. Show that linear and angular moments remains conserved for such systems. 15

Or

(a) State and explain the terms generalized coordinates, cyclic coordinates and degrees of freedom. 8

(b) State and derive D' Alembert's principle. 7

2. Obtain Lagrange's equation of motion using D' Alembert's principle. Show that if the Lagrangian does not depend explicitly on time, then the total energy is conserved. 15

Or

(a) Obtain expression for motion of Atwood machine by Lagrange's method. 8

(b) Show that Lagrange equations remain invariant under Galilean transformation. 7

3. Derive the equation for the orbit of a particle moving under the influence of an inverse square central force field. 15

Or

- (a) State and prove Virial theorem. 7
- (b) Derive Hamiltonian equations of motion using Hamiltonian principle. 8
4. Discuss Euler's angles for the orientation of a rigid body. Obtain expression for torque free motion of a rigid body. 15

Or

- (a) Discuss the vibrations of linear triatomic molecule. 8
- (b) What are small oscillations ? Discuss forced vibrations. 7
5. Write short notes on (any *three*) : 15
- (a) Conservative and non-conservative forces
- (b) Jacobi Integral and Kinetic energy
- (c) Poisson brackets and its properties
- (d) Angular momentum and inertia tensor.