

Exam. Code : 103201

Subject Code : 1279

B.A./B.Sc. 1st Semester

PHYSICS

Paper-A (Mechanics)

Time Allowed—3 Hours] [Maximum Marks—35

Note :—Attempt **five** questions, selecting at least **one** question from each Section. **Fifth** question may be attempted from any Section.

SECTION—A

- I. (a) Derive expression for acceleration in spherical polar coordinates. 5
- (b) Is area scalar or vector ? What do you know about volume ? 2
- II. (a) How rotational invariance of space leads to conservation of angular momentum ? 5
- (b) Show that the force $\vec{F} = 3x^2y^2\hat{i} + 2yx^3\hat{j} + 6z\hat{k}$ is conservative. 2

SECTION—B

- III. (a) Derive the differential equation of motion under the central forces. 5
- (b) What is reduced mass of a two body system ? 2

- IV. (a) Determine the turning points in the trajectory of a particle moving under a central force. How the total energy is related to the shape ? 6
- (b) State Kepler's third law of planetary motion. 1

SECTION—C

- V. (a) Derive an expression for Coriolis force acting on a particle moving in vertical direction. 5
- (b) Why is earth flattened at poles ? 2
- VI. Discuss Foucault's Pendulum in detail. 7

SECTION—D

- VII. What is Rutherford scattering ? Derive an expression for differential scattering cross section. 7
- VIII. (a) Derive Euler's equation of rotation of a rigid body about a fixed point. 5
- (b) What is a gyroscope ? Give example. 2