

Exam. Code : 103201

Subject Code : 1265

B.A./B.Sc. 1<sup>st</sup> Semester

PHYSICS

Paper—A (Mechanics)

Time Allowed—3 Hours] [Maximum Marks—35

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

**SECTION—A**

- (a) Derive an expression for velocity of a particle in spherical polar co-ordinates.

(b) In case of spherical polar co-ordinates, prove that  $\hat{e}_r \times \hat{e}_\theta = \hat{e}_\phi$ . 5+2
- (a) Prove that law of conservation of energy is a consequence of homogeneity of time.

(b) Show that the force  $\vec{F} = x^3\hat{i} + y^5\hat{j} + z^3\hat{k}$  is conservative. 5+2

**SECTION—B**

- (a) Define central force. Give two examples of central force.

- (b) From the effective potential energy curve, explain the nature of orbital motion of a body having total energy :
- (i) positive
  - (ii) zero
  - (iii) negative but greater than minimum effective potential energy
  - (iv) equal to minimum effective potential energy.
- 2+5

4. Explain Michelson-Morley experiment. How it led to the rejection of ether hypothesis ? 7

#### SECTION—C

5. What are Galilean transformations ? Show that the laws of momentum and energy conservation are invariant under Galilean transformations. 7
6. (a) Define Coriolis force. Calculate horizontal and vertical components of Coriolis force on a particle of mass  $m$  moving on the surface of earth with a velocity  $\vec{v}$ . What is the direction of Coriolis force in northern and southern hemispheres ?
- (b) No cyclones are set up at equator. Explain. 5+2

#### SECTION—D

7. (a) Define elastic collision and inelastic collision.
- (b) Show that in Lab. system, the particles of same mass will move at right angle to each other after an elastic collision, if one of these were at rest before collision. 2+5
8. Derive expression for angular momentum of a rigid body and define inertia tensor. 7