Exam. Code : 103201
Subject Code : 1266

B.A./B.Sc. 1st Semester (Batch 2021-24)

PHYSICS

Paper—A (Mechanics)

Time Allowed—3 Hours] [Maximum Marks—35

Note :—Attempt **FIVE** questions in all, selecting at least **ONE** question from each section. The **fifth** question may be attempted from any section. All questions carry equal marks.

SECTION—A

1. Derive expression for the acceleration of a particle moving in three dimensional space in spherical polar co-ordinates. 7

2. (a) Define homogeneity of time. Prove that the law of conservation of energy follows from the homogeneity of time. 4

   (b) Define solid angle. Prove that the solid angle subtended by a sphere at its centre is 4π steradian. 3

SECTION—B

3. State and prove Kepler's laws of planetary motion. 7

4. (a) Define a conservative force. Give one example. How a conservative force is related to potential energy ? 3

   (b) Show that the total energy E is constant of motion under the central force field. 4

SECTION—C

5. (a) What are inertial and non-inertial frames of reference ? Is earth an inertial frame of reference ? 2

   (b) Show that the laws of conservation of linear momentum and energy are invariant under Galilean transformations. 5

6. (a) What is Coriolis force ? Name its two geographical consequences. 2

   (b) Discuss the effect of Coriolis force on the free fall of a body from a height h above the surface of earth. 5

SECTION—D

7. (a) Define elastic collision and in-elastic collision. 2

   (b) Define centre of mass system. Prove that in centre of mass system, the magnitude of the velocities of the particles remains unaltered in elastic collision. 5

8. Derive Euler's equations of rotation of rigid body about a fixed point. 7