Sr. No. of Question Paper : 1873   **GC-3**   **Your Roll No**...............

Unique Paper Code	:	42221101
Name of the Paper	:	Physics – I (Mechanics)
Name of the Course	:	**B.Sc. Physical Science (CBCS)**
Semester	:	I

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on the receipt of this question paper.

2. Attempt any five questions in all.

3. Use of nonprogrammable calculator is allowed.

1. (a) What is a position vector ? Find modulus of position vector $2\hat{i} + 2\hat{j} - 3\hat{k}$.

   (2,2)

   (b) What are polar and axial vectors ? Give one example of each.   (2,1)

   (c) Solve following differential equations :

        (i) $(x^2 - 2y)dx = (5x - y^2)dy$

        (ii) $x^2dy + y(x + y)dx = 0$ (4,4)

2. (a) What are conservative forces ? Give two examples of conservative forces.   (2,2)

   (b) State and prove work energy theorem.   (2,5)

   (c) Two particles of masses 20 g and 40 g are moving opposite to each other with speed 2 m/s and 5 m/s respectively, on a straight line. They collide elastically. Find the change in momentum of each particle.   (4)

3. (a) Give the statement of law of conservation of angular momentum. Give two examples of its application where the law of conservation of angular momentum helps us to understand rotational motion.   (3,3)

    (b) A solid sphere of mass 100 g and radius 5 cm is rotating about its own axis. It completes 5 revolutions in 2 minute, calculate its

        (i) Moment of inertia

        (ii) Angular momentum

        (iii) Rotational kinetic energy   (2,2,2)

    (c) State the importance of Newton's first law of motions.   (3)

4. (a) Define damped oscillations. Give one example.   (2,2)

    (b) Write the differential equation for a damped harmonic oscillator. Solve the differential equation for its displacement for under-damped condition only.   (3,8)

5. (a) What is Poisson's ratio ? Can it be more than 0.5 ? Give reason for your answer using appropriate equation.   (2,1,2)

    (b) Obtain the relation between Poisson's ratio (a), bulk modulus (K) and Young's modulus (Y) for an isotropic material.   (10)

6. (a) Describe the Michelson-Morley experiment and explain the physical significance of its negative result.   (6,4)

    (b) Find the velocity of a rod moving in the direction of its length so that its length appears to be 60% of its original length.   (5)

7. Write short notes on any **two** of the following :

    (a) Geo-stationary satellite

    (b) Searle's method of determining Young's modulus

    (c) Time dilation in special theory of relativity.   (7½,7½)

                                                            (3000)