This question paper contains **4** printed pages]

Roll No. ☐☐☐☐☐☐☐☐☐☐

S. No. of Question Paper : **5821**

Unique Paper Code : **222181**   **D**

Name of the Paper : **Physics-I**

Name of the Course : **B.Sc. Mathematical Science/B.Sc. (Hons.) Maths.**

Semester : **III/I**

Duration : **3 Hours**   Maximum Marks : **75**

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

Attempt *five* questions in total.

Use of non-programmable calculator is allowed.

1.   (*a*)   What are axial and polar vectors ? Give *one* example of each.   3

   (*b*)   Find the work done W in moving a particle in a force :   4

$$F = (2xy + z^3)\, i + x^2 j + 3xz^2 k$$

   from   the point (1, –2, 1) to (3, 1, 4).

   (*c*)   State and prove Stokes theorem of vector calculus. Give its physical

   significance.   -   8

2. (*a*) State and prove work energy theorem.   6

    (*b*) What are elastic and inelastic collision ? Give examples.   3

    (*c*) Discuss one-dimensional elastic collision between two bodies.   6

3. (*a*) Define centre of mass and give its mathematical definition. Does the center of mass of a solid body necessarily lie within the body ? Support your answer with an example.   5

    (*b*) Derive an expression for the kinetic energy of a rotating body in terms of its moment of inertia and angular velocity.   5

    (*c*) State and prove theorem of parallel axes.   5

4. What are 'Lissajous' figures ?

    Discuss, with necessary theory, the superposition of two sinusoidal signals of equal frequencies but different amplitude. Describe what happens if one of the vibration changes its phase from 0° to 180° relative to the other.   1,10,4

5. (*a*) Explain the effect of damping an oscillatory motion.   2

(b) Set up and solve the differential equation of a damped harmonic oscillator and discuss its special cases :

(i) Heavy damping

(ii) Critical damping

(iii) Under damping. 9

(c) Define logarithmic decrement for a damped harmonic oscillator. 4

6. (a) Discuss the necessary condition for sustained interference. Describe with necessary theory, the Young's double slit method of determining wavelength of monochromatic light. 12

(b) Green light wavelength 5100 Å from a narrow slit is incident on a double slit if over all separation of 10 fringes on a screen 2 m away is 2.0 cm, find the double slit separation. 3

7. (a) Distinguish between Fresnel's and Fraunhofer's class of diffraction. 5

(b) What is zone plate and how is it made ? Explain how a zone plate acts like a convergent lens having multiple foci. Derive an expression for its focal length. 10

P.T.O.

8. Write short notes on any *two* of the following :   7½,7½

(1) Nicol prism

(2) Dispersive power and resolving power of a grating.

(3) Moment of Inertia.