



RR-0839

Third Year B. Sc. Examination

March / April – 2010

Physics : Paper - VI

Time : 3 Hours]

[Total Marks : 70

Instructions :

(1)

नीचे दृशावेक निशानीवाणी विगतो उत्तरवही पर अवश्य कभवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
← T.Y. B.Sc.	<input type="text"/>
Name of the Subject :	<input type="text"/>
← PHYSICS - 6	<input type="text"/>
← Subject Code No. : <input type="text"/> 0 <input type="text"/> 8 <input type="text"/> 3 <input type="text"/> 9	<input type="text"/>
← Section No. (1, 2,.....) : <input type="text"/> NIL	<input type="text"/>
	Student's Signature

- (2) Draw a neat diagram wherever necessary.
- (3) Symbols used in the paper have their usual meaning.
- (4) Figures to the right indicate full marks of the question.

1 Answer the following as required in brief : 14

- (1) Explain : ignorable coordinates.
- (2) Explain : 'mobility of charge carriers'
- (3) Define non inertial frame of reference. Give an example of it.
- (4) What is the origin of diamagnetism ?
- (5) Define the Hamiltonian. When is it equal to the total energy of the system ?
- (6) Explain atomic packing factor (APF).
- (7) State any two outstanding physical properties of metals.

2 (a) Describe the effect of Coriolis force on a body falling freely in the gravitational field of the earth. 7

- (b) Calculate the fictitious force and the observed force on a body of mass 10 kg in a frame of reference moving (a) vertically upwards and (b) vertically downwards with an acceleration of 4.2 m/s^2 ($g = 9.8 \text{ m/s}^2$) 4

OR

- 2 (a) Considering centre of mass. Show that the total angular momentum of a system of particles is the sum of orbital and spin angular momenta. 7

- (b) The circular orbital velocity of the sun about the centre of Galaxy is $3 \times 10^7 \text{ cm/s}$ and its distance is nearly equal to $3 \times 10^{22} \text{ cm}$ from the axis of the Galaxy. Estimate the mass of the Galaxy. 4

$$(G = 6.67 \times 10^{-8} \text{ c.g.s. units})$$

- 3 (a) Derive Euler's equations of motion of a rigid body one point of which is fixed. 6

- (b) State and prove Kepler's second law of planetary motion on the basis of conservation of angular momentum. 5

OR

- 3 (a) Obtain Lagrange's equations from D'Alembert's principle. 6

- (b) What is Chaos ? Define nonlinear system. Illustrate this definition with appropriate example. 5

- 4 (a) State Bragg's law for x-ray diffraction and derive modified Bragg's equation. 7

- (b) A beam of x-rays is incident on a crystal of lattice spacing 0.3 nanometer. The second order Bragg reflection is observed at a glancing angle of $17^\circ 24'$. Calculate : (i) the wavelength of x-rays and (ii) glancing angle for first order Bragg's reflection. 4

OR

- 4 (a) Describe Langevin's theory for a paramagnetic gas and derive an expression for magnetization 7

$$M = C\mu_m \int \cos \theta \exp(a \cos \theta) \sin \theta d\theta$$

- (b) The magnetic field strength in copper is $10^5 \frac{\text{ampere}}{\text{metre}}$. 4

If the magnetic susceptibility of copper is -0.8×10^{-5} , calculate the flux density and magnetization in copper.

$$\left(\mu_0 = 4\pi \times 10^{-7} \text{ N} \cdot \text{sec}^2 / \text{C}^2\right)$$

- 5 (a) Discuss relaxation time, collision time and mean free path of free electrons in metals. 6
- (b) Mention important applications of superconductivity materials in some fields. 5

OR

- 5 (a) Give an account of the phenomenon of superconductivity. Explain Type I and Type II superconductors. 6
- (b) Explain the domain model for ferromagnetic materials. 5

- 6 Explain in detail any two of the following : 12
- (a) Foucault's pendulum experiment
- (b) Miller indices
- (c) Ferrimagnetism (Ferrites)
- (d) Constraints.