(i) Printed Pages : 3 Roll No. .....

(ii) Questions : 7 Sub. Code : 0 1 5 0

Exam. Code : 0 0 0 2

B.A./B.Sc. (General) 2nd Semester

1059

PHYSICS

Paper–C : Electricity and Magnetism–II

Time Allowed : Three Hours] **[Maximum Marks : 22**

Note :– Attempt **five** questions in all, by selecting **two** each from of Unit–I and Unit–II. Unit–III is compulsory. Use of non-programmable calculator is allowed.

UNIT–I

1. (a) What is electric current density ? Derive microscopic form of Ohm's law. 3

   (b) Discuss the nature of electric field due to a charge that suddenly starts or stops moving. 1.5

2. (a) Explain Langevin theory of diamagnetism. 3

   (b) The magnetic susceptibility of a medium is 899×10^{-11}. Calculate the absolute permeability and relative permeability. 1.5

3. (a) Show that transformation laws of transforming electric field from one inertial frame of reference to another are given by :

$$E_x' = E_x,\ E_y' = \gamma E_y,\ E_z' = \gamma E_z \text{ where } \gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}.$$ 3

   (b) Define magnetic permeability and magnetic susceptibility and derive the relation $\mu_r = 1 + \chi_m$. 1.5

UNIT–II

4. (a) State and prove Ampere's circuital law. Use this law to find magnetic field due to long solenoid. 3

   (b) Calculate current in a circular coil of radius 10 cm and 100 turns to produce a magnetic field of 0.1 mT at its centre. 1.5

5. (a) Given that :

$$\vec{A} = \frac{\mu_0}{4\pi} \iiint \frac{\vec{J}\, dV}{r}.$$

   Derive mathematical expression for Biot-Savart's law. 3

   (b) A current of 1 A flows in a long solenoid of radius 2 cm having 1000 turns/metre. What is the magnetic energy stored in each metre of the solenoid ? 1.5

6. (a) Find magnetic field due to circular current carrying loop using Biot-Savart's law and hence find magnetic at its centre. 3

   (b) Define self induction and find expression for self inductance of a long solenoid. 1.5

UNIT–III

7. Attempt any **eight** questions :

   (a) Two long parallel wires separated by a distance of 10 cm are each carrying a current 5 A. Calculate force per unit length between them.

   (b) State the condition under which the conductivity of a material depends upon electric field.

   (c) What do you mean by Bohr's magneton ?

(d) Under what condition, a current loop placed in magnetic field does not rotate ?

(e) What is significance of non-diverging $\vec{j}$?

(f) Write down equation of continuity for steady current.

(g) What is effect on the magnetic field of toroid if radius is doubled keeping number of turns per unit length same ?

(h) What is orbital gyromagnetic ratio ?

(i) A positive charge moving downward enters in earth's magnetic field. In which direction the particle is deflected ?

(j) What is Hall effect ? $\frac{1}{2} \times 8 = 4$