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

(ii) Questions : 7 Sub. Code : 0150

Exam. Code : 0002

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

(2054)

PHYSICS

Paper—C (Electricity & Magnetism—II)

Time Allowed : Three Hours] **[Maximum Marks : 44**

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

UNIT—I

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

$$E'_x = E_x,\ E'_y = r\,E_y,\ E'_z = r\,E_z, \text{where } r = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}. \quad 6$$

(b) In a stationary frame, the electric field is $\vec{E} = (5\hat{i} - 6\hat{j}) \times 10^3\ NC^{-1}$. Find the electric vector in the frame moving with velocity 0.6 C w.r.t. stationary frame. C is the velocity of light. 3

2. (a) What is meant by free and bound currents ? Prove the relation $\vec{J}_{bound} = \text{curl } \vec{M}$. 6

(b) A magnetised piece of matter has magnetic moment 0.9 SI units. If the piece of matter be 12 cm long and be 0.5 cm^2 area of cross-section. Calculate the intensity of magnetisation and magnetic flux density of the piece of matter. 3

3. (a) Discuss Langevin's theory of diamagnetism. 6

(b) Derive and discuss the equation of continuity $\vec{\nabla} \cdot \vec{J} + \frac{\partial p}{\partial t} = 0$. 3

UNIT—II

4. (a) State Biot and Savart's Law. Use the same to find magnetic field $\vec{B}$ produced at a certain distance on the axis of current carrying circular coil of radius r and n turns. 6

(b) What is the value of $\vec{\nabla} \cdot \vec{B}$ and $\vec{\nabla} \times \vec{B}$ for points inside the current loop ? 3

5. (a) State the prove reciprocity theorem of mutual induction. 6

(b) Calculate the coefficient of self induction of an air-core solenoid having area of cross-section 10 square centimeter, length one meter and number of turns 5000. Given $\mu_0 = 4\pi \times 10^{-7}$. 3

6. (a) State Hall effect. Derive an expression for Hall coefficient. 6

(b) Show that the energy stored per unit volume in the magnetic field B set up in a solenoid is $\frac{B^2}{2\mu_0}$. 3

UNIT—III

7. Attempt any **EIGHT** of the following :

(a) What do you mean by invariance of charge ?

(b) A wire is carrying current. Is it charged ? Why ?

(c) Manganin or Eureka is used for making standard resistance coils. Why ?

(d) What is Bohr magneton ? What is its value ?

(e) Why an ordinary iron piece does not behave as magnet ?

(f) Define Gauss law in magnetism.

(g) Explain, why coils of the resistance box are wound over themselves.

(h) Why inductance is called electrical inertia ?

(i) A current is sent through a hanging coiled spring. Why does the spring contract in length ?

(j) Is the source of magnetic field analogous to source of electric field ? 1×8=8