(T) Roll No. .....

PAPER ID—13640

B.Sc. EXAMINATION, 2023

(First Semester)

ELECTRICITY AND MAGNETISM

Code : PHY-102

Time : 3 Hours *Maximum Marks : 45*

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

Unit I

(a) State and prove Stoke's Theorem. **6**

(b) If $A = zx^3i - 2x^2yzj + 2yz^4k$, find curl A at point (1, 1, 1). **3**

2. (a) Using Gauss's law, find the electricity intensity at a point (i) outside (ii) on the surface and (iii) inside a uniformly charged spherical shell. **6**

(b) Using differential form of Gauss's law derive Poission's and Laplace's equation. **3**

3. (a) Deduce an expression for force per unit area acting normally outwards on the surface of a charged conductor. Hence calculate the energy per unit volume of electrostatic field. **7**

(b) If $\phi = x^2 + y^2 + 2z$, find div grad ϕ. **2**

Unit II

4. Give the electronic theory of paramagnetism. **9**

5. (a) Show that the area of BH loop represents the energy loss per unit volume per cycle of magnetism. 5

(b) A magnetic field of 1600 A/m produces a magnetic flux of 2×10^{-5} Wb in a bar of iron of cross-section 0.2×10^{-4} m^2. Calculate relative permeability and susceptibility of the bar. 4

6. (a) Define the following : 6

(i) Magnetic Susceptibility

(ii) Intensity of magnetization

(iii) Magnetic Induction

(iv) Hysteresis

(v) Retentivity

(vi) Coercivity.

(b) Prove Div B = 0. 3

Unit III

7. Derive Poynting's theorem for conservation of energy in an electromagnetic field and discuss physical meaning of each term lying in it. 9

8. (a) Derive differential form of Faraday's Law. 4

(b) Derive Curl B= $\mu_0(J + \partial D/\partial t)$. 5