5158

B.Sc.B.Ed. (4 Years) (For Batch 2011 & Onwards)/B.Sc. (First Semester) (For Batch 2011 to 2023 Only) EXAMINATION

PHYSICS

Paper-II (PH-102)

Electricity, Magnetism and Electromagnetic Theory

Time : Three Hours   *Maximum Marks* : 40

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

1. (a) What is conservative field and how is it related to line integral ?   2

(b) What is the importance of Gauss's theorem ? 2

(c) Distinguish between Hard and Soft materials. 2

(d) What is the Poynting vector and its S.I. unit ? 2

Unit I

2. (a) Define Divergence of a vector field and obtain its expression in Cartesian co-ordinates. 5

(b) Find div. grad Φ if $\Phi = 4\ x^3y^2z^4$. 3

3. (a) What is electric potential ? Show that the electric field is a negative gradient of potential. 4

(b) State and prove the Stokes' theorem. 4

Unit II

4. (a) Define the following terms : 5

(i) Magnetising Field

(ii) Magnetic Induction

(iii) Magnetic permeability

(iv) Intensity of Magnetisation,

(v) Magnetic Susceptibility

Derive the relation between them.

(b) Calculate the value of Bohr's Magneton, given that : 3

$e = 1.6 \times 10^{-19}$ C

$h = 6.64 \times 10^{-34}$ Js

$m = 9.1 \times 10^{-31}$ kg.

5. (a) What is Hysteresis loss ? Show that energy loss per unit volume per cycle of the magnetisation is equal to the area of the B-H curve. 4

(b) Explain the Langevin's theory of Diamagnetism. 4

Unit III

6. (a) Derive Four Maxwell's Equations in the integral form. 4

(b) State and prove Poynting's theorem. 4

7. (a) What are the Boundary conditions ? Derive the Boundary conditions for $\vec{B}$ and $\vec{E}$, where letters have their usual meaning. 5

(b) Explain the Displacement Current. 3

Unit IV

8. (a) Define Quality factor of resonant circuit and calculate its value for series resonant circuit. 5

(b) If the A. C main supply is given to be 220 V, what would be the average e.m.f. during a position half cycle ? 3

9. (a) Prove that current lead by $\pi/2$ in pure capacitor and lags by $\pi/2$ in case of a pure inductor over e.m.f. 4

(b) Distinguish between Mean value, Peak value and R.M.S. value of an Alternating current. 4