5. Write short notes on the following :

(a) Dielectric Medium 4

(b) Polarization 4

(c) Bound Charge 4

(d) Electric Displacement. 4

Unit III

6. Write an expression for Biot-Savart law and hence find the magnetic field a distance z above the centre of the circular loop of radius R, which carries a steady current I. 16

7. (a) Find the magnetic field a distance s from a long straight wire carrying a steady current I. 4

(b) Define magnetic vector potential. Show that magnetic vector potential :

$$A(r) = \frac{\mu_0}{4\pi}\int \frac{J(r')}{r} d\tau',$$

where $J(r')$ is current density at r. 12

Subject Code—52500

B. Sc. EXAMINATION

(Main/Re-appear) (Batch 2018 Onwards)

(First Semester)

PHYSICS

CPL-103

Electricity and Magnetism—I

Time : 3 *Hours* *Maximum Marks :* 80

Note : Attempt *Five* questions in all. Q. No. **1** is compulsory. Use of simple calculator is allowed.

1. (a) Define electric flux and what is its SI unit. 2

(b) Why electric lines of force do not cross each other ? 2

(c) What do you understand by conservative field ? Write *two* examples of conservative field. **2**

(d) What is displacement current ? Where does it flow ? **2**

(e) Explain why magnetic monopole does not exist. **2**

(f) A neutron is moving parallel to direction of magnetic field. Then what is the force experienced by it. **2**

(g) What do you mean by Bohr Magneton ? What is its value ? **2**

(h) What is retentivity and coercivity ? **2**

Unit I

2. (a) What is Gauss law in electrostatic ? Give its differential form. **8**

(b) Find the gradient of $r = \sqrt{x^2 + y^2 + z^2}$ (magnitude of the position vector). **8**

3. (a) What is electric potential ? Find the potential of uniformly charged spherical shell of radius R. **10**

(b) Three charges are situated at the corner of a square of side "a". How much work does it take to bring in another charge, +q, from far away and place it in the fourth corner. **6**

Unit II

4. (a) Write an expression for Gauss's theorem in dielectrics and hence show that : **8**

$$\oint D.da = Q_f$$

where Q_f is free charge.

(b) A long straight wire, carrying uniform line charge λ, is surrounded by rubber insulation out to a radius a. Find the electric displacement ? **8**

Unit IV

8. (a) Derive an expression for the force acting on a magnetic dipole in an external field. How does the direction of force differ in paramagnetic and diamagnetic substance ? **12**

(b) The magnetic susceptibility of Bi is -2.12×10^{-11} Nm^{-1}. Calculate relative permeability. **4**

9. (a) What is meant by free and bound currents ? Prove the relation $J_{bound} = \nabla\times B$. **12**

(b) An infinitely long circular cylinder carries a uniform magnetisation M parallel to etc axis. Find the magnetic field inside and outside the cylinder. **4**