Reg. No. : ....

Name : ....

V Semester B.Sc. Degree CBCSS (OBE) Regular
Examination, November 2021
(2019 Admn. Only)
CORE COURSE IN PHYSICS
5B07 PHY : Electrostatics and Magnetostatics

Time : 3 Hours   Max. Marks : 40

PART – A

I. Answer **all** questions. **Each** carries **1** mark :

1) Write Poisson's and Laplace's equation.

2) What is the relation between electric field and potential ?

3) What is the physical significance of electric displacement vector D ?

4) Give significance of the equation $\nabla.B = 0$.

5) How the magnetization M is related to bound current J_b ?

6) What is the relation between Magnetic field and magnetic vector potential ?

PART – B

II. Answer **any 6** questions. **Each** carries **2** marks :

1) Distinguish diamagnets and paramagnets.

2) Find the work done to charge up a parallel plate capacitor.

3) Find the potential energy of a dipole placed in an external electric field E.

4) Show that the electrostatic field inside a charged hollow sphere is zero.

5) What is a linear dielectric material ? Obtain displacement vector D for a linear dielectric material.

6) What is a ferromagnetic material ?

7) Show that Curl of electrostatic field is zero.

8) Find the magnetic field due to a long straight current carrying wire.

PART – C

III. Answer **any 4** questions. **Each** carries **3** marks :

1) Find the energy stored in a uniformly charged solid sphere of radius R and charge q.

2) The vector potential A and the scalar potential V in a certain region of space are given to be $A = \frac{1}{2}a(xj + yi)$, $V = \frac{1}{4}a(x^2 + y^2)$, where 'a' is a constant. Find the electric and magnetic fields corresponding to these potentials.

3) The magnetic susceptibility of silicon is -0.4×10^{-5}. Calculate the flux density and magnetic moment per unit volume when a magnetic field of intensity 5×10^5 A/m is applied.

4) Calculate magnetic flux density of the magnetic field at the centre of a circular coil of 50 turn, having radius of 10 cm and carrying a current of 5 A.

5) Find the electric field at both inside and outside of a uniformly charged solid sphere of radius R and total charge Q.

6) Find the magnetic field of an infinite uniform surface current $K = K$ i flowing over the xy plane.
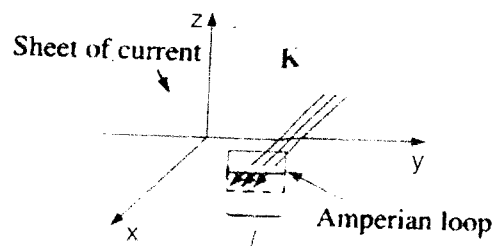
PART – D

IV. Answer **any 2** questions. **Each** carries **5** marks :

1) Two long straight conductors carrying currents are placed parallel to each other. Explain why they attract or repel each other. Derive an expression for force of attraction or repulsion.

2) Derive equations for div and curl of electrostatic field E due to a volume distribution of charge.

3) Derive boundary conditions for electric displacement vector D.

4) Derive the equation of field due to a magnetized object. Discuss Physical interpretation of Bound currents.