M 9931

**V Semester B.Sc. Degree (CCSS-Reg./Supple./Imp.)
Examination, November 2015
Core Course in Physics
5B06 PHY : ELECTRODYNAMICS – I**

Time : 3 Hours

Max. Weightage : 30

SECTION – A

(Choose the **correct** answer. **Each** bunch carries a weightage of 1).

1. i) In the equation $p = \alpha E$, α is

    a) Dipole moment
    b) Polarization
    c) Susceptibility
    d) Atomic Polarizability

   ii) Two metal spheres of radii R_1 and R_2 are charged to the same potential. The ratio of charges on the spheres

    a) $\sqrt{R_1} : \sqrt{R_2}$
    b) $R_1^2 : R_2^2$
    c) $R_1 : R_2$
    d) $R_1^3 : R_2^3$

   iii) Volume current density is

    a) Current per unit Volume
    b) Current per unit Area
    c) Current per unit length
    d) Charge per unit length

   iv) A soap bubble is negatively charged. Its radius

    a) Decreases
    b) Increases
    c) Remains uncharged
    d) Cannot be predicted   (W = 1)

2. i) A current carrying loop is placed in a uniform magnetic field. The torque acting on it doesnot depend on

    a) Shape of the loop
    b) Area of the loop
    c) Value of current
    d) Magnetic field

   ii) Domain formation is the necessary feature of

    a) Diamagnetism
    b) Paramagnetism
    c) Ferromagnetism
    d) All of the above

P.T.O.

iii) The radius of curvature of the path of a charged particle in uniform magnetic field is directly proportional to
   a) Charge
   b) Momentum of the particle
   c) Energy of the particle
   d) Intensity of the field

iv) If a medium of dielectric constant K > 1 is introduced in a region, electric field E.
   a) Increased K times
   b) Reduced by a factor K
   c) Not affected
   d) None of the given   (W = 1)

SECTION – B

(Answer **any six** questions. **Each** question carries a weightage of **1**).

3. What is physical definition of divergence of a vector field ?
4. What is meant by irrotational field ?
5. Write down the advantage of potential formulation in electrostatics.
6. Write down Poisson's equation.
7. Give Clausius-Mossoti formula.
8. What is meant by polarization of a dielectric ?
9. What is Lorentz force ?
10. State Biot-Savart law in vector form.   (6×1=6)

SECTION – C

(Answer **any nine** questions. **Each** question carries a weightage of **2**).

11. Show that $(A \times B) \times C$ is not equal to $A \times (B \times C)$.

12. Find the area of a parallelogram formed by $A = 2\hat{i} + 3\hat{j}$ and $B = 4\hat{j} - 2\hat{k}$.

13. Find the potential inside a spherical shell of radius 0.1 m, uniformly charged with $100\mu C$.

14. Two charges $4\mu C$ and $5\mu C$ are at the corners of an equilateral triangle of side 30 cm. Find the electric field at the third corner.

15. A charge of $10\mu C$ is 0.5 m above a large block of a linear dielectric material of susceptibility 6. Find the force on the charge and its direction.

16. A part of long wire carrying a current of 1A is bent into a semicircle of radius 1 cm. Find the field at the centre of the semicircle.

17. Derive Gauss's law in differential form.

18. A sphere of linear dielectric material is placed on an originally uniform electric field E_0. Find the new field inside the sphere, if the dielectric constant is K.

19. Calculate the work done by the force $F = 2\hat{i} + 2\hat{j} + 10\hat{k}$ N in moving an object through a displacement of $4\hat{i} + 5\hat{j} - \hat{k}$ m. Also find the component of the force acting along the direction of displacement.

20. Prove that the normal component of electric field is discontinuous at any boundary of a charged surface.

21. Two identical drops are charged to the same potential V. Find the new potential if they coalesce into one drop.

22. A solenoid of length 20 cm and radius 1 cm and containing 200 turns carries a current of 2A. Calculate the magnetic induction at the center. Also calculate the magnetic moment of the solenoid.

$(9\times2=18)$

SECTION – D

(Answer **any one** question. Carries a weightage of **4**).

23. Derive an expression for the magnetic field intensity of on the axis of a circular coil carrying current i. Plot the field against distance.

24. Show that electric field is negative gradient of electric potential and obtain Poisson's and Laplace's equations.

$(1\times4=4)$