C 41425 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2013

(CCSS)

Physics

PH 4B 07—ELECTRODYNAMICS—I

Time : Three Hours Maximum : 30 Weightage

Section A

Answer all **twelve** *questions.*
Each question carries ¼ weightage.

1. A hollow metal sphere of radius 5 cm is charged such that the potential on its surface 10 V. The potential at the centre of the sphere is :

   (a) Zero. (b) 10 V.

   (c) 15 V. (d) 20 V.

2. A soap bubble is given a positive charge. Its radius will :

   (a) Increase. (b) Decrease.

   (c) Remain unchanged. (d) Oscillate.

3. When a dielectric of dielectric constant K is introduced between the plates of a parallel plate capacitor, the field at a point between the plates :

   (a) Increases. (b) Remains the same.

   (c) Becomes K times E. (d) None of the above.

4. An infinite number of capacitors each of capacitors C, 2C, 4C, 8C, 16C, ... are connected in series. The equivalent capacitance of the system is :

   (a) C. (b) C/2.

   (c) 2c. (d) infinite.

5. The displacement current arises due to :

   (a) Positive charges only.

   (b) Negative charges only.

   (c) Both positive and negative charges.

   (d) Time varying electric field.

6. The mathematical expression for Laplace's equation is _____.

7. A long, straight wire is carrying a current of 2 A. The magnetic filed at a point distant 10 cm from the wire is :

   (a) 4×10^{-6} G. (b) 4×10^{-7} G.

   (c) 4×10^{-2} G. (d) None of the above.

8. Two parallel wires each of 50 cm length are placed 1 m apart. Each wire is carrying a current of 2 A in the same direction. The force between the two wires is :

   (a) Attractive. (b) Repulsive.

   (c) Sometime (a) and sometime (b). (d) None of the above.

9. Most of the substance show which of the magnetic property :

   (a) Diamagnetism. (b) Paramagnetic.

   (c) Non-magnetic. (d) Ferromagnetic.

10. The magnetic materials having negative magnetic susceptibility are :

    (a) Paramagnetic. (b) Diamagnetic.

    (c) Ferromagnetic. (d) Ferromagnetic.

11. Which among the following is a unit less quantity :

    (a) Permeability. (b) Magnetic flux.

    (c) Susceptibility. (d) Pole strength.

12. The magnetic field at a point on the axis of a long solenoid of length 2m total number of turns 500 when a current of 2 A flows though it is :

    (a) 3.24×10^{-4} T. (b) 6.28×10^{-4} T.

    (c) 13.24×10^{-4} T. (d) 5.24×10^{-4} T.

(12 × ¼ = 3 weightage)

Section B

Answer all **nine** *questions.*
Each question carries 1 *weightage.*

13. State Coulomb theorem.

14. Define Volt.

15. What are induced charges ? Explain with example.

16. What are dielectrics ? Give example.

17. State Gauss's law in presence of dielectric.

18. Show that $\nabla \times B = \mu_0 J$.

19. Define magnetic vector potential.

20. Define susceptibility.

21. Distinguish between linear and nonlinear media.

(9 × 1 = 9 weightage)

Section C

Answer any **five** *questions.*
Each question carries 2 *weightage.*

22. Obtain the differential form of Gauss's law.

23. A point charge 10^{-7} is situated at the centre of a cube of 1m side. Calculate the electric flux though its surface.

24. Derive Poisson's equation and obtain Laplace's equation.

25. Two parallel conducting planes in free space are at $y = 0$ and $y = 2$ cm, and the zero voltage reference is at $y = 1$ cm. Calculate the conductor voltages, if the electric displacement between the conductors is 253j nc/m^2.

26. A dielectric cube of side a centered at the origin, carries a frozen-in-polarization P = kr where k is a constant. Find all the bound charges and check they add up to zero.

27. Find the magnetic field of an infinite uniform surface current K = Kx flowing over the xy-plane.

28. Discuss about the comparison of magnetostatics and electrostatics.

(5 × 2 = 10 weightage)

Section D

Answer any **two** *questions.*
Each question carries 4 *weightage.*

29. Derive an expression for the electric intensity due to a uniformly charged ring at a point on its axis and hence find the electric intensity at the centre of the ring.

30. State Ampere's law. Express the law in differential form and obtain an expression for the divergence and curl of B.

31. With suitable example classify the properties of Diamagnets, Paramagnets and Ferromagnets.

(2 × 4 = 8 weightage)