C 62043

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2014

(U.G.—CCSS)

Physics—Core Course

PH4 B07—ELECTRODYNAMICS—I

Time : Three Hours　　　　　　　　　　　　　　　　　　　　Maximum : 30 Weightage

Section A

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

1. The magnitude of electric field E in the annular region of a charged cylindrical capacitor is :

    (a) Same though out.

    (b) Higher nearer the outer cylinder than the inner cylinder.

    (c) Varies $1/r$ where r is distance from the centre.

    (d) Varies $1/r^2$.

2. The energy density of a capacitor is given by :

    (a) $\frac{1}{2}\varepsilon_0 E^2$.

    (b) $\frac{1}{2}\varepsilon_0 B^2$.

    (c) $\frac{1}{2}\varepsilon_0 E$.

    (d) None of the above.

3. The displacement current arises due to :

    (a) Positive charges only.

    (b) Negative charges only.

    (c) Both positive and negative charge.

    (d) Time varying electric field.

4. Mathematical expression for Poisson's equation is ————.

5. Tesla equals to :

    (a) Nam.

    (b) Nam^{-1}.

    (c) NA^{-1}m^{-1}.

    (d) None of the above.

Turn over

6. Two parallel wires each of 50 cm. length are placed 1 m. apart. Each wire is carrying a current o
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.

7. Laplace's equations is given by ————.

8. The ferromagnetic property can be explained on the basis of formation of ————.

9. Circular loop A has radius R and current I and another B has twice the current and radius as tha
of A then the ratio of magnetic field at the centre of these loop is :

   (a) 1.   (b) 2.

   (c) 3.   (d) 4.

10. The magnetic field at a point on the axis of a long solenoid of length 2m total number of turns 50
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.

11. The magnetic field at the centre of the cube of edge of length a is ————.

12. A magnet of moment M is rotated through 360° in a magnetic field B , the work done will be :

    (a) MB.   (b) 2MB.

    (c) MB/2.   (d) None of the above.

                                                                    (12 × ¼ = 3 weightag

Section B

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

13. State Coulomb's law.

14. Obtain an expression for the charge required to produce equilibrium in an electrified soap bubl

15. State mean value and maximum value theorem

16. Derive an expression for the energy of a charged condenser.

17. Show that $\Delta \cdot A = 0$

18. State and explain Amperes law.

19. Define magnetic vector potential.

20. Define susceptibility.

21. What is Lorentz force ?

                                                                    (9 × 1 = 9 weight

Section C

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

22. Applying Gauss's law for deriving an expression for the electric intensity due to an infinite sheet of charge..

23. The energy of a charged capacitor is 0.2 J . If its capacitance is 2 μF, calculate :

   (i)   The charge on the capacitor ; and

   (ii) The potential difference between the plates.

24. Define electrical images with a neat diagram.

25. State and explain second uniqueness theorem

26. An atom consist of a point nucleus of charge q surrounded by a uniformly charged spherical cloud $(-q)$ of radius a. Find the atomic polarizability of such an atom.

27. Explain the physical interpretation of bound charge.

28. Discuss about the comparison of magetostatics and electrostatics.

                                                                (5 × 2 = 10 weightage)

Section D

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

29. List and explain the basic properties of conductors and insulators. Discuss the properties of equipotential surfaces.

30. Obtain the Laplace's equation in one, two and three dimension. Explain its properties of the solution.

31. State Biot Savart law. Derive an expression for the magnetic field due to a current carrying conductor at a point near it.

                                                                (2 × 4 = 8 weightage)