LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **PHYSICS**

FIFTH SEMESTER – NOVEMBER 2011

PH 5508/PH 5505/PH 4500 - ELECTRICITY & MAGNETISM

Date : 02-11-2011 Dept. No. Max. : 100 Marks
Time : 9:00 - 12:00

PART – A

Answer all questions. All questions carry equal marks. (10x2=20marks)

1. Calculate the electric intensity required to just support a water droplet of mass 10^{-9} kg having a charge of 4.9 X 10^{-12} C.
2. Define one farad.
3. State Kirchhoff's laws.
4. State Faraday's laws of electrolysis.
5. What is meant by Lorentz force?
6. Calculate the self inductance of a 1 metre long solenoid of 400 turns and 5 cm diameter.
7. If the charge on a capacitor of capacitance 2μF δ leaking through a high resistance of 100 mega ohms is reduced to half of its maximum value, calculate the time of leakage.
8. Why choke coil is preferred to a resistor in a circuit?
9. Define magnetic susceptibility and magnetic permeability.
10. Define Poynting vector.

PART – B

Answer any FOUR questions. (4x7.5=30marks)

11. a) What is a dipole?
    b) Find the potential energy of an electric dipole placed in a uniform electric field.
12. Show that $\pi = T. dE/ dT$.
13. Using Biot-Savart law , calculate the value of magnetic induction at any point on the axis of a solenoid.
14. Describe with theory the method of measuring high resistance by leakage.
15. Give an account of Maxwell's equations. What is the significance of displacement current?

PART – C

Answer any FOUR questions. (4x12.5=50marks)

16. a) Obtain an expression for the capacity of a cylindrical condenser. (7.5)
    b) A cable has a wire of radius 1 mm and it is surrounded by a thin metallic sheet of radius 6 mm. The space between the cable is filled with a material of dielectric constant 2.05. What is the capacitance of 8 km length cable? (5)

17. a) Describe the construction and working of lead acid accumulator. (6)

    b) Derive Gibb's Helmholtz equation for the emf of a reversible cell. (6.5)

18. a) Define coefficient of mutual induction between a given pair of coils and describe an experiment to determine it. (10.5)

    b) Two coils, a primary of 600 turns and a secondary of 30 turns are wound on an iron ring of mean radius 0.1 m and cross section 4 X 10^{-2} m in diameter. Find their mutual inductance. (μ_r for iron = 800). (2)

19. Discuss the theory of series and parallel resonant circuits and compare them. (5+5+2.5)

20. Using Langevin theory derive an expression for the magnetic susceptibility of a diamagnetic material.

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