



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

FIFTH SEMESTER – NOVEMBER 2017

PH 5512 – ELECTRICITY AND MAGNETISM

Date: 06-11-2017
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

PART-A

Answer ALL Questions

(10x2=20)

1. Define electric potential.
2. The dielectric constant of water is 78. Calculate its electrical permittivity.
3. State the equation of continuity.
4. Define Thomson coefficient.
5. Calculate the magnetic induction at the centre of a square current loop of side 1m carrying current of 1 A.
6. Define the coefficient of mutual induction.
7. What is meant by the time constant of a L-R circuit.
8. List out the various energy losses occurring in a transformer.
9. State any two properties of ferromagnetic materials.
10. State Snell's law

PART-B

Answer ANY FOUR Questions

(4x7.5=30)

11. Obtain the boundary conditions to be satisfied by D and E at the interface of two dielectric media.
12. Explain Seebeck effect. Describe the laws of thermoelectric effects. (3.5+ 4)
13. Describe any one method of determining the self inductance of a coil of wire.
14. i) Describe the method of measuring a high resistance by the leakage method. (5)
ii) If the charge on a capacitor of capacitance $2 \mu\text{F}$ is leaking through a high resistance of $100 \text{ M}\Omega$ is reduced to half its maximum value, calculate the time of leakage. (2.5)
15. Describe the theory of parallel resonance circuit using j operator.
16. Using Maxwell's equations, deduce the wave equations for electric and magnetic fields in free space and hence determine the velocity of light in vacuum.

PART-C

Answer ANY FOUR Questions :

(4x12.5 = 50)

17. What is an electric dipole? Derive an expression for the potential and field at any point due to an electric dipole. (2+10.5)

18. Explain the theory of potentiometer. How will you use it to calibrate an ammeter and a high range voltmeter. (4.5 +4+4)
19. i) State Biot-Savart law. Use it to calculate the magnetic induction due to a current in a circular coil of wire at a point on its axis. (2+5.5)
- ii) In the Bohr model of the hydrogen atom, the electron circulates around the nucleus in a path of radius 5.29×10^{-11} m at a frequency of 6.58×10^{15} Hz. Find the magnitude of magnetic induction at the centre of the orbit. (5)
20. Explain the principle and construction of a moving coil ballistic galvanometer. Derive an expression between the quantity of charge flowing through it and the throw obtained. Show how to correct the observed throw for damping. (5.5+4+3)
21. Obtain an expression for the growth and decay of charge in a capacitor through a resistance.
22. i) Give an account of Langevin's theory of paramagnetism. (6.5)
- ii) Define the terms a) magnetization b) magnetic susceptibility c) magnetic permeability. (2+2+2)
