LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIFTH SEMESTER – APRIL 2017

PH 5512- ELECTRICITY AND MAGNETISM

Date: 22-04-2017   Dept. No.   Max. : 100 Marks
01:00-04:00

PART-A

Answer ALL questions: **(10 X 2 = 20 Marks)**

1. State Gauss's law.
2. What is called electric polarization?
3. Write the continuity equation. Mention its significance.
4. Define Peltier coefficient.
5. State Biot-Savart law.
6. What is Lorentz force?
7. If the charge on a capacitor of capacitance 2 μF in leaking through a high resistance of 100 MΩ is reduced to half its maximum value, calculate the time of leakage.
8. Define j-operator.
9. What is called magnetic susceptibility?
10. Write the Maxwell's equations.

PART-B

Answer any FOUR questions: **(4 X 7.5 = 30 Marks)**

11. Derive an expression for electric field intensity due to a dipole at a distance 'r' along the perpendicular bisector of its axis.
12. What is a Potentiometer? How does it help to calibrate a voltmeter? Explain with neat diagram.
13. (a) Derive an expression for the magnetic field induction at a point on the axis of a circular coil carrying current.   **(5)**
    (b) Each of the two coils of a Helmholtz galvanometer contains 100 turns of wire of mean radius 0.5 m. when a current of 0.2 A is passed through the coil, a deflection of 45° is obtained. Calculate the horizontal component of earth's magnetic field.   **(2.5)**
14. Obtain an expression for power in A.C. circuit containing resistance, inductance and capacitance.
15. State and prove Poynting's theorem.

PART-C

Answer any FOUR questions: **(4 X 12.5 = 50 Marks)**

16. State Faraday's law of induction and express in its differential form.
17. (a) State and prove Poisson's equations in electrostatics.   **(6)**
    (b) Obtain Clausius-Mosotti relation.   **(6.5)**
18. Applying thermodynamics to the working of a thermocouple, show that
$$\pi = \frac{dE}{dT} \text{ and } \sigma_a - \sigma_b = T \cdot \frac{d^2 E}{dT^2}$$
19. Explain in detail the construction and working of a moving coil ballistic galvanometer.
20. Describe the theory of 'the charge and discharge' of a capacitor through a resistor.
21. Discuss Langevin's theory of paramagnetism.
22. Obtain the law of refraction in the case of a plane polarized electromagnetic wave is incident on an interface of two dielectric media.

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