



**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

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

**FIFTH SEMESTER – NOVEMBER 2014**

**PH 5512/PH 5508/PH 5505 - ELECTRICITY AND MAGNETISM**

Date : 05/11/2014  
Time : 09:00-12:00

Dept. No.

Max. : 100 Marks

**PART – A**

**Answer ALL questions:**

**(10x2 = 20)**

1. State Gauss's law in electrostatics.
2. Write the relation between dielectric constant and susceptibility.
3. Define Thomson coefficient.
4. Write the equation of continuity.
5. State Ampere's circuital law.
6. Calculate the magnetic field intensity due to a long straight conductor carrying a current of 150 A at a distance of 5 cm.
7. When is the induced emf in an inductor resistor circuit higher?
8. The charge on a capacitor of capacitance  $3\mu\text{F}$  in leaking through a resistance of 100 mega Ohms is reduced to half its maximum value calculate the time of leakage.
9. Define magnetic permeability.
10. Write the expression for speed of light.

**PART B**

**Answer any FOUR questions:**

**(4 x7.5 = 30)**

11. Find the electric potential at any point due to an electric dipole.
12. Explain how the specific resistance of the material of a wire can be determined using Carey-Foster bridge.
13. Obtain an expression for the force acting on a charge  $q$  moving with a velocity  $v$  in a magnetic field of uniform intensity  $\mathbf{B}$ .
14. Explain the theory of transformer.
15. Obtain an expression for growth of current in a circuit containing a resistance and inductance.
16. Describe Langevin's theory of diamagnetism.

**PART C**

**Answer any FOUR questions:**

**(4 x 12.5 = 50)**

17. Using Gauss's law obtain expressions for electric field due to a uniform infinite cylindrical charge at points.  
a) Outside b) At the surface and c) inside the charge distribution.
18. What is thermo-electric diagram? Show how Peltier and Thomson emf's neutral temperature and the temperature of inversion can be determined using this diagram.
19. Explain how (a) Charge sensitiveness and (b) Absolute capacitance of a capacitor is determined using a ballistic galvanometer.
20. Explain decay of charge in LCR circuit. Deduce the conditions under which the discharge is oscillatory.
21. A plane electromagnetic wave is incident obliquely on a plane interface between two dielectric media. Obtain the laws of reflection and Snell's law of refraction.
22. Use Biot-Savart's law to find the magnetic field due to  
(a) a straight line conductor (b) along the axis of a circular coil.

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