LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

FIFTH SEMESTER – APRIL 2010

PH 5505/PH 4500 - ELECTRICITY & MAGNETISM

Date & Time: 27/04/2010 / 1:00 - 4:00 Dept. No. Max. : 100 Marks

SECTION - A

Answer ALL the questions. **(10 × 2 = 20 Marks)**

1. An electric dipole consists of two opposite charges of magnitude $q = 2.0\times10^{-6}$C separated by 4.0cm. When the dipole is placed in an external field of 1.0×10^{5} N C^{-1}, find the maximum torque exerted by the field on the dipole.
2. Define the unit farad.
3. What is meant by Thomson effect?
4. Define conductivity of an electrolyte and mention its unit.
5. State Ampere's circuital law.
6. Define coefficient of self-induction of a coil.
7. The time constant of a certain induction coil was found to be 3.0×10^{-3}sec. With a resistance of 60 ohms added in series a new time constant of 0.5×10^{-3}sec was obtained. Find the resistance and inductance of the coil.
8. Why is series resonance circuit called acceptor circuit?
9. What are ferromagnetic materials?
10. Define Poynting vector.

SECTION – B

Answer any FOUR questions. **(4 × 7.5 = 30 Marks)**

11. Derive an expression for the capacitance of a capacitor consisting of two co-axial cylinders. Give two examples of practical cylindrical capacitor.
12. Explain, with necessary, theory how a Carey Foster bridge is used to determine the resistance of the material of a wire.
13. Describe the principle, construction and working of a moving coil galvanometer.
14. Describe, with theory, the method of measuring a high resistance by the leakage method.
15. Using Maxwell's equations, prove that electromagnetic waves are transverse in nature.

(P.T.O.)

SECTION – C

Answer any FOUR questions. **(4× 12.5 = 50 Marks)**

16. (a) State and prove Gauss's law in electrostatics.

    (b) Applying Gausss's law show that a charged sphere acts externally as though its charge were concentrated at the centre.

17. (a) What is a thermo-electric diagram?

    (b) Explain Seeback, Peltier effect. Define neutral temperature and the temperature of inversion and show how they are all represented in the thermo – electric diagram.

18. (a) Describe a method of determining the mutual induction between a pair of coils with relevant theory.

    (b) A solenoid is 0.5m long and has 1000 turns and its cross-section is $0.005m^2$. There is a second coil of 300 turns closely wound on the central part of the solenoid. Calculate their mutual inductance.

19. Discuss parallel resonance circuit and Explain its use.

20. Give Langevin's theory of paramagnetism to obtain Curie law and also mention the failure of the theory.

$$$$$$$