LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION - **PHYSICS**

FIRST SEMESTER – **NOVEMBER 2013**

PH 1812 - ELECTRODYNAMICS

Date : 05/11/2013   Dept. No.   Max. : 100 Marks
Time : 1:00 - 4:00

PART - A

Answer **ALL** questions: (10 x 2 = 20)

1. Establish Poisson's equation for electric potential.
2. State Gauss's law in the differential and integral form.
3. Show that the energy of an ideal dipole **p** in an electric field **E** is given by U= - **p.E**
4. Define Ampere's law for a magnetised material.
5. Magnetic forces do no work. Justify.
6. Write Neumann formula for mutual inductance.
7. Write down Fresnel's equation for the case polarisation in the plane of incidence.
8. Define skin depth.
9. Define radiation zone.
10. What is meant by **velocity** and **acceleration fields?**

PART - B

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

11. Find the electric field at a distance z above the centre of a circular loop of radius r with a uniform linear charge density λ.
12. Determine   x **B** in terms of current density vector **J**(r).
13. Obtain the wave equation for **E** and **B** in free space.
14. Explain with necessary theory, the phenomenon of reflection at a conducting surface.
15. Show that retarded scalar potential satisfies the in-homogenous wave equation

PART - C

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

16. (a) Derive an expression for the energy of a charge distribution. (6)
    (b) Establish Gauss's law in the presence of a dielectric.   (6.5)
17. Outline the theory of multipole expansion of magnetostatic vector potential in powers of (1/r).
18. State and prove Poynting's theorem.
19. Derive an expression for complex dielectric constant and hence explain the phenomena of anomalous dispersion. Establish Cauchy's formula relating the coefficient of refraction and coefficient of dispersion.
20. Derive expressions for the electric and magnetic fields of a point charge in arbitrary   motion.

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