LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – NOVEMBER 2011

PH 1812/1807 - ELECTRODYNAMICS

Date : 01-11-2011 Dept. No. Max. : 100 Marks

Time : 1:00 - 4:00

PART – A

Answer **ALL** the questions (10 X 2 = 20)

1. What are linear dielectrics?
2. Show that the energy of an ideal dipole **p** in an electric field **E** is given by U= - **p.E**
3. Magnetic forces do no work. Justify.
4. Establish Poisson's equation for magnetic vector potential
5. Write Neumann formula for mutual inductance.
6. What is a gauge transformation? Define coulomb gauge.
7. Give the Maxwell's divergence equations for a linear media with no free charge and free current.
8. Write down Fresnel's equation for the case of polarisation in the plane of incidence.
9. Define radiation zone.
10. Explain the term " acceleration field" due to a point charge in arbitrary motion.

PART – B

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

11. Find the electrostatic potential inside and outside a uniformly charged spherical shell of radius R (use direct definition).
12. Find the magnetic field at a distance z above the centre of a circular loop of radius, which carries a steady current I.
13. State and prove Poynting's theorem.
14. Explain with necessary theory, the phenomenon of reflection at a conducting surface.
15. Obtain Leinard-Wiechert potentials for a moving point charge.

PART – C

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

16. Outline the theory of multipole expansion of electrostatic potential in powers of (1/r).
17. Derive an expression for the magnetic vector potential at any point due to a magnetised material. Hence give the physical interpretation for bound currents.
18. Establish Maxwell's stress tensor and hence evaluate force per unit volume in the electromagnetic fields.
19. Derive an expression for the complex dielectric constant and hence explain the phenomenon 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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