SIXTH SEMESTER EXAMINATION 2008
ELECTROMAGNETIC THEORY

Answer question no. 1 which is compulsory and any five from rest

1. Answer the following question   2x10
   a. Can Stroke's theorem be applied to closed surfaces?
   b. What is the significance of a zero vector?
   c. What do we mean when we say that an object is charged?
   d. Why is the field intensity not zero in a steady current carrying current?
   e. When can we use Ampere's circuital law to determine the magnetic field ?
   f. What is meant by depth of penetration ?
   h. Is it necessary for the fields to satisfy Maxwell's equation in order to exist?
   i. What is a uniform linear array?
   j. What is a uniform linear array?
2. a. Using the rectangular coordinate system, Verify that i. div.(curl A)=0
   ii. Curl(grade f)   6
   b. Express the position vector $r=xa_x + ya_y + za_z$ in the spherical coordinate system. 4
3. a. Show that the equipotential surfaces for an infinity cylinders.   4
   b. A long spherical cloud af radius 'b' has a uniform volume charge distirbution of ρ_v. Calculate and sketch the potential distribution and also electric field intensity at any point in space using Poisson's and Laplace's equation .   5
4. The conductivity of a homogenous conducting medium, bounded by $10cm \leq r \leq 20cm$, $30° \leq \theta \leq 60°$ and $30° \leq \emptyset \leq 60°$ in 0.4 S/m. The surface at $\theta=45°$ is at a ground potential, and the surface at $\theta=30°$ is at 100V. Using Laplace's equation, determine the resistance of the medium, neglecting the edge effects. 10
5. a. What do you mean by magnetic vector potential? How is it different from magnetic scalar potential? Can you derive the Biot-Savart law from the magnetic vector potential?   5
   b. A straight wire extend from z = -L to z= L and carries a current I. What is the B field in a plane bisecting the wire?   5
6. State and explain the condition of the electro-magnetic fields at the interface between   a. dielectric-dielectric and b. dielectric- conductor boundaries.   10
7. a. Explain the polarization of a wave. What is the major difference between the elliptically and circularly polarized waves?   5
   b. In a dielectric medium ($\varepsilon = 9\varepsilon_0, \mu = \mu_0$) a plane wave with H=0.2 cos(10^9t – kx - $k\sqrt{8}z)a_y$ A/m is incident on an air boundary at z= 0 find i. the incident E ii. the transmitted and reflected E and iii. K.   5
8. What is the difference between directive gain and directivity ? Find the directive gain of the Hertzian dipole and compare with that of the half-wave dipole.   10

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