T.E. Electronic Sem V / old Nov 2010

Engineering Electromagnetics

Con. 5782-10. **(OLD COURSE)** **GT-6915**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining.
(3) Vector notation should be used wherever **necessary**.
(4) Assumptions made should be **clearly** stated.

1. (a) Derive Poisson's and Laplaces equations. **5**
   (b) Discuss Maxwell's equations in point as well as integral form for steady electric and magnetic fields. **5**
   (c) Explain concept of retarded potentials. **5**
   (d) Explain surface impedance of a conductor. **5**

2. (a) State and prove Poynting Theorem. Explain the terms instantaneous, average and complex Poynting Vector. **10**
   (b) Derive the expression for the field components of transverse electric wave propogating through rectangular waveguide. **10**

3. (a) Derive expression for input impedance of a two wire transmission line. **10**
   (b) In free space $\vec{E}(z, t) = 50 \cos(\omega t - \beta z)\, \vec{a}_z$ V/m. Find average power crossing a circular area of radius 2.5 m in the plane z = constant. **10**

4. (a) Derive the expression for reflection and transmission coefficient for parallel polarised plane wave at oblique incidence. **10**
   (b) A normal incident $\bar{E}$ field has amplitude $E_0^i = 1\ V/m$ in free space just outside of seawater in which $\epsilon r = 80\ \mu r = 1$ and $\sigma = 2.5$ s/m. For a frequency of 30 MHz at what depth the amplitude will be 1 m V/m for $\vec{E}$. **10**

5. (a) Using Smith chart find the imput impedance and reflection coefficient at a point 0.64 λ from load $Z_L = (75 - j25)\ \Omega$. Given characteristic impedance = 50 Ω. **10**
   (b) What is skin effect. Define skin depth and how is it related to attenuation constant. **10**

6. (a) Derive boundary conditions for electric and magnetic field vectors at boundary of two dielectric media. **10**
   (b) For an Electromagnetic wave travelling between a pair of perfectly conducting planes of infinite extent is y & z directions, analyse TEmn modes. **10**

7. Show that power radiated by short dipole is $P = 80\pi^2 \left(\frac{d\ell}{\lambda}\right)^2 I^2_{rms}$. **20**