Code No: R7211003 **R7**

II B.Tech I Semester(R07) Supplementary Examinations, May/June 2010
ELECTROMAGNETIC WAVES AND TRANSMISSION LINES
(Electronics & Instrumentation Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) State coulomb's law in vectorial form and list out its applications and limitations.
   (b) A charge, $Q_1 = 10$ nC is at the origin in free space. If the x-component of E is to be zero at the point (3, 1, 1), what charge, Q_t should be kept at the point (2,0, 0)? [8+8]
2. (a) Define inductance of a coil and explain the requirements of inductor coils.
   (b) The radius of inner and outer conductors of a coaxial cable are 2 mm and 6 mm respectively and $\mu = \mu_0$. Find the inductance of 10 m length. [8+8]
3. (a) Show that the conduction and displacement currents are always displaced from each other by 90^0 in time for a sinusoidally varying field.
   (b) Express the fields $E = 10.0 \sin x \ \sin t \ a_y$ and $H = \frac{10}{\mu_o} \cos x \ \sin t \ a_z$ in phasor form. [8+8]
4. (a) State Poynting theorem and prove it.
   (b) The magnetic field, **H** of a plane wave has a magnitude of 5 mA/m in a medium defined by $\in_r = 4$, $\mu_r = 1$.
      i. Determine the average power flow.
      ii. The maximum energy density in the plane wave. [8+8]
5. (a) Explain the normal incidence of uniform plane wave at plane conducting boundary.
   (b) Explain the oblique incidence of uniform plane wave at plane conducting boundary. [8+8]
6. Obtain the expression for the field components of an electromagnetic wave propagating between a pair of perfectly conducting planes. [16]
7. (a) Derive the expression for γ interms of primary constants of a line?
   (b) A copper wire transmission line operates at 1MHz. For copper μ=μ_0, ε=ε_0, σ=5.8×10^7 mho/m. The radius of the wire a = 2.0mm. Find dc and ac resistances of the line. [8+8]
8. Write short notes on:
   (a) Quarter wave line($\lambda/4$)
   (b) Smith chart. [16]

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