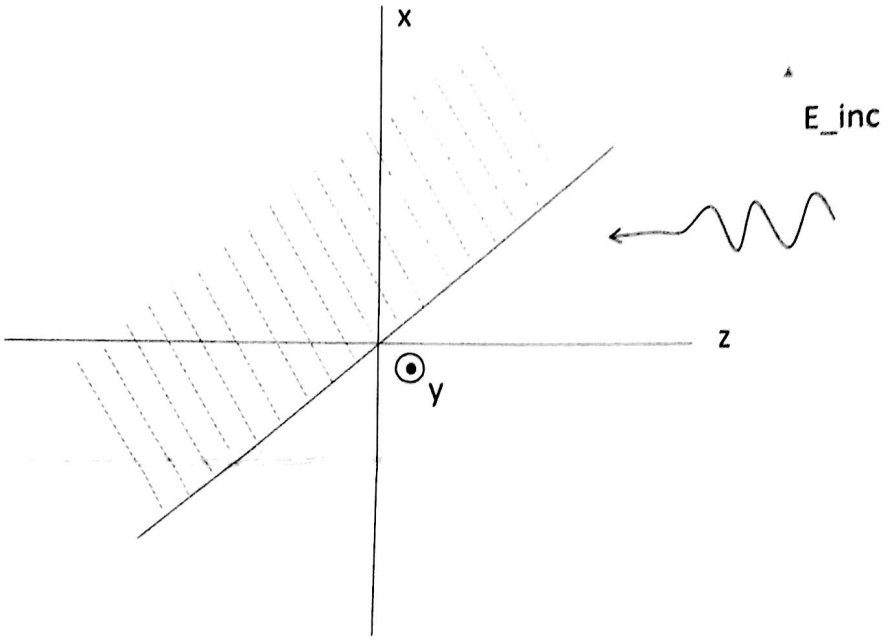
Centre for Applied Research in Electronics,
I.I.T. Delhi Oct 7, 2016
ELL713 Minor 2

[**x,y,z** in bold font represent the unit vectors, $\varepsilon_0 = 8.8 \times 10^{-12}$; $\mu_0 = 4\pi \times 10^{-7}$]

Marks : 6+6+3+5+5, Time 1 hr.

1. Write the expression for the E-field of a LCP uniform plane wave which is propagating along $[(-\mathbf{y} - \mathbf{z})/\sqrt{2}]$, at f = 10 GHz, in a non-magnetic medium with $\varepsilon_r = 3 - j0.01$.

2. The region z < x is perfect conductor and z > x is air. An incident field with $E = \mathbf{x}\, e^{j\beta z}$ is incident on the boundary (the plane x = z). What will be the expression for the scattered Electric field in the region z > x ? The geometry is :



3. What is the direction of the E-field (specify as a unit vector) : $\mathbf{x}1.0 + \mathbf{y}\,(0.5 + j)$?

4. Give the circuit for matching an impedance $(12 - j120)\Omega$ to 50Ω using Smith chart. Use only 50-ohm transmission line sections (suitable for microstrip) , some of which may be open circuited at one end.

5. A 1A (peak) current flows through a copper wire of radius 1 mm , at 1 GHz. What heat is generated in 1m of wire ? Conductivity of copper (which is non-magnetic) is 5.9×10^7 .