1. (40%) Explain the following terms: a) Eddy current, b) Stokes's theorem, c) Dielectric constant, d) TEM, e) Antenna radiation patterns, f) Boit-Savart law, g) Lorentz's force, h) wave polarization

2. (20%) Prove that a maximum power is transferred from a voltage source with an internal impedance Z_g to a load impedance Z_L over a lossless transmission line when $Z_i = Z_g^*$, where Z_i is the impedance looking into the loaded line. What is the maximum power-transfer efficiency?

3. (20%) A plane boundary of infinite extent in the z direction passes through the points (4, 0, 0) and (0, 3, 0), as what indicated right. The electric field intensity in medium 1 ($\varepsilon_r = 2.5$) is $\vec{E} = 25\vec{a}_x + 50\vec{a}_y + 25\vec{a}_z$ V/m. Determine the $\vec{E}$ field in medium 2 ($\varepsilon_r = 5$).
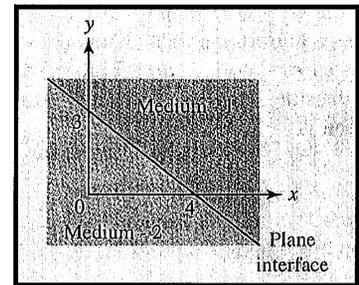
4. (20%) A point charge Q exists at a distance d above a large grounded conducting plane. Determine

      a. The surface charge density ρ_s

      b. The total charge induced on the conducting plane.