ARAB ACADEMY FOR SCIENCE & TECHNOLOGY & MARITIME TRANSPORT
COLLEGE OF ENGINEERING & TECHNOLOGY
Electronics and Communications Department

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Electromagnetics
Course # EC341
Term: 6th

Sheet (5)

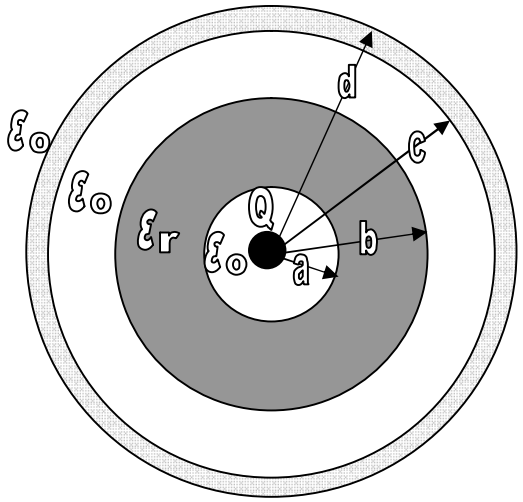
1. Find the magnitude of $\overline{E}$ in a sample of silver having $\sigma = 6.17 \times 10^7\ (\Omega.m)^{-1}$ and $\mu_e = 0.0056\ m^2/(V.s)$ if:
   a. $U_d = 1mm/s$.
   b. $J = 10^7\ A/m^2$.

2. In a given region, $\overline{J} = \hat{a}_z\ Kr_c^2\ A/m^2$.within a radius of $r_c = r_a$, Find:
   a. The current through a perpendicular cross section.
   b. $\nabla . \overline{J}$
   c. $\partial\rho_v / \partial_t$

3. In a copper conductor [$\sigma = 3.82 \times 10^7\ (\Omega.m)^{-1}$]. It's found that $\overline{J} = \hat{a}_x\ (y^2 + z^2) A/m$. Given $\mu_e = 1.4 \times 10^{-4}\ m^2/(V.s)$. Find:
   a. $\overline{E}$
   b. $\overline{U_d}$
   c. ρ_{ve}

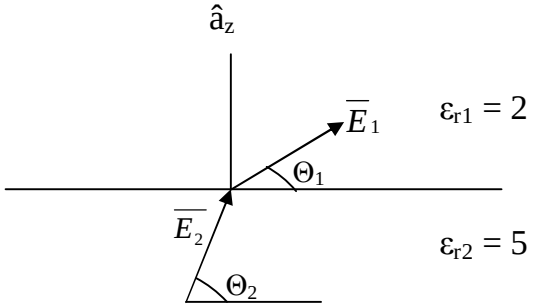
4. In a certain conductor if $10^{-4}\ m^2$ cross-section, it is know that $n_e = 10^{26}\ m^{-3}$, $E = 0.1$ V/m, and I = 0.5 kA. Find:
   a. ρ_{ve}
   b. U_d
   c. μ_e
   d. J
   e. σ

5. An ungrounded spherical configuration of concentric spherical dielectric shells enclosed by conductor shell is shown in figure. Region 1 and 3 are free space, region 2 is a dielectric whose relative permittivity equals ε_r, and region 4 is a conductor. If a charge Q is placed at the center. Find:
   a. $\overline{D}$ in all regions through the use of Gauss's law.
   b. $\overline{E}$ and $\overline{P}$ in all regions.
   c. ρ_s on the conductor surfaces.
   d. ρ_{sb} and ρ_{vb}



6. Show that the resistance between the base and the top of truncated cone of conductivity (σ) is given by $\mathbf{R = h / (\sigma \pi r_1 r_2)}$, where **h** is the height of the truncated cone, $\mathbf{r_1}$ is the radius of the base and $\mathbf{r_2}$ is the radius of the top of the cone.

7. Given that $\overline{E}_1 = 2\hat{a}_x - 3\hat{a}_y + 5\hat{a}_z$ at the charge free dielectric interface. Find the angles θ_1 and θ_2



8. Find the capacitance of a coaxial capacitor of length **L**, where the inner conductor has radius **a** and the outer has radius **b**. assume zero electric field fringing at the ends and uniform ρ_L along the conductors.

9. Find the capacitance of the parallel-plate capacitors where two different parallel slabs of dielectric are used. Assume uniform ρ_s distribution and neglected electric field fringing at the edges.

10. Find the voltage across each dielectric in the capacitor show when the applied voltage is 200V.