Phys102 (Sec # 40) Quiz # 8 (Ch.25 & 26)

Name: (Key) ID #

1- A potential difference of 9.0 V is applied across the length of a cylindrical conductor with radius 2.0 mm. Calculate the current density if the conductor has a resistance of 90 ohms.

$$V = iR \Rightarrow i = \frac{V}{R} = \frac{9}{90} = 0.1 \text{ A}$$

$$J = \frac{i}{A} = \frac{0.1}{\pi r^2} = \frac{0.1}{\pi (2\times10^{-3})^2} = 7.9 \times 10^{3} \frac{A}{m^2}$$

2- A parallel-plate capacitor has an area A and a separation d. Find its capacitance if it is filled with two dielectrics as shown in the figure. [$K_1 = 5$ and $K_2 = 2.5$ are the dielectric constants, $A = 6\text{cm}^2$, $d = 3$ mm]

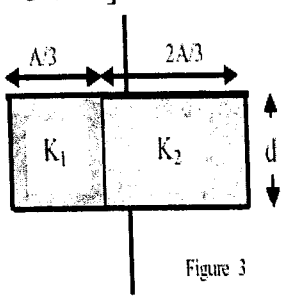

Figure 3

Treat it as two capacitors in parallel

$$C_1 = K_1 \varepsilon_0 \frac{A/3}{d}$$

$$C_2 = K_2 \varepsilon_0 \frac{2A/3}{d}$$

$$C_{eq} = C_1 + C_2 = \varepsilon_0 \frac{A}{3d}(k_1 + 2k_2)$$

$$= 1.77 \times 10^{-11} \text{ F}$$

$$= 17.7 \text{ PF}$$