P.5-9 a) Eq. (3-118): $E_{1t} = E_{2t} \longrightarrow E_2 \sin\alpha_2 = E_1 \sin\alpha_1$.

Eq. (5-58): $J_{1n} = J_{2n} \longrightarrow \sigma_1 E_{1n} = \sigma_2 E_{2n} \longrightarrow \sigma_2 E_2 \cos\alpha_2 = \sigma_1 E_1 \cos\alpha_1$.

$$\therefore \quad E_2 = E_1 \sqrt{\sin^2\alpha_1 + \left(\frac{\sigma_1}{\sigma_2}\cos\alpha_1\right)^2}. \qquad (1)$$

$$\tan\alpha_2 = \frac{\sigma_2}{\sigma_1}\tan\alpha_1 \longrightarrow \alpha_2 = \tan^{-1}\left(\frac{\sigma_2}{\sigma_1}\tan\alpha_1\right). \qquad (2)$$

b) Eq. (3-121b): $D_{2n} - D_{1n} = \rho_s \longrightarrow \epsilon_2 E_{2n} - \epsilon_1 E_{1n} = \rho_s$.

$$\rho_s = \left(\frac{\sigma_1}{\sigma_2}\epsilon_2 - \epsilon_1\right) E_{1n} = \left(\frac{\sigma_1}{\sigma_2}\epsilon_2 - \epsilon_1\right) E_1 \cos\alpha_1.$$

c) If both media are perfect dielectrics, $\sigma_1 = \sigma_2 = 0$, Eqs. (1) and (2) revert to Eqs. (3-130) and (3-129) respectively and $\rho_s = 0$.