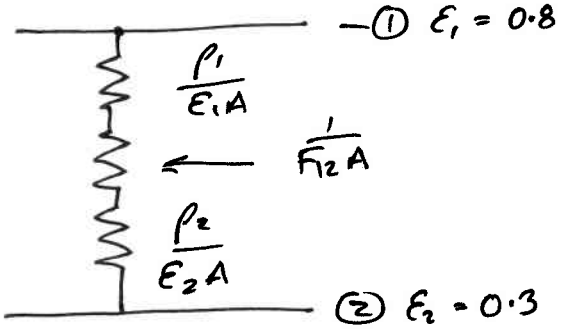
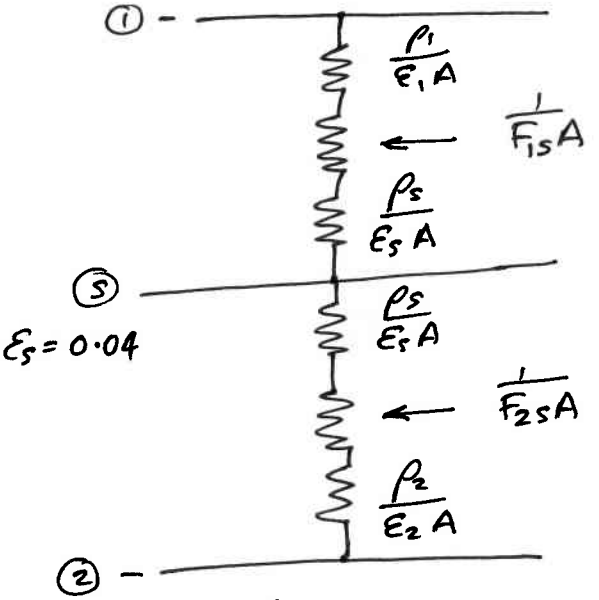
Qu. 5

With no shield



With shield



In each case $\dot{Q}_{12} = \dfrac{\sigma (T_1^4 - T_2^4) A}{\Sigma \text{ resistances}} = \dfrac{K}{\Sigma \text{ resistances}}$

$$\dot{Q}_{12} = \frac{K}{\frac{\rho_1}{\varepsilon_1 A} + \frac{1}{F_{12} A} + \frac{\rho_2}{\varepsilon_2 A}} \qquad \frac{K}{\frac{\rho_1}{\varepsilon_1 A} + \frac{1}{F_1 A} + \frac{\rho_s}{\varepsilon_s A} + \frac{\rho_s}{\varepsilon_s A} + \frac{1}{F_{2s} A} + \frac{\rho_2}{\varepsilon_2 A}}$$

Since areas are large $F_{12}, F_{1s}, F_{2s} = 1$ & $\rho = 1 - \varepsilon$

$$\dot{Q}_{12} = \frac{KA}{\frac{1-0.8}{0.8} + \frac{1}{1} + \frac{1-0.3}{0.3}} \qquad \frac{KA}{\frac{1-0.8}{0.8} + \frac{1}{1} + \left(\frac{1-0.04}{0.04}\right) \times 2 + \frac{1}{1} + \frac{1-0.3}{0.3}}$$

$$= \frac{KA}{3.583} \qquad \frac{KA}{52.58}$$

$$\therefore \%\ \text{reduction} = \frac{\frac{KA}{3.583} - \frac{KA}{52.58}}{\frac{KA}{3.583}} \times 100\%$$

$$= \underline{93.2\%}$$