

#129

$$T_i = 150^\circ\text{C} \quad T_\infty = 15^\circ\text{C} \quad T_s = 75^\circ\text{C}$$

$$L = 0.10\text{m}$$

$$k = 1\text{ W/m}\cdot^\circ\text{C}$$

$$q = \frac{k(T_i - T_s)}{L} = \frac{1(150 - 75)}{0.10} = 750\text{ W/m}^2$$

$$q = h(T_s - T_\infty) \rightarrow 750 = h(75 - 15)$$

$$750 = 60h \Rightarrow h = \frac{750}{60} = 12.5\text{ W/m}^2\cdot^\circ\text{C}$$

$$E = \sigma T^4 \quad T_1 = 15 + 273 = 288\text{ K}$$

$$\epsilon = 5.67 \times 10^{-8} \quad T_2 = 75 + 273 = 348\text{ K}$$

$$\Delta E = \epsilon(T_2^4 - T_1^4)$$

$$\Delta E = (5.67 \times 10^{-8})[(348)^4 - (288)^4]$$

$$\Delta E = 441\text{ W/m}^2$$