

$$\text{For } Bi = 0.1953 \approx 2.0$$

$$\lambda_1 = 0.4217 \text{ rad } A_1 = 1.0311$$

$$\frac{T_0 - T_{\infty}}{T_i - T_{\infty}} = A_1 e^{-\lambda_1^2 \tau} \rightarrow 1.0311 e^{(-0.4217)^2 (0.007)} = 0.870$$

$$T_0 = 200(0.870) = 174.3^\circ\text{C}$$

6-10

$$\alpha = 0.82 \times 10^{-7} \text{ m}^2/\text{s} \quad k = 0.15 \text{ W/m}\cdot^\circ\text{C}$$

$$h = 45 \text{ W/m}^2\cdot^\circ\text{C}$$

$$T_i = 20^\circ\text{C} \quad T_{\infty} = 500^\circ\text{C} \quad T_s = 400^\circ\text{C}$$

$$\frac{T_s - T_i}{T_{\infty} - T_i} = \frac{400 - 20}{500 - 20} = 0.7917$$

$$= \exp(\eta^2) \text{erfc}(\eta) = 1 - 0.7917 = 0.2083$$

semi inf solid

$$\eta = \frac{h\sqrt{\alpha t}}{k} = 2.10$$

$$\sqrt{\alpha t} = \frac{\eta \cdot k}{h} \rightarrow \sqrt{\alpha t} = \frac{(2.10)(0.15)}{45} = 0.007 \text{ m}$$

$$\alpha t = (0.007)^2 = 4.9 \times 10^{-5} \text{ m}^2$$

$$t = \frac{4.9 \times 10^{-5}}{0.82 \times 10^{-7}} = 597.56 \text{ sec}$$