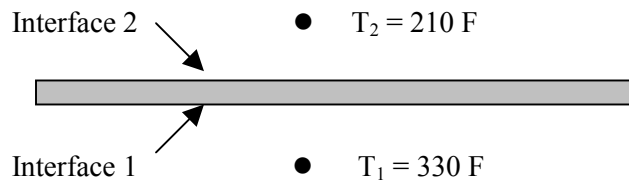


Problem 1 Free convection h/t problem—conventional engineering methodology



Problem: What is the steady-state heat flux?

Given: $h_1 = 1.40\Delta T_1^{-.3} \text{ B/hrft}^2\text{F}$

$$k_{\text{wall}}/t_{\text{wall}} = 900 \text{ B/hrft}^2\text{F}$$

$$h_2 = .55\Delta T_2^{-.4} \text{ B/hrft}^2\text{F}$$

Solution: $U = 1/(1/h_1 + t_{\text{wall}}/k_{\text{wall}} + 1/h_2)$

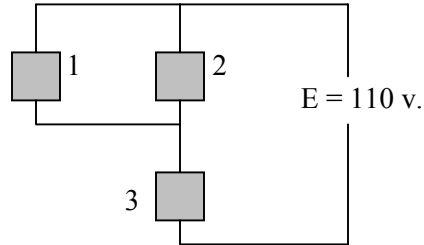
$$U = 1/(1/1.40\Delta T_1^{-.3} + 1/900 + 1/.55\Delta T_2^{-.4})$$

To be completed by the reader

Problem 2 Electrical problem—conventional engineering methodology

Problem: Calculate I_{circuit} using conventional engineering methodology.

Given: $R_1 = 3.2I_1^{0.3}$ ohms $R_2 = 1.8I_2^{0.5}$ ohms $R_3 = 5$ ohms



Solution: $R_{1,2} = 1/(1/R_1 + 1/R_2)$

$$R_{1,2} = 1/(1/3.2I_1^{0.3} + 1/1.8I_2^{0.5})$$

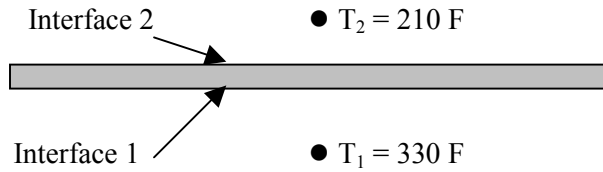
$$R_{\text{circ}} = R_{1,2} + R_3 = 1/(1/3.2I_1^{0.3} + 1/1.8I_2^{0.5}) + 5$$

$$I_{\text{circ}} = V_{\text{circ}}/R_{\text{circ}} = 110/(1/(1/3.2I_1^{0.3} + 1/1.8I_2^{0.5}) + 5)$$

To be completed by the reader.

Problem 3 Highly nonlinear h/t problem—conventional engineering methodology

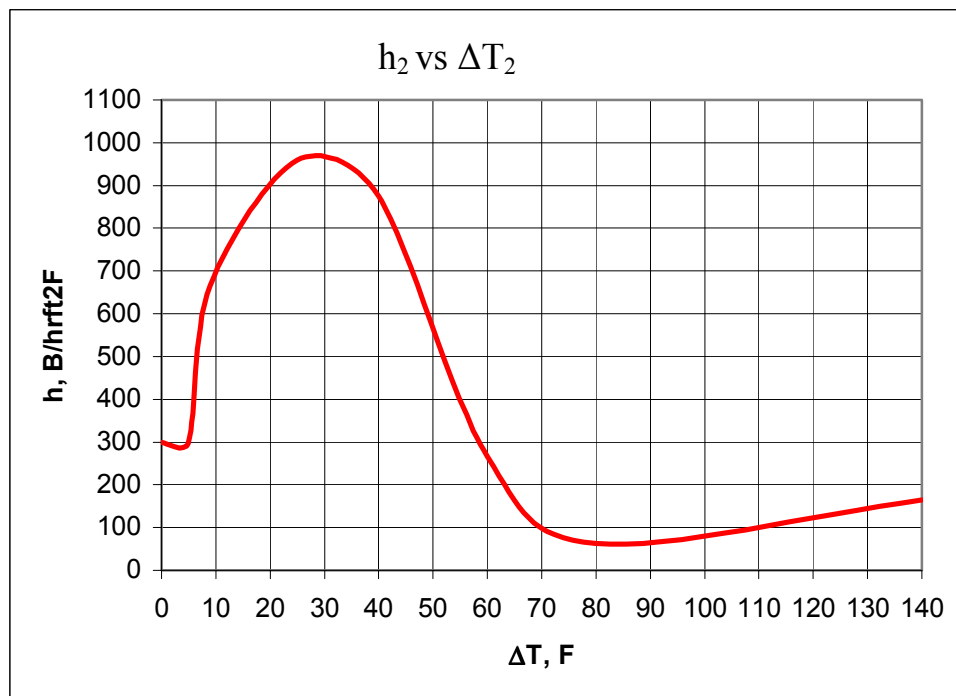
Problem: What is the steady-state heat flux?



Given: $h_1 \{\Delta T_1\} = 400\text{ B/hrft}^2\text{F}$

$(k/t)_{\text{wall}} = 900\text{ B/hrft}^2\text{F}$

$h_2 \{\Delta T_2\}$ is given in chart below



Solution: $U = 1/(1/h_1 + t_{\text{wall}}/k_{\text{wall}} + 1/h_2)$

$U = 1/(1/400 + 1/900 + 1/h_2)$

To be completed by the reader.