Solutions

2.1

- $R_{sa,max} = (T_{j,max} - T_a)/P - (R_{jc} + R_{cs}) = 75/120 - 0.23 = \mathbf{0.395}$ K/W.

2.2

- $m = \sqrt{2h/(kt)} = \sqrt{2 \times 25/(200 \times 0.0015)} = \mathbf{12.91}$ m^{-1}.
- $mH = 12.91 \times 0.030 = 0.387$; $\eta_f = \tanh(0.387)/0.387 = \mathbf{0.953}$.

3.1

- (a) $A_f = 25 \times 2 \times 0.030 \times 0.100 = \mathbf{0.150}$ m^2.
- $A_b = 0.100 \times 0.120 - 25 \times 0.0015 \times 0.100 = \mathbf{0.00825}$ m^2.
- (b) $hA_{eff} = h(A_b + \eta_f A_f) = 25(0.00825 + 0.953 \times 0.150) = 3.779$ W/K, so $R_{sa} = \mathbf{0.2646}$ K/W.
- $T_j = T_a + P(R_{jc} + R_{cs} + R_{sa}) = 35 + 120(0.23 + 0.2646) = \mathbf{94.4}$ °C, inside 110 °C.
- (c) $m = \sqrt{2 \times 50/(200 \times 0.0015)} = 18.26$, $mH = 0.548$, $\eta_f = \mathbf{0.911}$.
- $hA_{eff} = 50(0.00825 + 0.911 \times 0.150) = 7.244$ W/K, $R_{sa} = \mathbf{0.138}$ K/W; $T_j = 35 + 120(0.23 + 0.138) = \mathbf{79.2}$ °C.
- A larger h steepens the temperature fall along the fin, so the tips run cooler and η_f drops: the conductance less than doubles, and $R_{jc} + R_{cs}$ do not change at all.

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