

Week 1

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Conductive heat transfer summary:

Heat transfer is the transfer of mass of differing chemical species, which caused by temperature difference. If there is a temperature difference within or between bodies, heat energy transfers from high to low temperatures.

Exercise:

$L = 0.4 \text{ m}$, $A = 20 \text{ m}^2$, $\Delta T = 25$, and $k = 0.78 \text{ W/m}$

- simple method:

$$\begin{aligned} Q &= kA \frac{\Delta T}{L} \\ &= 0.78 \text{ W/m} * 20 \text{ m}^2 * \frac{25}{0.4 \text{ m}} \\ &= 975 \text{ W} \end{aligned}$$

- the resistance concept:

$$\begin{aligned} R_{wall} &= \frac{L}{kA} \\ &= \frac{0.4 \text{ m}}{0.78 \text{ W/m} * 20 \text{ m}^2} \\ &\approx 0.0256 \text{ }^\circ\text{C/W} \end{aligned}$$

$$\begin{aligned} Q &= \frac{\Delta T}{R_{wall}} \\ &= \frac{25^\circ\text{C}}{0.0256 \text{ }^\circ\text{C/W}} \\ &= 976.5625 \text{ W} \end{aligned}$$