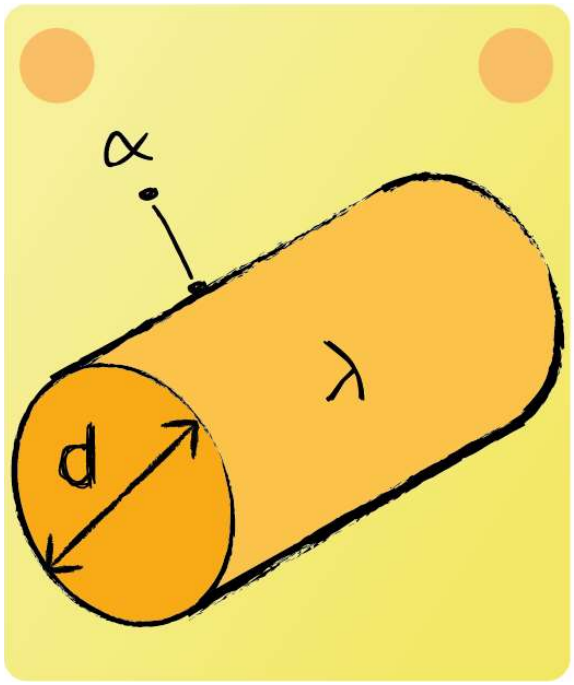
Lecture 14 - Question 4



Consider the following thin cylinder. Determine whether the lumped capacity model can be applied. Take α = 20 W/m^{2}K, λ = 0.01 W/mK and d = 0.1 m.

No

$$L_c = \frac{V}{A} = \frac{\frac{\pi}{4}d^2L}{2\cdot\frac{\pi}{4}d^2+\pi dL}$$

Thin cylinder approximation : $L_c \approx \frac{\frac{\pi}{4}d^2L}{\pi dL} = \frac{1}{4}d = 0.025\ m$

$$Bi = \frac{\alpha\cdot L_c}{\lambda} = 50$$

No, since Bi » 1.