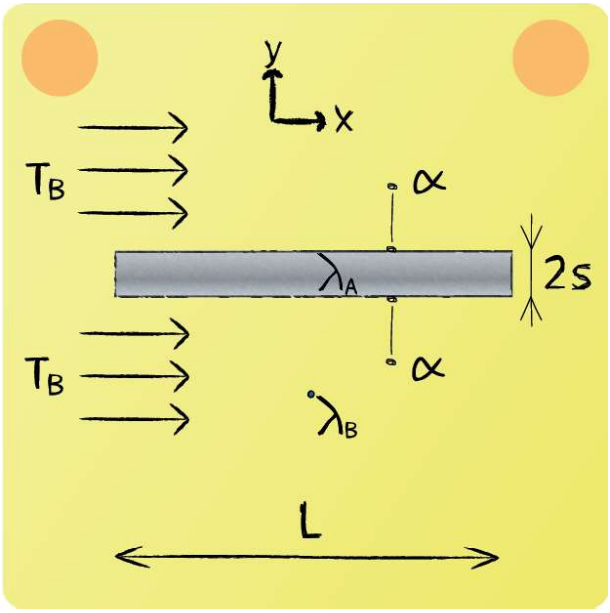
Exam Preparation - Conduction 9



Choose the right euqation to determine the heat transfer coefficient α for a plate of thicknes $2s$ and a thermal conductivity λ_A for a given problem specific Biot number Bi.

Heat transfer happens in the y-direction. Therefore the conductive inside and convective resistance outside the body in y-direction have to be brought into relation. Resulting in:

$$\mathrm{Bi_s} = \frac{\alpha \cdot L}{\lambda_A}$$

Note that L is the characteristic length, which is the ratio $\frac{V}{A}$. Resulting in:

$$L = \frac{2s \cdot A_s}{2 \cdot A_s} = s$$

Where A_s is the surface area where the fluid is flowing over.

Therefore:

$$\mathrm{Bi_s} = \frac{\alpha \cdot s}{\lambda_A}$$

And thus:

$$\longrightarrow \alpha = \frac{\mathrm{Bi} \cdot \lambda_A}{s}$$