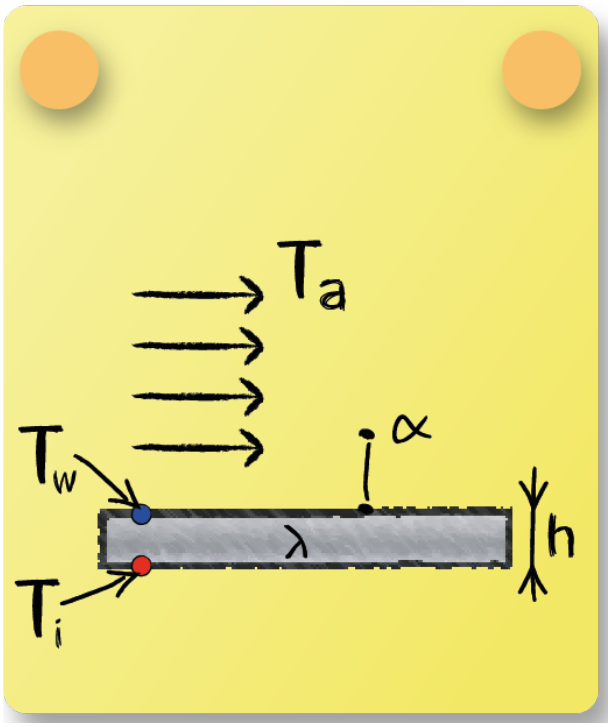
Lecture 6 - Question 2



Air is blowing over a thin horizontal steel plate, determine the heat transfer coefficient α for the given values. Assume a steady state and one-dimensional heat transfer.

In case of a steady state conductive and convective heat fluxes must equal each other in order to satisfy energy conservation.

$$\dot{Q}_{\text{cond}} = \dot{Q}_{\text{conv}}$$

$$-\lambda A \frac{T_{\text{w}} - T_{\text{i}}}{h} = \alpha A (T_{\text{w}} - T_{\text{a}})$$

With all values given, the heat transfer coefficient is obtained by rearranging the equation:

$$\alpha = \frac{\lambda}{h} \frac{T_{\text{i}} - T_{\text{w}}}{T_{\text{w}} - T_{\text{a}}}$$