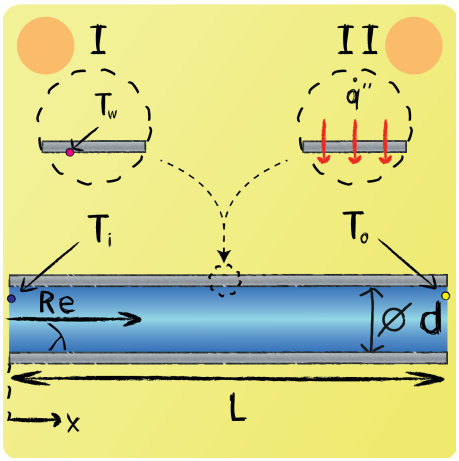
Exam Preparation Convection 04

Give an expression for the average heat transfer coefficient in case II.



For case 1, the flow is thermally and hydrodynamic fully developed. Therefore:

$$\overline{\mathrm{Nu}}_{\mathrm{I}} = 3.66 \cdot \left(\frac{\eta}{\eta_{\mathrm{w}}}\right)^{0.14}$$

If instead of the wall temperature, the heat flow at the wall remains constant, then the heat transfer coefficients have values increased by 20Thus:

$$\overline{\mathrm{Nu}}_{\mathrm{II}} = 1.2 \cdot 3.66 \cdot \left(\frac{\eta}{\eta_{\mathrm{w}}}\right)^{0.14} = 4.932 \cdot \left(\frac{\eta}{\eta_{\mathrm{w}}}\right)^{0.14}$$

$$\rightarrow \overline{\alpha}_{\mathrm{II}} = \frac{4.932 \cdot \lambda}{d} \cdot \left(\frac{\eta}{\eta_{\mathrm{w}}}\right)^{0.14}$$