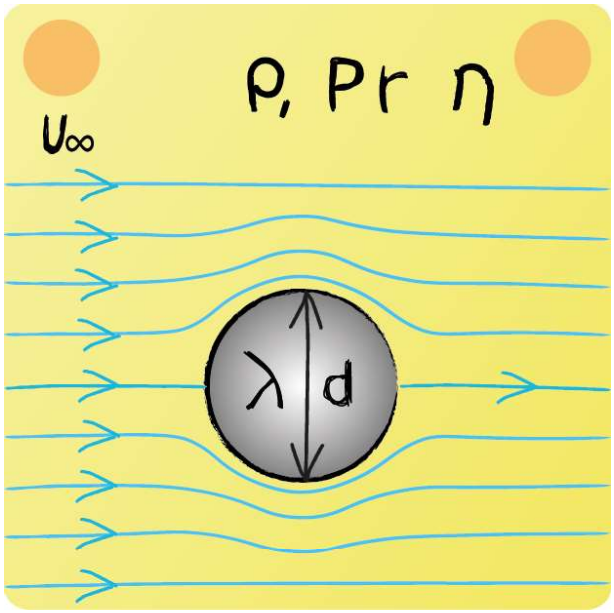
Lecture 6 - Question 2



Consider transverse flow around a cylinder by an ideal gas. Determine the average heat transfer coefficient $\bar{\alpha}$.

Reynolds number:

$$\mathrm{Re_d} = \frac{\rho \cdot u_\infty \cdot d}{\eta} = \frac{1.2 \cdot 5 \cdot 0.1}{1.8 \cdot 10^{-5}} = 3.33 \cdot 10^4$$

Nusselt number:

$$\overline{\mathrm{Nu_d}} = \mathrm{C} \cdot \mathrm{Re_d}^{\mathrm{m}} \mathrm{Pr}^{0.4} = 0.193 \cdot \left(3.33 \cdot 10^4\right)^{0.618} 0.73^{0.4} = 106.11$$

Heat transfer coefficient:

$$\overline{\alpha} = \frac{\overline{\mathrm{Nu}_d} \cdot \lambda}{d} = \frac{106.11 \cdot 70}{0.1} = 7.4 \cdot 10^4 \ \mathrm{W/m^2K}$$