

Problem 15.1 Solution

$$Q = CA_1 \left[\frac{2g(p_1 - p_2)}{\left(\frac{A_1}{A_2} \right)^2 - 1} \right] = (0.984) 7.854 \times 10^{-3} \left[\frac{\frac{2(9.81)(55)}{9.53}}{\left[\frac{7.854 \times 10^{-3}}{1.964 \times 10^{-3}} \right]^2 - 1} \right]^{\frac{1}{2}}$$

(The 0.984 value was assumed)

$$q = 2.12 \times 10^{-2} \frac{\text{m}^3}{\text{s}} = 0.0212 \frac{\text{m}^3}{\text{s}}$$

Now check N_R and re-evaluate C .

$$v_1 = \frac{Q}{A_1} = \frac{2.12 \times 10^{-2} \text{m}^3/\text{s}}{7.854 \times 10^{-3} \text{m}^2} = 2.70 \text{ m/s}$$

$$N_R = \frac{v_1 D_1}{\nu} = \frac{(2.70)(0.10)}{3.60 \times 10^{-7}} = 7.5 \times 10^5 \text{ Then } C = 0.984 \text{ OK}$$

Problem 15.11 Solution

$$v = \sqrt{\frac{2gh(\gamma_g - \gamma)}{\gamma}} : h = 225 \text{ mm} = 0.225 \text{ m}$$

$$\gamma_g = 132.8 \frac{\text{kN}}{\text{m}^3} (\text{mercury}); \gamma = 7.74 \frac{\text{kN}}{\text{m}^3} (\text{methyl Alcohol})$$

$$v = \sqrt{\frac{2(9.81)(0.225)(132.8 - 7.74)}{7.74}} = 8.45 \frac{\text{m}}{\text{s}}$$