

- 1) Given: Sp gravity = 0.8,  
 $D_1 = 150 \text{ mm} = 0.15 \text{ m}$ ,  
 $D_2 = 75 \text{ mm} = 0.075 \text{ m}$   
 $Z_2 - Z_1 = 150 \text{ mm} = 0.15 \text{ m}$   
 $Q = 40 \text{ litres/sec} = 0.04 \text{ m}^3/\text{s}$   
 $Col = 0.96$

Pressure difference  $(P_1 - P_2)$

$$A_1 = \frac{\pi}{4} D_1^2 = \frac{\pi}{4} \times 0.15^2 = 0.0177 \text{ m}^2$$

$$A_2 = \frac{\pi}{4} D_2^2 = \frac{\pi}{4} \times 0.075^2 = 0.0044 \text{ m}^2$$

$$Q = Col \times \frac{A_1 A_2}{\sqrt{A_1^2 - A_2^2}} \times \sqrt{2gh}$$

$$0.04 = 0.96 \times \frac{0.0177 \times 0.0044}{\sqrt{0.0177^2 - 0.0044^2}} \times \sqrt{2 \times 9.81 h}$$

$$0.04 = 0.96 \times 0.00458 \times 4.429 \sqrt{h}$$

$$0.04 = 4.397 \times 10^{-3} \times 4.429 \sqrt{h}$$

$$\sqrt{h} = \frac{0.04}{4.397 \times 10^{-3} \times 4.429}$$

$$= \frac{2.054^2}{4.429}$$

$$h = 4.22 \text{ m}$$

$$= \left[ \frac{P_1}{\rho} + Z_1 \right] - \left[ \frac{P_2}{\rho} + Z_2 \right]$$

$$4.22 = \left[ \frac{P_1 - P_2}{\rho} \right] + (Z_1 - Z_2)$$

$$= \frac{P_1 - P_2}{\rho g} - 0.15$$

$$(P_1 - P_2) = \rho g (4.22 + 0.15)$$

$$= 0.8 \times 1000 \times 9.81 \times 4.37$$

$$(P_1 - P_2) = 34.3$$

