

$$2. \quad \rho = 0.8 \times 1000 = 800 \text{ kg m}^{-3}$$

$$d_1 = 150 \text{ mm} = 0.15 \text{ m}$$

$$d_2 = 75 \text{ mm} = 0.075 \text{ m}$$

$$\Delta z = 150 \text{ mm} = 0.15 \text{ m}$$

$$40 \text{ l} = 40 \text{ dm}^3 = 40 \times (0.1)^3 \text{ m}^3 \\ = 0.04 \text{ m}^3$$

$$Q = 0.04 \text{ m}^3/\text{s}$$

$$C_d = 0.96$$

$$s.g. = 0.8$$

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

$$A_1 = \frac{\pi d_1^2}{4} = \frac{\pi (0.15)^2}{4} \\ = 0.01767 \text{ m}^2$$

$$A_2 = \frac{\pi d_2^2}{4} = \frac{\pi (0.075)^2}{4} \\ = 0.00442 \text{ m}^2$$

$$h = \left(\frac{Q \times \sqrt{A_1^2 - A_2^2}}{C_d A_1 A_2} \right)^2 \times \frac{1}{2g}$$

$$h = \left(\frac{0.04 \times \sqrt{0.01767^2 - 0.00442^2}}{0.96 \times 0.01767 \times 0.00442} \right)^2 \times \frac{1}{2 \times 9.81}$$

$$h = 0.4652 \text{ m}$$

$$P_1 - P_2 = \cancel{800 \times 9.81} \times 800 \times 9.81 \times (0.4652 + 0.15)$$

$$= 4828.09 \text{ N/m}^2 \text{ ans}$$