

QUADRI JOHN OBAJUWON

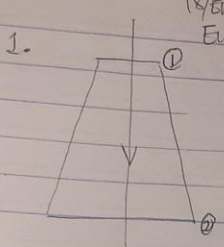
18/ENG04/070

ELECT-ELECT

ENG 214

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1.



$L = 2\text{m}$
 $V_1 = 5\text{m/s}$
 $P_1/\rho g = 2.5\text{m of liquid.}$
 $V_2 = 2\text{m/s}$
Loss

Loss of head = $h_L = \frac{0.35(V_1 - V_2)^2}{2g}$
 $= \frac{0.35(5-2)^2}{2 \times 9.81} = \frac{0.35 \times 9}{2 \times 9.81} = 0.16\text{m}$

Pressure head = $\frac{P_2}{\rho g} = 7$

Using Bernoulli's equation we get

$$\frac{P_1}{\rho g} + \frac{V_1^2}{2g} + z_1 = \frac{P_2}{\rho g} + \frac{V_2^2}{2g} + z_2 + h_L$$

$z_2 = 0$ because datum line passes through (2)
 $\therefore z_1 = 2.0$

$$2.5 + \frac{5^2}{2 \times 9.81} + 2 = \frac{P_2}{\rho g} + \frac{2^2}{2 \times 9.81} + 0 + 0.16$$
$$2.5 + 1.27 + 2.0 = \frac{P_2}{\rho g} + 0.203 + 0.16$$

$$\therefore \frac{P_2}{\rho g} = 5.407 \text{ m of fluid.}$$

2. $d_1 = 20 \text{ cm}$ (diameter of inlet)

$$a_1 = \frac{\pi}{4} \times (20)^2 = 314.16 \text{ cm}^2$$

$$d_2 = 10 \text{ cm}$$

$$a_2 = \frac{\pi}{4} \times 10^2 = 78.74 \text{ cm}^2$$

$$P_1 = 17.658 \text{ N/cm}^2 = 17.658 \times 10^9 \text{ N/m}^2$$

$$\rho = 1000 \frac{\text{kg}}{\text{m}^3} \text{ and } \frac{P_1}{\rho g} = \frac{17.658 \times 10^9}{9.81 \times 1000} = 18 \text{ m of water}$$

$$\frac{P_1}{\rho g} = \frac{17.658 \times 10^9}{9.81 \times 1000} = 18 \text{ m of water}$$

$$\frac{P_2}{\rho g} = -30 \text{ cm of mercury}$$

$$= 0.30 \text{ m of mercury} = -0.30 \times 13.6$$
$$= -4.08 \text{ m of mercury}$$

$$\therefore \text{Differential head} = h = \frac{P_1}{\rho g} - \frac{P_2}{\rho g} = 18 - (-4.08)$$

$$= 18 + 4.08 = 22.08 \text{ m of water}$$
$$= 2208 \text{ cm of water.}$$

$$Q = \frac{C_d a_1 a_2}{\sqrt{a_1^2 - a_2^2}} \times \sqrt{2gh}$$

$$4. \quad \alpha = 170 \text{ mm} = 0.17 \text{ m}$$

$$S_g = 13.6$$

$$S_o = 1.026$$

$$h = \alpha \left[\frac{S_g}{S_o} - 1 \right] = 0.17 \left[\frac{13.6}{1.026} - 1 \right] = 2.0834 \text{ m}$$

$$\begin{aligned} \therefore V &= \sqrt{2gh} = \sqrt{2 \times 9.81 \times 2.0834} = 6.393 \text{ m/s} \\ &= \frac{6.393 \times 60 \times 60}{1000} \text{ km/hr} \\ &= \underline{\underline{23.01 \text{ km/hr}}} \end{aligned}$$