NAME: IFEANYI-OBI-IFEANYI

MATRIC NO: 18/ENG06/028

DEPT: MECHANICAL

Given Sp of gravity of $D_1 = 150mm = 0.15m$, $D_2 = 75mm = 0.075m$

$Z_2 - Z_1 = 150mm = 0.15m$, $Q = 40lit/sec = 0.04m^3/s$, $cd = 0.96$

pressure different $(P_1 - P_2)$

$$A_1 = \frac{\pi D^2}{4} = \frac{\pi \times 0.15^2}{4} = 0.01767m^2$$

$$A_2 = \frac{\pi D_2^2}{4} = \pi \times 0.75^2 = 0.00442m^2$$

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

$$0.04 = \frac{0.96 \times 0.01767 \times 0.00442 \times \sqrt{2 \times 9.81 \times h}}{\sqrt{0.01767^2 - 0.00442^2}}$$

$$0.04 = 0.96 \times 0.004565 \times 4.429\sqrt{h}$$

$$h = \left(\frac{0.04}{0.96 \times 0.004565 \times 4.429}\right)$$

$$h = \left(\frac{P_1}{w} + Z_1\right) - \left(\frac{P_2}{w} + Z_2\right)$$

$$h = \left(\frac{P_1}{w} - \frac{P_2}{w}\right) + (Z_1 - Z_2)$$

$$4.247 = \left(\frac{P_1 - P_2}{Pg}\right) - 0.15$$

$$4.247 + 0.15 = \frac{P_1 - P_2}{Pg}$$

$$(4.247 + 0.15)\,Pg = P_1 - P_2$$

$$P_1 - P_2 = (0.8 \times 1000 \times 981)(4.247 + 0.15)$$

$P_1 - P_2 = 34.51 kN/m^2$

* Diameter of Inlet $D_1 = 300mm = 0.3m$

Areas of Inlet $A_1 = \frac{\pi \times D_1^2}{4} = \frac{\pi \times 0.3^2}{4} = 0.07^2 m$

Specific gravity of heavy Liquid (mercury) in U tube manometer

Shc = 13.6

Specific gravity of ~~heavy~~ Liquid (oil) flowing Through pipe Sp = 0.9

Reading of differential manometer, $y = 250mm = 0.25m$

The differential "h" is given by;

$$h = \left(\frac{P_1}{w} + Z_1\right) - \left(\frac{P_2}{w} + Z_2\right)$$

$$= y\left[\frac{Shi}{Sp} - 1\right] = 0.25\left[\frac{13.6}{0.9} - 1\right] = 3.53m \text{ of oil}$$

A Discharge of oil Q

Using The relation

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

$$Q = \frac{0.98 \times 0.07 \times 0.07767 \times \sqrt{2 \times 9.81 \times 3.53}}{\sqrt{0.07^2 - 0.07767^2}}$$

$$Q = 0.1489 m^3/s$$

b pressore differente between entrance and Throat section $P_1 - P_2$ We all know That

$$h\left(\frac{P_1}{w} + Z_1\right) - \left(\frac{P_2}{w} + Z_2\right) = 3.53$$

$$h = \left(\frac{P_1}{w} - \frac{P_2}{w}\right) - (Z_1 - Z_2) = 3.53$$

$$Z_2 - Z_1 = 300mm = 0.3m$$

$$\left(\frac{P1 - P2}{w}\right) - 0.3 = 3.53$$

$$\frac{P1 - P2}{w} = 3.83$$

$$P1 - P2 = 3.83w$$

$$P1 - P2 = 3.82 \times 9.81 \times 0.9$$

$$= 33.8 kN/m^2 //$$

911 I know