NAME: BOLAJI OLUWATOYIN

MATRIC NUMBER: 18/ENG02/029

DEPARTMENT: COMPUTER ENGINEERING

COURSE: ENGINEERING DRAWING 2

Course: Fluid Mechanics Assignment

1. A 300mm x 150mm Venturimeter is provided in a vertical pipeline carrying oil of specific gravity 0.9, flow being upward. The difference in elevation of the throat section and entrance section of the venturimeter is 300mm. The differential U-tube mercury manometer shows gauge deflection of 250mm. Calculate (a) The discharge of oil, and (b) The pressure difference between the entrance section and the throat section. Take the co-efficient of meter as 0.98 and specific gravity of mercury as 13.6

$C_d = 0.98$

$D_1 = 300mm = 0.3m$

Area $A_1 = \frac{\pi(3)^2}{4} = 0.07m^2$

$D_2 = 150m = 0.15m$

Area $A_2 = \frac{\pi(0.15)^2}{4} = 0.01767m^2$

Discharge =

$h = P_1 - P_2 = h = x[S_m - 1] = 0.25[13.6 - 1]$

$= 3.5m$ of Oil

$\Delta D = \frac{P_1 - P_2}{w} + Z_2 - Z_1 = 3.53$

$Z_2 - Z_1 = 300$

$\frac{P_1 - P_2}{w} = 0.3 = 3.53$

$P_1 - P_2 = 33.8 KN/m^2$

2 A vertical venturimeter carries a liquid of relative density 0.8 and has inlet and throat diameters of 150mm and 75mm respectively. The pressure connection at the throat is 150 mm above that at the inlet. If the actual flow rate of flow is 40 litres/sec and the $C_d = 0.96$, calculate the pressure difference between inlet and throat in N/m^2.

Solution

$$V_{real} = C_d V_{ideal} = C_d A_2 \sqrt{\frac{2g(\Delta H_p Z)}{\left(1-\left(\frac{A_2}{A_1}\right)^2\right)}}$$

liquid into piezometer

$$40 \times 10^{-3} = 0.96 \left(\frac{\pi}{4} 0.075^2\right) \sqrt{\frac{2 \times 9.81 (\Delta H_p Z)}{\left(1-(75/150)^{2}\right)}}$$

$$\Delta H_p Z = 4.25m$$

$$\Delta H_p Z = \left(\frac{P_1}{\rho g} + Z_1\right) - \left(\frac{P_2}{\rho g} + Z_2\right)$$

$$P_1 - P_2 = \rho g (\Delta H_{p2} + (Z_2 - Z_1))$$

$$= 800 \times 9.81 (4.25 + 0.15)$$

$$= 34.63 kPa$$