DATE:

a) Discharge of orl Q

Using the relation

$$Q = \frac{(d \times A_1 \times A_2 \times \sqrt{2gh})}{\sqrt{A_2^2 - A_1^2}}$$

$$Q = \frac{0.98 \times 0.07 \times 0.07787 \times \sqrt{2 \times 9.81}}{(0.07^2 - 0.077072^2)^{1/2}}$$

$$Q = 0.1489 m^3 s^{-1}$$

b) Pressure difference between entrance and throat section $P_1 - P_2$. We know

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

$$Z_2 - Z_1 = 800m = 0.3m$$

$$\left(\frac{P_1 - P_2}{W}\right) - 0.3 = 3.53$$

$$\frac{P_1 - P_2}{W} = 3.53 + 0.3$$

$$= 3.83$$

$$P_1 - P_2 = 3.83W$$

$$= 3.83 \times 9.81 \times 0.9$$

$$= 33.8 kNm^{-2}$$

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

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

$$4.247 = \left(\frac{P_1 - P_2}{P_0}\right) - 0.15$$

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

$$P_1 - P_2 = (0.8 \times 1000 \times 9.81)(4.247 + 0.15)$$

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

2) Dimeter of inlet $D_1 = 300mm = 0.3m$

Area of inlet $D = \frac{\pi \times D_1^2}{4} = \frac{\pi \times 0.3^2}{4} = 0.09_m^2$

S.g of heavy (mercury) in tube manometer $S_H = 13.6$

S g of oil flowing through pipe $S.p = 0.9$

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

The differential "L" is given by;

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

$$= y\left[\frac{S_H}{S_f} - 1\right] = 0.25\left[\frac{13.6}{0.9} - 1\right) = 3.53m$$

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① Given Sp of Gravity

$D = 150mm = 0.15m$

$D_2 = 75mm = 0.075m$

$2_2 = 150n = 0.15m$

$Q = 40 = 0.04m$

$Cd = 0.96$

$\angle P_1 - P_2 \rangle$

$A = \pi D^2 = \pi \times 0.075^{-2} = 0.0044m^2$

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

$$0.04 = \frac{0.96 \times 0.01767 \times 0.00442 \times \sqrt{2 \times 9.81 \times L}}{\sqrt{0.01767^2 - 0.0442^-}}$$

$$0.04 = 0.98 \times 0.004565 \times 4429\sqrt{h}$$

$$h = \left(\frac{0.04}{0.96 \times 0.004565 \times 4.4424}\right)$$