ii) Pressure difference between entrance & throat

$h = \left(\frac{P_1}{w} - h_1\right)\left(\frac{P_2}{w} - h_2\right) = 3.53$

But $Z_2 - Z_1 = 300mm$ or 0.3_m

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

$\therefore P_1 - P_2 = (9.81) \times 0.9 \times 3.83$

$= 33.8 kN/m^2$

2. Pressure difference ($P_1 P_2$)

$A_1 = \pi/4 P_1^2 = \pi/4 \times 0.15^2 = 0.01767 m^3$

$A_2 = \pi/4 D_2^2 = \pi/4 \times (0.075)^2 = 0.0012_m^2$

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

$0.04 = 0.96 \times \frac{0.01767 \times 0.00472}{\sqrt{0.01767} \times \sqrt{0.00472}} \times \sqrt{2 \times 9.81 \times h}$

$h = \left(\frac{0.04}{0.96 \times 0.004565 \times 4.429}\right) = 4.247_m$

$\therefore Also h = \left(\frac{P_1}{w} + y_1\right)\left(\frac{P_2}{w} + y_2\right)$

$4.247 = \left(\frac{P_1}{w} - \frac{P_2}{w}\right)(Z_1 - Z_2)$

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

$= (0.9 \times 1000 \times 9.81)(4.247 + 0.15) N/m^2$

$= 34.51 kN/m^2$

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1. Diameter of inlet at $P_1 = 300mm = 0.3m$
Area of inlet $A_1 = \pi/4 \times 0.3 = 0.07m^2$
Diameter of throat $P_2 = 150mm = 0.15m$
Area of throat $A_2 = \pi/4 \times 0.15^2 = 0.0707m^2$
specific gravity of ~~heavy~~ heavy liquid emerged in the tube manometer
$She = 13.6$
Specific gravity of Liquid (Coil) flowing through pipe
$Sp = 0.9$
Reading of differential manometer, $y = 250mm$
$0.25m$

=> The differential 'h' is given by

$$h = \left[\frac{P_1}{\omega} + Z_1\right] - \left[\frac{P_2}{\omega} + Z_2\right] = y\left[\frac{She}{Sy} - 1\right] = 0$$

$= 3.53m$ of Oil

ii Discharge of oil, Q:
Using the relation
$$Q = Cd \times \frac{A_1 A_2}{\sqrt{A_1^2 - A_2^2}} \times \sqrt{2gh}$$

$$\therefore Q = \frac{0.98 \times 0.07 \times 0.0707}{\sqrt{0.07^2 \times 0.0707^2}} \times \sqrt{2 \times 9.81 \times 3.53}$$

$$= \frac{0.001212}{0.0677} \times 8.62$$

$$= 0.1489 m^3/s$$