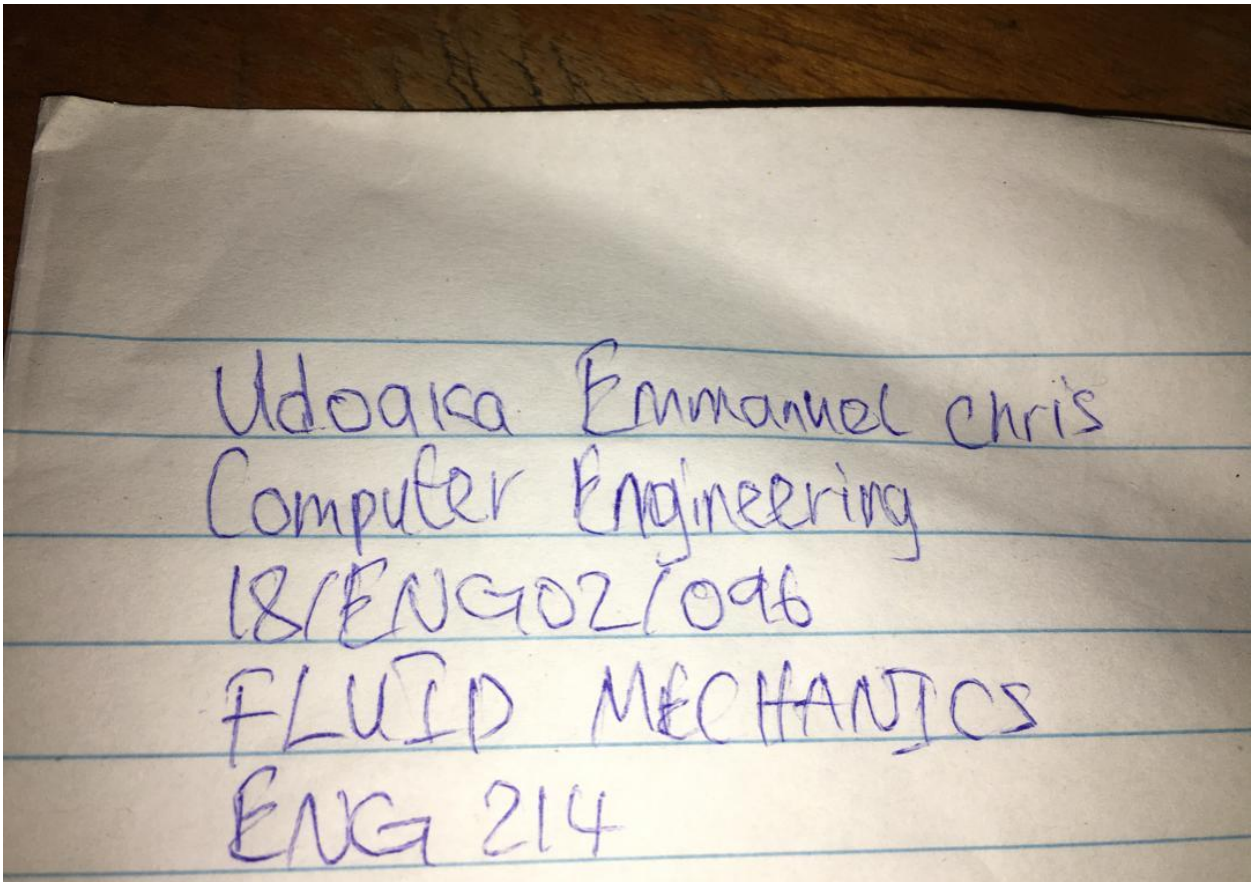
Udoaka Emmanuel chris
Computer Engineering
18/ENG02/096
FLUID MECHANICS
ENG 214

To get h;

$\frac{P_1}{w} - \frac{P_2}{w} = h$.

$P_1 = 17.668 \times 10^4 N/m^2$

$w = 9.81 \times 10^3 N/m^3$

But we have that throat vacuum pressure = 30cm of Hg

$= 0.3m\ Hg$

$= 0.3 \times 13.6 = 4.08$

$\frac{P_2}{w} = -4.08$ (since vacuum pressure)

Then $\frac{P_1}{w} = \frac{17.658 \times 10^4}{9.81 \times 10^3} = 18$.

$\therefore \frac{P_1}{w} - \frac{P_2}{w}$; $18 - -4.08 = 22.08$.

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

$$= 0.98 \times 0.0314 \times 7.85 \times 10^{-3} \times \sqrt{\frac{2 \times 9.81 \times 22.08}{(0.0314^2 - (7.85 \times 10^{-3})^2)}}$$

$= 2.4156 \times 10^{-4} \times 684.59$

$= 0.1653$

$Q_{actual} = 0.1653 m^3/s$

3.) Orificemeter; Given that:

$d_o = 15cm = 15 \times 10^{-2} m$ Pipe Diameter, $d_p = 30cm = 30 \times 10^{-2} m$

$A_o = \frac{\pi \times (15 \times 10^{-2})^2}{4}$ $A_p = \frac{\pi \times (30 \times 10^{-2})^2}{4}$

$= 0.01767 m^2$ $= 0.07069 m^2$

S.P.G of Oil = 0.9 (S_o)

coefficient of discharge = 0.64.

Reading of differential = 50cmhg.

Differenbal head $h = y\left[\frac{5hL}{50} - 1\right]$

$5hL = 13.6$

$y = 50 \times 10^{-2}$

$h = 50 \times 10^{-2}\left[\frac{13.6}{0.9} - 1\right]$

$h = 50 \times 10^{-2} \times 14.11$

$= 7.055\,m.$

$Q = \frac{C_d A_o A_p \sqrt{2gh}}{\sqrt{A_p^2 - A_o^2}}$

$= \frac{0.64 \times 0.01767 \times 0.07069 \times \sqrt{2 \times 9.81 \times 7.055}}{\sqrt{(0.07069^2) - (0.01767^2)}}$

$= \frac{7.994 \times 10^{-4} \times 11.765}{\sqrt{4.68 \times 10^{-3}}}$

$= 0.1374\ m^3/s.$

4.) $y = 170mmHg = 0.17mHg$, $S.g_{Hg} = 13.6$, $S.g_{sw} = 1.026.$

$\Delta h = y\left(\frac{S.g_{Hg}}{S.g_{sw}} - 1\right)$

$\Delta h = 0.17\left(\frac{13.6}{1.026} - 1\right)$

$\Delta h = 2.08m.$

$V = \sqrt{2g\Delta h}$

$V = \sqrt{2 \times 9.81 \times 2.08}$

$V = 6.388\,m/s.$

5.) $Q = 0.05\,dm^3/mm = 8.33 \times 10^{-5}\,m^3/sec$

Speed of Rotabon = 1700 Rev/min = 28.3 Rev/sec.

Nominal Displacement = $10cm^3/rev = 10^{-5}m^3/rev.$

Torque Input = 15 Nm.

Pressure change = 15bar = $15 \times 10^5\,N/m^2$

- Ideal Flow rate = Nominal displacement x Speed Rotabon,

$= 10^{-5} \times 28.3 = 2.83 \times 10^{-4}\,m^3/sec$