ECHEAEBOR EFE CHAISTIAN
MECHATRONICS ENGINEERING
18/ENGOS/0114
2NG 214 (FLUID MECHANICS)

1.) $V_1 = 5ms^{-1}$, $V_2 = 2ms^{-1}$

$P_{T_1} = 2.5m$,

$P_{T_2} = ?$ $\quad P_{T_1} - P_{T_2} = \frac{0.35(V_1 - V_2)^2}{2g}$

$= \frac{0.35 \times 3^2}{2 \times 9.81} = 0.161$

$\therefore P_{T_1} - P_{T_2} = 0.161$,

$2.5 - P_{T_2} = 0.161$

$P_{T_2} = 2.5 + 0.161$

$P_{T_2} = 2.67m$

$\therefore$ Pressure head at lower end = ~~2.67m~~ 2.67m

2.) $D = 200mm$

$= 0.20m$

$A_1 = \frac{\pi d^2}{4} = \frac{\pi (0.20)^2}{4} = 0.0314m^2$

$P_1 = 17.658 N/cm^2 = \frac{17.658}{10^{-6}} = 17658000$

Specific gravity of mercury = 13.6

$\frac{P_1}{w} = \frac{P_1}{P_g} = \frac{17.658 \times 10^{-6}}{1000 \times 9.81} = 1.8 \times 10^{-9}$

Vaccum pressure = $\frac{P_2}{w}$ = 300mmHg

$d_2 = 100\,mm = 0.10$

$= -0.30 \times 13.6$ $A_2 = \frac{\pi d^2}{4} = \frac{\pi (0.10)^2}{4} = 7.85 \times 10^{-3}$ Qactual = 0.64

$P_2 = -4.08$

$h = 1.8 \times 10^{-9} + 4.08$

$= 4.08000000002m$

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

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

$= \frac{0.98 \times 0.0314 \times 7.85 \times 10^{-3} \sqrt{2 \times 9.81 \times 4.08000000002}}{\sqrt{(0.0314)^2 - (7.85 \times 10^{-3})^2}}$

$= 0.07108691665$

3.) $d_1 = 150mm = 0.15m$

Pipe diameter $d_2 = 300mm = 0.30m$

$A_2 = \frac{\pi d_2^2}{4} = \frac{3.142 \times 0.15^2}{4} = 0.0177m^2$

$A_1 = \frac{\pi d_1^2}{4} = \frac{3.142 \times 0.30^2}{4} = 0.0707m^2$

$y = 500mm\,Hg = 0.50m\,Hg$

$Cd = 0.64$

$h = \frac{S.G\ of\ Hg - S.G\ of\ oil}{S.G\ of\ oil} \times y$

$= \frac{13.6 - 0.9}{0.9} \times 0.5$

$= 7.06m$

Rate of flow, $Q_{actual} = \frac{Cd\, A_2 A_1 \sqrt{2gh}}{\sqrt{A_1^2 - A_2^2}}$

$Q_{actual} = 0.64 \times 0.0177 \times 0.0707 \sqrt{2 \times 9.81 \times 7.06}$

$\sqrt{(0.0177)^2 - (0.0707)^2}$

4.) $V = \sqrt{2gh}$

$H =$

$H = 0.$

$=$

$V = \sqrt{}$

$= 6$

5.) Dischar

ECHEBEBORE EFE CHARLES
MECHATRONICS ENGINEERING
18/ENG.05/014
ENG 214 FLUID MECHANICS
1.)

:10

$^2 = 7.85 \times 10^{-3}$ $Q_{actual} = \dfrac{0.64 \times 0.0707 \times 0.0177 \sqrt{2 \times 9.81 \times 7.06}}{\sqrt{0.0707^2 - (0.0177)^2}}$

$= 0.1377_{/s}$

4.) $V = \sqrt{2gh}$

$H = y\left(\dfrac{\text{S.G of mecury} - \text{S.G of water}}{\text{S.G of water}}\right)$

$< 4.0800000Q2$

$H = 0.17\left(\dfrac{13.6 - 1.026}{1.026}\right)$

$= 0.17 \times 12.26$

$= 2.0842\,m$

$V = \sqrt{2 \times 981 \times 2.0842}$

$= 6.39\,ms^{-1}$

$\therefore$ Speed of Submarine $= 6.39\,ms^{-1}_{/s}$

5.) Discharge, $Q = 0.05\,m^3/mn$

$P = 1\,bar$