(3) An orifice meter with; orifice diameter = 15cm = 0.15m

pipe diameter = 30cm = 0.3m

$A_1 = \frac{\frac{22}{7} \times 0.3^2}{4} = 0.071 m^2$

$C_d = 0.64$

Sp. gravity of oil $S_0 = 0.9$

$A_0 = \frac{\frac{22}{7} \times 0.15^2}{4} = 0.018 m^2$

Reading of differential manometer

$y = 50cm$ of mercury $= 0.5m$ of mercury

Differential head $h = y\left(\frac{S_H}{S_0} - 1\right)$

Where S_H = Sp. gravity of heavier liquid = 13.6 (for mercury)

$= 0.4\left[\frac{13.6}{0.9} - 1\right] = 5.64$ m of oil.

Discharge/flow of oil

Using the relation $Q = C_d \frac{A_0 A_1 \sqrt{2gh}}{\sqrt{A_1^2 - A_0^2}}$

$Q = 0.64 \times \frac{(0.018 \times 0.071)(\sqrt{2 \times 9.81 \times 5.64})}{\sqrt{(0.071)^2 - (0.018)^2}}$

$Q = 0.64 \times \frac{(1.28 \times 10^{-3})(10.52)}{\sqrt{(0.071)^2 - (0.018)^2}}$

$= 0.13 m^3/s$.

(4)

Reading of the manometer $y = 15m$

Sp. gravity of mercury $S_H = 13.6$

Sp. gravity of seawater $S_1 = 1.026$ with respect to fresh water

To find the head (h), using the relation: $h = y\left[\frac{S_H}{S_1} - 1\right]$

$h = 15\left[\frac{13.6}{1.026} - 1\right] = 183.83$

(2) A horizontal Venturimeter with;
Inlet diameter = 20cm ; The Pressure at Inlet is 17.658 N/cm²
throat diameter = 10cm ; Vacuum pressure at the throat is 30cm of mercury
Cd = 0.98

$D_1 = 20cm = \frac{20}{100} = 0.2m$
$D_2 = 10cm = 0.1m$

Area of Inlet $= A_1 = \frac{\pi d^2}{4} = \frac{\frac{22}{7} \times 0.2^2}{4} = 0.031m^2$

Area of throat $= \frac{\frac{22}{7} \times 0.1^2}{4} = 0.00785m^2$

pressure at Inlet $p_1 = 17.658 N/cm^2$; $\therefore \frac{P_1}{w} = \frac{176.58}{9.81} = 18m$
to $kN/m^2 = \frac{17.658 \times 1000}{100} = 176.58 \, kN/m^2$

Vaccuum pressure at throat, $\frac{P_2}{w} = -30cm$ of mercy.
$= -0.3m$ of mercy $= -0.3 \times 13.6 = -4.08m$ of water
Coefficient of discharge, $C_d = 0.98$.
Differential head $h = \frac{P_1}{w} - \frac{P_2}{w} = 18 - (-4.08) = 22.08m$

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

$= 0.98 \times \frac{0.031 \times 0.00785}{\sqrt{(0.031)^2 - (0.00785)^2}} \times \sqrt{2 \times 9.81 \times 22.08}$

$= 0.98 \times \frac{0.031 \times 0.00785}{\sqrt{(0.031)^2 - (0.00785)^2}} \times \sqrt{433.21}$

$= 0.98 \times \frac{0.0002435}{\sqrt{(0.031)^2 - (0.00785)^2}} \times \sqrt{433.21}$

$\Rightarrow 0.166 m^3/s$

EGUAKUN JOSHUA OSADEBAMEN

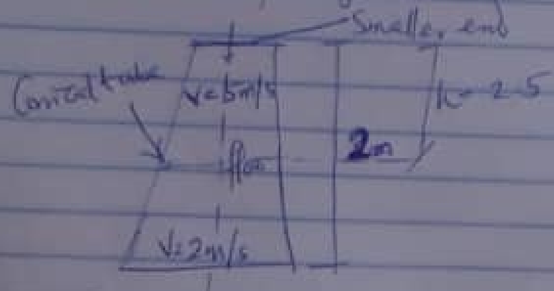
16/ENG03/021 (CARRY OVER STUDENT)

ENG 214

FLUID MECHANICS

ASSIGNMENT

(1) A Conical tube of length 2.0m.



$V_1 = 5$

$V_2 = 2$

$h_4 = 2.5$

$L = 2.0$

$\frac{0.35(V_1-V_2)^2}{2g}$

Pressure head, $\frac{P_1}{w}$

Loss of head (head loss) $h_L = \frac{0.35(V_1-V_2)^2}{2g} = \frac{0.35(5-2)^2}{2\times9.81} = 0.16m$

P@ Lower end; applying bernoulli equation

$$\frac{P_1}{w} + \frac{V_1^2}{2g} + Z_1 = \frac{P_2}{w} + \frac{V_2^2}{2g} + Z_2 + h_L$$

$$2.5 + \frac{5^2}{2g} + 2.0 = \frac{P_2}{w} + \frac{2^2}{2g} + 0 + 0.16$$

$$2.5 + \frac{5^2}{2\times9.81} + 2.0 = \frac{P_2}{w} + \frac{2^2}{2\times9.81} + 0 + 0.16$$

$$5.77 = \frac{P_2}{w} + 0.209 + 0.16$$

$$5.77 = \frac{P_2}{w} + 0.364$$

$$\frac{P_2}{w} = 5.41m$$

The pressure head for the lower end is 5.41m.