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Department : ELECTRICAL ELECTRONICS ENGINEERING

Course Title : FLUID MECHANICS

Course Code : ENG 214

E. O

ASSIGNMENT SOLUTION

(1) Parameters

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

Rtq Smaller end = 2.5m

$$h_f = \frac{(0.35 (V_1 - V_2)^2)}{2g} \quad L = 2.0$$

Rtq lower end:

$L = z_1 - z_2 = z$

$$\frac{P_1}{w} + \frac{V_1^2}{2g} + z_1 = \frac{P_2}{w} + \frac{V_2^2}{2g} + z_2 + h_f$$

$$\frac{P_2}{w} = \frac{P_1}{w} + \frac{1}{2g}(V_1^2 + V_2^2) + (z_1 - z_2) h_f$$

$$= \frac{2.5 + 5^2 - 2^2}{2 \times 9.81} + \frac{2 - (0.35(5-2)^2}{2 \times 9.81}$$

$$= 2.5 + 1.07 + 2 - 0.160055$$

$P_2 = 5.409$ ~~5.43945~~

2) Parameters

Inlet diameter = 250m

Outlet diameter = 100m

$P_1 = 17.65 RM/cm^2$

$A_2 = \pi d^2/4 = (10/100)^2 \times 3.142/4 = 7.853 \times 10^{-3}\ m$

$h = 30\ cm$ (0.3 m of mercury)

$P_1 = 17.658$

$= \frac{17.658}{1000} = 1.7658 \times 10^{3}\ N/m$

$\frac{P_1}{w} = \frac{1.7658 \times 10^{-3}}{9.8} = 1.8 \times 10^{-4} m$

$\frac{P_2}{w} = 0.3 \times 13.6 = 4.08$ of H_2O

$h = P_1/w - P_2/w = 1.8 \times 10^{-4} - (-4.08)$

$h = 4.08018\ m_y$

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

$Q = 0.98 \times \frac{0.0314 \times 7.853 \times 10^{-3}}{\sqrt{(0.0314)^2 - (7.853 \times 10^{-3})}} \times \sqrt{2 \times 9.81 \times 4.08}$

$Q = \frac{0.000241}{0.0304} \times 80.0496$

$Q = 0.6346\ m^3/s$

(3) $D_1 = 15cm$, $D_2 = 30cm$

50cm of mercury = 0.5m ; Q = ?

S.G = 0.9 $C_d = 0.64$

$A_1 = \pi d^2/4 = (15/100)^2 \times 3.14/4 = 0.0176 m^2$

$A_2 = \pi d^2/4 = (30/100)^2 \times 3.14/4 = 0.0706 m^2$

$h = J\left[13.6/0.9 - 1\right]$

$h = 0.5\left[13.6/0.9 - 1\right]$

$= 7.05 m$

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

$Q = \frac{0.64 \times 0.0176 \times 0.0706}{\sqrt{(0.0176)^2 - (0.0706)^2}} \times \sqrt{2 \times 9.81 \times 7.05}$

4) Area = 15m

170mm of mercury (0.17m)

S.G of mercury (13.6)

S.G of sea water = 1.026

$h = J(13.6/1.026 - 1)$

$h = 0.17\left[\frac{13.6}{1.026} - 1\right]$

$h = 2.083 m$

$V = \sqrt{2gh}$

$V = \sqrt{2 \times 9.81 \times 2.083}$

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