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15/ENG04/012
ELECTRICAL/ENG
FLUID MECH
Assignment

NO2)

$d_1 = 20\,cm$, $a_1 = \frac{\pi(20)^2}{4} = 314.16\,cm^2$

$d_2 = 10cm$, $a_2 = \frac{\pi(10^2)}{4} = 78.74\,cm^2$

$P_1 = 17.658\,N/cm^2 = 17.658 \times 10^4\,N/m^2$

$P_{for\ water} = 1000$, $h = \frac{P_1}{P_g} = \frac{17.658 \times 10^4}{9.81 \times 1000} = 18M$ of water

$\frac{P_2}{P_g} = -80cm\ Hg$

$= 0.80M$, $\therefore = -0.80 \times 13.6 = -9.8\,m$ of water

$\therefore$ Diff head $= h = \frac{P_1}{P_g} - \frac{P_2}{P_g} = 18 - (-9.8) = 18 + 9.8 = 27.8\,m$ of water

discharge (Q), $Q = Cd \frac{a_1 a_2}{\sqrt{a_1^2 - a_2^2}} \times \sqrt{2gh}$

$= 0.98 \times \frac{314.16 \times 78.74}{\sqrt{(314.16)^2 - (78.74)^2}} \times \sqrt{2 \times 9.81 \times 27.8}$

$= \frac{503\,237.21}{304} \times 165555\,cm^3/s = 165.58\,l/s$

NO5) $D = 20cm$

$a_2 = \frac{\pi d^2}{4} = \frac{\pi \times 20^2}{4} = 314.16\,cm^2$

$d = 10$

$a_2 = \frac{\pi d^2}{4} = \frac{\pi \times 10^2}{4} = 78.74\,cm^2$

Sp gr oil $= 0.9$

Reading of diff Manometer $= 25.8cm$ of Mercury

16) Diff head

$h = x\left[\frac{Sg}{Sa} - 1\right] = 50\left[\frac{13.6}{0.9} - 1\right]$

$= 50 \times 14.11 = 705.5$ cm of oil

$Cd = 0.64$

rate of flow Q

$Q = Cd \frac{a_1 a_2}{\sqrt{a_1^2 - a_2^2}} \times \sqrt{2gh}$

$= 0.64 \times 314.16 \times 78.54 \times \sqrt{2 \times 981 \times 705.5} / \sqrt{(78.54)^2 - (314.16)^2}$

$= 26124.34 \text{ cm}^3/\text{s} = 26.12 \text{ l/s}$

17) Length = 20

V at smaller end = 5 m/s

V at lower end = 2 m/s

P at smaller end = 2.5 N

loss of head $= \frac{0.35 (5-2)^2}{2 \times 9.81} = 0.16$

Bernoulli's eqn

$\frac{P_1}{w} + \frac{v_1^2}{2g} + z_1 = \frac{P_2}{w} + \frac{v_2^2}{2g} + z_2 + h_f$

$\frac{P_1}{w} + \frac{v_1^2 - v_2^2}{2g} + z_1 - z_2 - h_f = \frac{P_2}{w}$

$2.5 + \frac{(5^2 - 2^2)}{2 \times 9.81} + 2 - 0 - 0.16 = \frac{P_2}{w}$

$2.5 + (.97 + 2.0) - 0.16 = \frac{P_2}{w}$

$5.41 \text{ scr} = \frac{P_2}{w}$

18) Diff of mercury level, x_2 ?

$x_2 = 170 \text{ mm} = 0.17 \text{ m}$

Sg of mercury = 13.6

Sg of sea-water = 1.026

$h = x\left[\frac{Sg}{Sa} - 1\right]$

$0.17\left[\frac{13.6}{1.026} - 1\right] = 2.034$

$\therefore V = \sqrt{2gh} = \sqrt{2 \times 9.81 \times 2.034}$

$= 6.353 \text{ m/s}$

To change - 18 km/h

$\frac{6.353 \times 60 \times 60}{1000}$

$= 23.01 \text{ km/hr}$