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

$= 0.5 \times 14.11$

$= 7.055_M$

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

$= \frac{7.994 \times 10^{-4} \times 11.765}{\sqrt{4.68 \times 10^{-2}}}$

$= 0.1374 m^3/s$

(4) Axis 15m below the surface of water

Sp.gr of mercury = 13.6

Sp.gr of sea water = 1.026

120mm of mercury (0.17m) $V = ?$

$h = y\left(\frac{S_{Hg}}{S_{SW}} - 1\right)$

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

$h = 2.0834 m$

$V = \sqrt{2gh}$

$V = \sqrt{2 \times 9.81 \times 2.0834}$

$= \sqrt{40.87}$

$V = 6.393 m/s$

(5.) rate of $0.05 m^3/min$

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

Speed of rotation = 1700 rev/min $= 28.3$ rev/sec

Normal displacement = $10 cm^3$/rev $= 10^{-5} m^3$/rev

torque input = 15 Nm $= 15 \times$ ~~$10^5 N/m^2$~~

Ideal flow rate = Normal displacement × Speed rotation

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

i) Volumetric efficiency = $\frac{\text{Actual flowrate}}{\text{Ideal flowrate}} \times 100$

$= \frac{8.33 \times 10^{-5}}{2.83 \times 10^{-4}} \times 100$

$= 29.45\%$

ii) Fluid power = $Q \times \Delta P$

$= 8.33 \times 10^{-5} \times 15 \times 10^5$

$= 124.95$ watts

iii) Shaft power = $T \times \omega$

$\omega = 2 \times \pi \times 28.3$

$\omega = 177.81$ rad/sec

$= 15 \times 177.81$

$= 2667.2$ watts

iv) Overall efficiency = $\frac{\text{fluid power}}{\text{shaft power}} \times 100$

$= \frac{124.95}{2667.2} \times 100$

$= 0.0468 \times 100$

$= 4.684\%$

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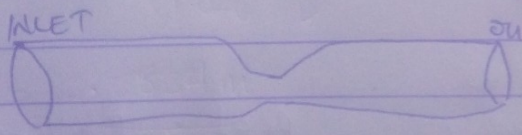
(1) $\frac{P_1}{w} + \frac{V_1^2}{2g} + Z_1 = \frac{P_2}{w} + \frac{V_2^2}{2g} + Z_2 + H_L$

$\frac{P_2}{w} = 2.5 + \frac{5^2 - 2^2}{2(9.81)} + 2 - \frac{0.35(5-2)^2}{2(9.81)}$

$\frac{P_2}{w} = 2.5 + 1.07 + 2 - 0.161$

$\frac{P_2}{w} = 5.459\text{m of liquid}$.

(2)



INLET; $d_1 = 20\text{cm} = 20 \times 10^{-2}\text{m}$

$A = \frac{\pi d^2}{4} = \frac{\pi \times (20 \times 10^{-2})^2}{4}$

$A_1 = 0.0314\text{m}^2$

$P_1 = 17.668\ \text{N/cm}^2$

$= 17.668 \times 10^4\ \text{N/m}^2$

$C_d = 0.98$

THROAT DIAMETER,

$d_2 = 10\text{cm} = 10 \times 10^{-2}\text{m}$

$A = \frac{\pi d^2}{4} = \frac{\pi \times (10 \times 10^{-2})^2}{4}$

$A_2 = 7.85 \times 10^{-3}\text{m}^2$

$P_1 = 17.658$

$\Rightarrow \frac{17.658}{9.81} = 1.7658 \times 10^{-3}\ N/m$

$\frac{P_1}{w} = \frac{1.7658 \times 10^{-3}}{9.81} = 1.8 \times 10^{-4} m$

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

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

$h = 4.08018 m$

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

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

$= 2.4156 \times 10^{-4} \times 684.5^{-1}$

$Q = 0.165 m^3/s$

(3) $D_1 = 15cm$ $D_2 = 30cm$ Reading of differential = 50

$Q = ?$ $SPG = 0.9$

coefficient of discharge = 0.64

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

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

$h = y\left[\frac{13.6}{0.9} - 1\right]$

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