1 $V = 5ms^{-1}, V_2 = 2ms^{-1}$

$P_1 = 2.5m, PT_2 = ?$

$PT_1 - PT_2 = 0.35\frac{(v_1 - v_2)^2}{2g} = \frac{0.35 \times 3^2}{2 \times 9.81} = 0.161$

$\therefore PT_1 - PT_2 = 0.161$

$2.5 - PT = 0.161$

$PT_2 = 2.5 - 0.161$

$PT_2 = 2.67m$

2 200

$= 0.20m$

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

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

Specific gravity of mecury = 13.6

$\frac{P_1}{\omega} = \frac{P_1}{\rho g} = \frac{17.658 \times 10^{-6}}{1000 \times 9.81} = 1.8 \times 10^{-7}$

vacum pressure $= \frac{P_2}{\omega} = 300mmHg$

$d_2 = 100mm = 0.1$

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

$P_1 = -4.08$

$h = 1.8 \times 10^{-7} + 4.08 = 4.08000000m$

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

$$q_{actual} = \frac{C_d A_1 A_2 \sqrt{2gh}}{\sqrt{A_1^2 - A_2^2}}$$

$$= \frac{0.98 \times 0.0314 \times 7.815 \times 10^{-3} \sqrt{2 \times 9.81 \times 4.08000002}}{\sqrt{(0.0316)^2 - (7.85 \times 10^{-3})^2}}$$

$$= 0.07108691665$$

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3. $d_0 = 15 \times 10^{-2} m$  $d_1 = 30 \times 10^{-2} m$  $C_d = 0.64$

$y = 50 \times 10^{-2} mHg$  $Q = ?$

$A_0 = \frac{\pi \times (15 \times 10^{-2})^2}{4} = 0.01767 m^2$  Sg of Oil $= 0.9$  $S_m = 13.6$  $S_0 = 0.9$

$H = y \left[ \frac{S_m}{S_0} - 1 \right]$

$A_1 = \frac{\pi \times (30 \times 10^{-2})^2}{4} = 0.0707 m^2$

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

$H = 7.055 m$

$Q = \frac{C_d A_0 A_1 \sqrt{2gh}}{\sqrt{A_1^2 - A_0^2}} = \frac{0.64 \times 0.0176 \times 0.0707 \sqrt{2 \times 9.81 \times 7.055}}{0.0707^2 - 0.0176^2}$

$Q = 0.0137 m^3/s$

(4) $y = 170 mmhg = 170 \times 10^{-3} mhg$

Sg of mercury $= 13.6 hg$

Sg of Sea water $= 1.026$

$H = y \times \frac{S_m}{S_0} - 1$

$V = \sqrt{2gH}$

$H = 170 \times 10^{-3} \times \left( \frac{13.6}{1.026} - 1 \right)$

$V = \sqrt{2 \times 9.81 \times 2.08}$

$V = 6.39 m/s$  $H = 2.08 m$

(5.) ~~Actu~~ Actual flowrate $Q = 5 dm^3/min = 8.33 \times 10^{-5} m^3/sec$

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

$V = 1700 rev/min = 28.33 rev/sec$

$T = 15 N/m$  Normal displacement $= 100 cm^3/rev$

$= 1 \times 10^{-5} m^3/rev$

~~Wednesday - [illegible]~~

Volumetric Efficiency

$$\frac{\text{Actual flowrate}}{\text{ideal flowrate}} \times 100\%$$

ideal flowrate = displacement × speed

$Q = 1\times10^{-5} \times 28.33$

$= 2.833\times10^{-4} m^3/sec$

Volumetric Efficiency $= \frac{8.33\times10^{-5}}{2.833\times10^{-4}} \times 100$

$= 29.4\%$

fluid power $(Q \times \Delta P)$

$= 8.33 \times 10^{-5} \times 15 \times 10^5 = 124.95$ watts

Shaft power $= T \times \omega$

$\omega = 2\times\pi\times v = 2\times\pi\times 28.33 = 178$ rad/sec

$= T\times\omega$

$= 15 \times 178 = 2670$ watts

Over-all Efficiency.

$$\frac{\text{fluid power}}{\text{shaft power}} \times 100\%$$

$= \frac{124.95}{2670} \times 100$

$= 4.68\%$

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