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1) $L = 2.0m$

V_1 smaller ~~[illegible]~~ end $= 5 m/s$

V_2 at lower end $= 2 m/s$

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

Ph at ~~[illegible]~~ lower end $= 2.5m$

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

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

$$= 2.5 + 1.07 + 2 - 0.16055$$

Pressure at lower

$= 5.4097 bar$ ~~[illegible]~~

2) Inlet diameter = 0.2 m
Outlet diameter = 0.1 m

$d = 0.98$

$A_1 = \frac{\pi d^2}{4} = \frac{\pi \times 0.2^2}{4} =$ ~~0.0514 m²~~ $0.0514\, m^2$

$A_2 = \frac{\pi d^2}{4} = \frac{\pi \times 0.1^2}{4} = 7.85 \times 10^{-3}\, m^2$

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

$\frac{P_1}{w} = \frac{1.765 \times 10^{-2}\, N/m}{9.81}$

$= 1.799 \times 10^{-3}$

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

$h = \frac{P_1}{w} - \frac{P_2}{w} = 1.799 \times 10^{-3} - (-4.08)$

$= 4.082\, m$

$\therefore$

$$Q = \frac{0.98 \times 0.0314 \times 4.85 \times 10^{-5} \times \sqrt{2 \times 9.81 \times 4.}}{\sqrt{(0.0314)^2 - (4.85 \times 10^{-5})^2}}$$

$$Q = \frac{0.0002415 \times 8.949}{\sqrt{0.00092}}$$

$$Q = \frac{0.00216}{0.0303}$$

$$= 0.0709 \ m^3/s$$

3) $d_1 = 0.15m$, $d_2 = 0.3m$, $S.G = 0.9$,
$C_d = 0.64$

$$A_1 = \frac{\pi d^2}{4} = \frac{\pi \times 0.15^2}{4} = 0.0176 m^2$$

$$A_2 = \frac{\pi d^2}{4} = \frac{\pi \times 0.3^2}{4} = 0.07069 m^2$$

$$h = 0.5\left[\frac{13.6}{0.9} - 1\right]$$
$$= 7.05 m$$

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

$$= \frac{0.64 \times 0.0176 \times 0.07069 \times \sqrt{2 \times 9.81 \times 7.05}}{\sqrt{(0.0176)^2 - (0.07069)^2}}$$

$$= \frac{0.000786 \times 11.7609}{\sqrt{0.000309 - 0.00499}}$$

$$= 2.33 \times 10^{-3} m^3/s$$

4) x axis = 15 m

170 mm of mecury = 0.17 m

SG of Mecury = 13.6

SG of sea water = 1.026

v = ?

$$h = y\left(\frac{S_m}{S_1} - 1\right)$$

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

$$h = 2.083\text{ m}$$

$$v = \sqrt{2gh}$$

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

$$v = 6.39\text{ m/s}$$

5)

$Q = 0.05 dm^3/mm = 8.33 \times 10^{-5} m^3/sec$

Speed of rotation $= 1700$ Rev/min

$= 28.3$ Rev/sec

Nominal Displacement

$= 10 cm^3/rev$

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

Torque Input $= 15$ Nm

Pressure change $= 15$ bar

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

Ideal flow rate =

Nominal displacement × Speed rotation

$= 10^{-5} \times 28.3$

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