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MATRIC NO - 18/ENG06/059
DEPT - MECHANICAL ENGR

1]

Solution

$L = 2.0m$

$V_1 = 5 m/s$

$\frac{P_1}{\rho g} = 2.5m$ of liquid

$V_2 = 2 m/s$

$h_L = \frac{0.35(v_1 - v_2)^2}{2g} = \frac{0.35(5-2)^2}{2 \times 9.8}$

$= 0.16m$

$\frac{P_2}{\rho g} = ?$

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

$z_2 = 0, \; z_1 = 2$

$\therefore 2.5 + \frac{5^2}{2 \times 9.8} + 2 = \frac{P_2}{\rho g} + \frac{2^2}{2 \times 9.8} + 0 + 0.16$

$\frac{P_2}{\rho g} = 5.77 - 0.363$

$\frac{P_2}{\rho g} = 5.407m$ of fluid

2]

Solution

Given

diameter at inlet $d_1 = 20cm$

area at inlet is $a_1 =$

diameter at throat $d_2 = 10cm$

area at throat $= \frac{\pi}{4} \times d_2$

$C_d = 0.98$

$P_1 = 17.658$

$\frac{P_1}{\rho g} = \frac{17.658 \times 10^4}{9.81 \times 1000}$

$\frac{P_2}{\rho g} = -30cm = -0.3m$

differential head

$h = \frac{P_1}{S_y} - \frac{P_2}{S}$

1) Discharge

$$Q_{act} = Cd \times \frac{P_1}{P_2}$$

$$= 0.98 \times 0.18$$

$$= \cancel{0.1764}$$

$$= 0.1764$$

$$Q. = 176.4$$

3] Solution

Given

$$d_0 = 15cm$$

$$a_0 = \frac{\pi}{4}(15)^2 = 176.7cm^2$$

$$d_1 = 30cm$$

$$a_1 = \frac{\pi}{4}(30)^2 = 706.85cm^2$$

$$S_0 = 0.9$$

$x = 50cm$ of mercury

∴ Differential head,

$$h = x\left[\frac{S_2}{S_0} - 1\right] = 50\left[\frac{13.6}{0.9} - 1\right] cm$$

$$= 50 \times 14.11 = 705.5cm \text{ of } 0.1$$

$$Cd = 0.64$$

The rate of the flow.

$$Q = Cd \cdot \frac{a_0 a_1}{\sqrt{a_1^2 - a_0^2}} \times \sqrt{2gh}$$

$$= 0.64 \times \frac{176.7 \times 706.85}{\sqrt{(706.85)^2 - (176.7)^2}} \times \sqrt{2 \times 981 \times 705.5}$$

$$= \frac{94046317.78}{684.4}$$

$$= 137414.25 cm^3/s$$

$$= 137.414 \text{ litres/s} //$$

4]

Solution

$h_m = 1.7m$

$$h = h_m\left(\frac{5m}{5} - 1\right)$$

$$= 1.7\left(\frac{13.6}{1.026} - 1\right)$$

$$= 20.83m$$

$$V = C_v \times \sqrt{2 \times g \times h}$$

$$= 1 \times \sqrt{2 \times 9.81 \times 20.83}$$

$$= 20.21 \text{ m/sec}$$

③ $0.05 m^3/min$

15 bar

1700 rpm

$10 cm^3$

15 Nm