AFOLABI KABIR 18ENGO7002 PETROLEUM ENGINEERING

1 $L = 2.0$

velocity flow at smaller end $V_1 = 5 m/s$

velocity flow at larger end $V_2 = 2 m/s$

let the loss of head $= \frac{0.32(V_1 - V_2)^2}{2g}$

$= 0.16 m$

Apply Bernoulli's method

$$\frac{P_1}{\rho g} + \frac{V^2}{2g} + Z_1 = \frac{P_2}{\rho g} + \frac{V^2}{2g} + Z_2 + H$$

where $P_s = \frac{P_1}{\rho g}$ $P_e = \frac{P_2}{\rho g}$

$$2.5 + \frac{25}{19.62} + 2 = P_2 + \frac{4}{19.62} + 0.161$$

$5.774 - 0.365 = P_2$

$P_2 = 5.409 m$

2 $D_1 = 20 cm$ $A_1 = 314.16 cm^2$

$D_2 = 10 cm$ $A_2 = 78.54 cm^2$

$\rho = 1000 kg/m^3$

$$\frac{P_1}{\rho g} = \frac{17.658 \times 10^{-4}}{1000 \times 9.81} = 18 m$$

$$\frac{P_2}{\rho g} = 30 \times 10^{-2} \times 13.6$$

$= 4.08 m$

let differential head $= \frac{P_1}{\rho g} - \frac{P_2}{\rho g}$

$= 18 + 4.08 = 22.08 \times 100$

$H_2 = 2208 cm$

$$= 0.98 \sqrt{2 \times 981 \times 2208} \times \frac{314.16 \times 78.54}{\sqrt{(314.16)^2 - (78.54)^2}}$$

$= 165455.3\ cm^3/s$

3 $d_1 = 30$ $A = 706.86\ cm^2$

$d_2 = 15$ $= 176.72\ cm$

Specific gravity of oil $= 0.9$

Specific gravity of mercury $= 13.6$

Differential manometer reading $x = 50$ cm

Co efficient discharge $= 0.64$

$$h = 50\left(\frac{13.6}{0.9} - 1\right)$$

$h = 705.56$ cm of oil

$$Q = 0.64 \times \sqrt{2 \times 981 \times 705.56} \times \frac{706.86 \times 176.72}{\sqrt{(706.86)^2 - (176.72)^2}}$$

$$Q = \frac{137443.29}{1000}$$

$= 137.44\ lit/sec$

4 Specific gravity of mercury $= 13.6$

Specific gravity of water $= 1.026$

mercury head $= 170$ mm $V = ?$

$$h = 0.17\left[\frac{13.6}{1.026} - 1\right] = 2.0834\ m$$

$V = \sqrt{2gh} = 6.393\ m/s$

$$V = \frac{6.393 \times 60^2}{1000} = 23.01\ km/hr$$