1.) $V_1 = 5 ms^{-1}$ $V_2 = 2 ms^{-1}$

PHQV smaller, end = 2.5m

$h_f = \frac{(0.35(v^1 - v^2)^2}{25}$ $L = 2.0m$

P_h at lower end =

$L = t_1 - t_2 = 2m$

$\frac{P_1}{w} + \frac{V_1^2}{2g} + Z_1 = \frac{P_2}{w} + \frac{V_2^2}{2g} + Z_2 + h_f$

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

$= 2.5 + \frac{5^2 - 2^2}{2 \times 9.81} + 2 - \frac{(0.35(5.2)^2}{2 \times 9.81}$

$= 2.5 + 1.07 + 2 - 0.16055$

$P_2 = 5.409 bar$

Pressure at lower end $\therefore 5.409 bar$

$P_1 = 17.658$

$= \frac{17.658}{1600} = 1.7658 \times 10^{-3} N/m$

$\frac{P_1}{w} = \frac{1.7656 \times 10^{-3}}{9.81} = 1.8 \times 10^{-4} m$

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

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

$h = 4.08018m$

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

$Q = 0.98 \times \frac{0.0314 \times 7.853 \times 10^{-3}}{\sqrt{(0.0314)^2 - (7.853 \times 10^{-3})^2}}$

$\times \sqrt{2 \times 9.81 \times 4.08018}$

$Q = \frac{0.000241}{0.0304} \times 8.947$

$Q = 0.070 m^3/s$

2.) inlet diameter = 200m

outlet diameter = 100m

$P_1 = 17.658m$

J. 300m of Mercury

$Cd = 0.98$

$A_1 = \frac{\pi d^2}{4} = \frac{(200)^2 \times 3.14}{4}$

$= 0.0314m$

$A_2 = \frac{\pi d^2}{4} = \frac{(\frac{10}{100})^2 \times 3.14}{4} = 7.853 \times 10^{-3} m$

$y = 30cm$ (0.3m of Mercury)

③ $D_1 = 15cm$ $D_2 = 30cm$

500mg Mercury = 0.5m $Q = ?$

$S.G = 0.9$ $Cv = 0.64$

$A_1 = \frac{\pi d^2}{4} = \frac{(\frac{18}{100})^2 \times 3.14}{4}$

$= 0.0176m^2$

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

$0.0706m^2$

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

$h = 0.5\left[\frac{13.06}{0.9} - 1\right]$

$= 7.05 \text{mot } 0.1$

$$q = \frac{((d - A_1 A_2) \times \sqrt{2gh})}{\sqrt{A_1^2 - A_2^2}}$$

$$Q = \frac{0.64 \times 0.0176, 0.070\sqrt{2 \times 9.81 \times 7.05}}{\sqrt{(0.0700)^2 - (0.070)^2}}$$

$$q - \frac{9.35 \times 10^{-3}}{40\Omega}$$

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

4 $A \times S = 15m$

170mm of Mercury (0.17m)

SG of Mercury (13.6)

SG of SG water = 1.026 V=)

$$h = y\left(\frac{SG1}{S_1} - 1\right)$$

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

$h = 2.083m$

$V = \sqrt{2gh}$

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

$V = 6.39 m s^{-1}$

5) $0.05 m^3/min$

15 bar

1700 rpm

$10 Pm^2 P_2 V$

15 NM