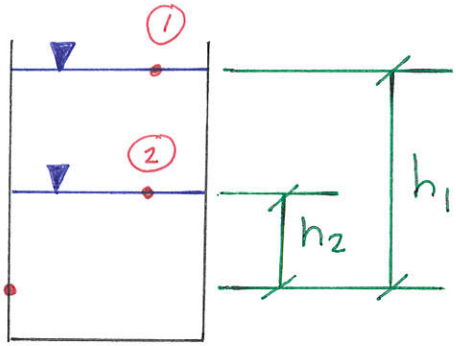
(*) Exp. # 7 :- Determination of Coefficient of Discharge (Cd) Under Varying Head.

(*) Procedure :-



- $Q_1 = C_d A_o \sqrt{2gh_1}$
- $Q_2 = C_d A_o \sqrt{2gh_2}$

$$\rightarrow Q_{avg} = \frac{Q_1 + Q_2}{2}$$

$$= \frac{C_d A_o (\sqrt{2gh_1} + \sqrt{2gh_2})}{2}$$

$$\rightarrow \text{Collected Volume} = \left(\frac{C_d A_o (\sqrt{2gh_1} + \sqrt{2gh_2})}{2} \right)(t) = A_r (h_1 - h_2)$$

- Where : $A_r \rightarrow$ Area of Reservoir $= 1.832 * 10^{-2}\ m^2$

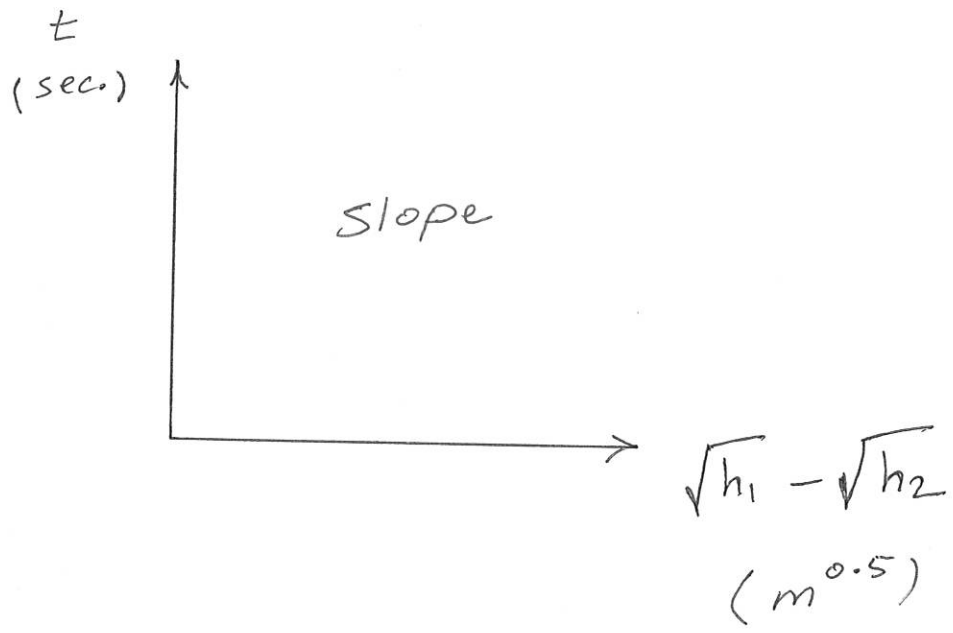
$$\rightarrow t = \frac{2A_r (h_1 - h_2)}{A_o C_d \sqrt{2g} (\sqrt{h_1} + \sqrt{h_2})}$$

$$\rightarrow t = \frac{2A_r (\sqrt{h_1} - \sqrt{h_2})(\sqrt{h_1} + \sqrt{h_2})}{A_o C_d \sqrt{2g} (\sqrt{h_1} + \sqrt{h_2})}$$

$$\rightarrow t = \frac{A_r}{C_d A_o} \sqrt{\frac{2}{g}} (\sqrt{h_1} - \sqrt{h_2}) \quad *$$

$$\bullet \quad \frac{dt}{dh} \rightarrow \frac{Ar}{Cd\,Ao}\sqrt{\frac{2}{g}} = \text{slope}$$

$$\rightarrow \frac{t}{\sqrt{h_1}-\sqrt{h_2}} = \text{slope} = \frac{Ar}{Cd\,Ao}\sqrt{\frac{2}{g}}$$



$$\rightarrow Cd = \frac{Ar}{(\text{slope})(Ao)}\sqrt{\frac{2}{g}} \quad \#$$

❖ Results: (Tables)

Test	Orifice Diameter, D (m)	Larger Head, h1 (m)	Smaller Head, h2 (m)	Falling Time, t (sec.)	Area of Reservoir, (m^2)	$\sqrt{h1}$ ($m^{0.5}$)	$\sqrt{h2}$ ($m^{0.5}$)	$\sqrt{h1} - \sqrt{h2}$ ($m^{0.5}$)
1	0.003							
2								
3								
4								
5								
6								
7								
8								
9								
10								

Test	Orifice Diameter, D (m)	Larger Head, h1 (m)	Smaller Head, h2 (m)	Falling Time, t (sec.)	Area of Reservoir, (m^2)	$\sqrt{h1}$ ($m^{0.5}$)	$\sqrt{h2}$ ($m^{0.5}$)	$\sqrt{h1} - \sqrt{h2}$ ($m^{0.5}$)
1	0.006							
2								
3								
4								
5								
6								
7								
8								
9								
10								

❖ Results: (Figures)

1- Plot (t) against ($\sqrt{h1} - \sqrt{h2}$) for 3 mm orifice and determine the slope of curve.

2- Plot (t) against ($\sqrt{h1} - \sqrt{h2}$) for 6 mm orifice and determine the slope of curve.

3- Determine the value of Coefficient of Discharge (C_d) for the two orifices.

4- Compare between the all above results.