GOVT CO-ED POLYTECHNIC

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LAB MANUAL

Branch :Civil Engineering

Year &Semester :2nd Year & 3rd Semester

HYDRAULICS

CONTENTS

Experiment No: 1

AIM: Use the piezometer to measure the pressure at a given point..

THEORY:

A piezometer is a device used to measure liquid pressure at a point in a system by measuring the height to which a column of the liquid rises against gravity. A piezometer is designed to measure static pressure.

1.Piezometer consists of a transparent glass tube, inserted at a point in the wall of a vessel or of a pipe where pressure is to be measured. The tube extends vertically upward to such a height that liquid can freely rise in it without overflowing. The pressure at any point in the liquid is indicated by the height of the liquid in the tube above that point.

2.Calculate the pressure of the liquid at a point using formula for Piezometer.

$p = \gamma_L h$ where p-= intensity of pressure, h= rise of liquid in piezometer in and

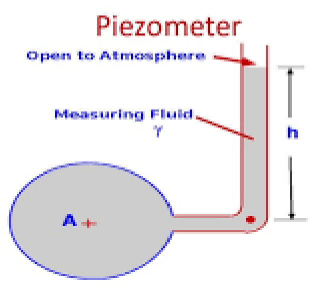
γ_L = Specific weight of the liquid

Limitations in the use of piezometer-

- Piezometrescan not measure very high or low pressure.it can measure only moderate pressure.
- Piezometrescan not measure negative pressure.

Piezometrescan not measure gas pressure

EXPERIMENTAL:



Pr at A =ρgh N/m²

RESOURCES REQUIRED:

Sr. No	Particulars	Specification	Quantity	Remark
1	Piezometer	Standard make	1	For each batch

PROCEDURE:

1. Open the valve and start fluid flow in the pipe.
2. Observe the glass tube connected to pipe through which the liquid is flowing
3. Note the height of water in the glass tube on the scale attached to it.
4. Calculate intensity of pressure at the point, $p = \gamma_L h$.
5. Repeat the experiment by changing the fluid flow using the valve.

OBSERVATION & CALCULATION:

Sr. No.	Rise in water level in the piezometer, Pressure head (h)	Pressure intensity ($p = \gamma_L h$)
1		
2		
3		

Sample calculations: $p = \gamma_L h$. Where p = Pressure intensity at the point

γ_L = Specific weight of the liquid,

h= Piezometric head

RESULTS:

Pressure intensity at the given point using piezometer is

1. = ________________ N/m^2
2. = ________________ N/m^2
3. = ________________ N/m^2

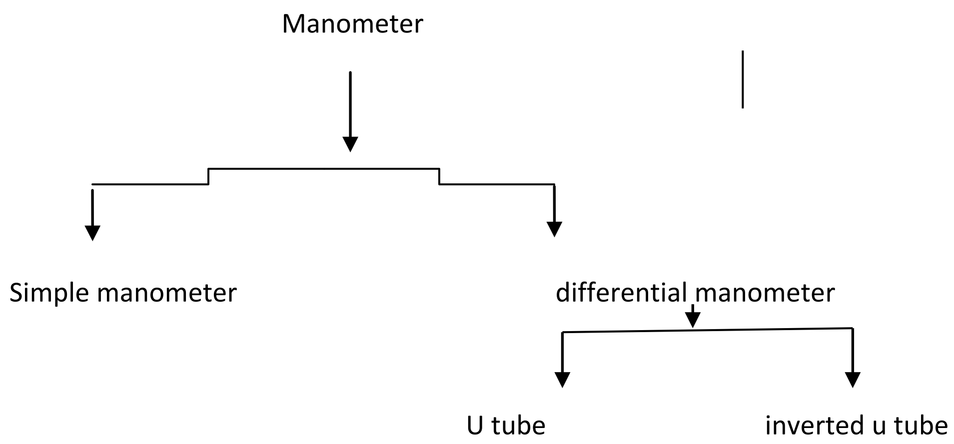
EXPERIMENT NO.2

AIM: Use the U tube differential manometer to measure the pressure difference between two given points.

THEORY:

Pressure difference between the two points is essential to decide the direction of flow.
Differential manometers are also used to compare the pressure of two different containers. They reveal both which container has greater pressure and how large the difference between the two is.

Manometer are pressure measuring devices generally used in laboratory. Manometers overcome the limitations in the use of piezometers. Manometers can measure high, low, negative pressure of liquids and gases. The only disadvantage of manometers is that they are not easy to carry or transport. Mercury is used as manometric liquid in simple and U tube differential manometers where in inverted U tube manometer “the fluid which is lighter than the fluid flowing through the pipe line can be used as manometric fluid.” The classification is shown below.



Calculate the pressure of the liquid at a point.

$P = h\gamma$

Where,

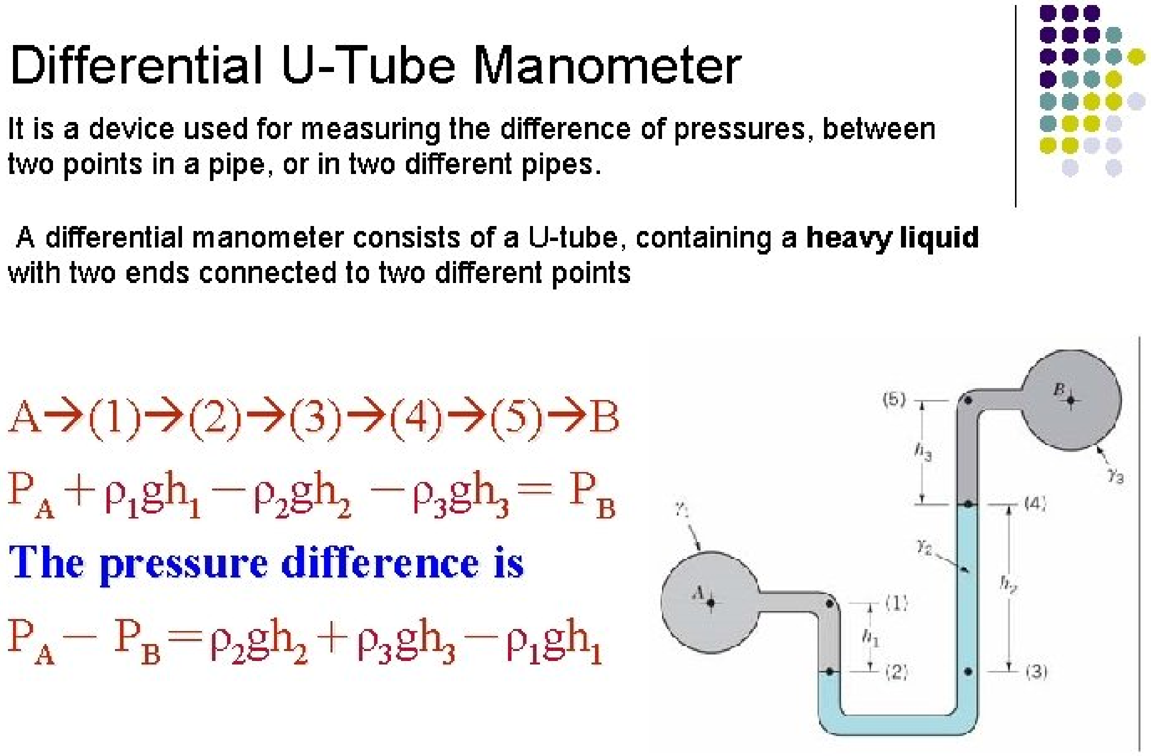
P= intensity of pressure

h = rise of liquid in piezometer and

γ= Specific weight of the liquid

A differential U tube manometer is a device used to measure the difference in pressure between two points of the same or different pipe lines. It consists of a U tube containing heavy liquid and its two ends are connected to the points whose difference of pressure is required to be measured.

EXPERIMENTAL SETUP:



RESOURCES REQUIRED:

Sr. No	Particulars	Specification	Quantity	Remark
1	U tube differential manometer	Standard make	**1**	For each batch

PROCEDURE:

1. Start the fluid flow in pipe by opening the valve.
2. Observe the manometer connected to pipe through which liquid is flowing.
3. Note the difference of heavy liquid in U tube.
4. Note the distance of center of pipe from heavy liquid in the right limb and left limb.
5. Calculate the difference of pressure head at A and B.
6. Calculate the difference of pressure intensities.
7. Repeat the experiment by changing the rate of flow by operating the valve.

OBSERVATION & CALCULATION:

Specific gravity of liquid flowing in pipe A, S_1 =___________________________ Specific gravity of liquid flowing in pipe B , S_2 =___________________________

Specific gravity of manomericliquid , S_3 =___________________________

Sr. No.	Manometer readings			Formula	Pressure difference=
	h_1	h_2	H	$H_A - H_B = S_3 h + S_2 h_2 - S_1 h_1$	$p_A - p_B = \gamma_A \square (h_A - h_B)$
1					
2					
3					

Sample Calculation:

i. $H_A - H_B = S_3 h + S_2 h_2 - S_1 h_1$

ii. $P_A - P_B = \gamma (h_A - h_B)$

VI. Results

Pressure difference = $P_A - P_B$ =

4. = ______________ N/m^2
5. = ______________ N/m^2
6. = ______________ N/m^2

Experiment No: 3

AIM: Use the Bernoulli's apparatus to apply Bernoulli's theorem to get the total energy line for a flow in a closed conduit of varying cross sections.

THEORY:

The significance of Bernoulli's principle can be summarized as total head is constant along a streamline. The sum of potential energy, kinetic energy and pressure energy is constant on every streamline provided no energy enters or leaves the system. This principle is used in various instruments to measure the rate of flow.

Bernoulli's theorem states that in an ideal, incompressible fluid, when the flow is steady and continuous, the sum of pressure energy, kinetic energy and potential energy is constant along a stream line.

Potential energy: Potential energy is the energy possessed by the fluid/object because of its position with respect to some arbitrary horizontal datum plane.

The potential energy per unit weight = Z, in metres.

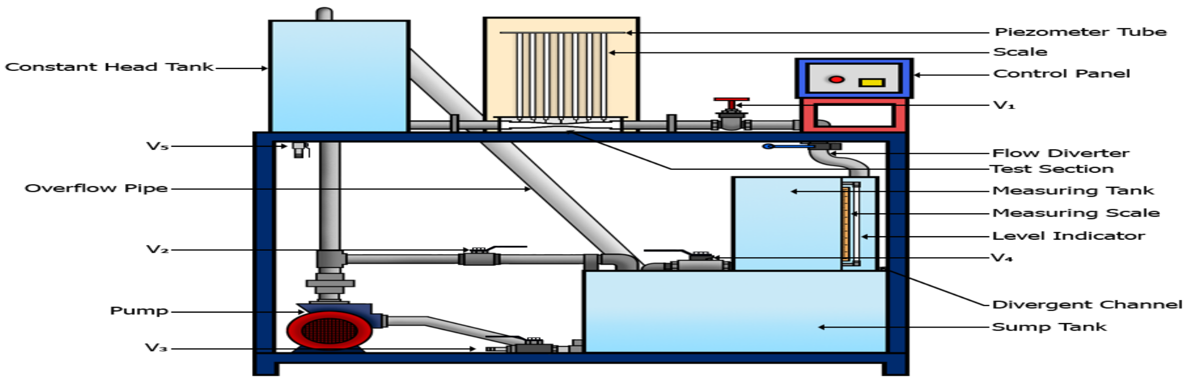
Kinetic energy: It is the energy possessed by a liquid by virtue of its motion. Suppose a liquid of weight W is moving at a velocity V metres/second.

K.E. = $\frac{1}{2} mV^2$

Pressure energy: When the liquid is in motion, it is under some pressure. This pressure is converted into equivalent height of liquid.

$h = P/\gamma_L$, γ_L = being specific weight of liquid.

EXPERIMENTAL SETUP



Bernoulli's Apparatus

RESOURCES REQUIRED:

Sr. No	Particulars	Specification	Quantity	Remark
1	Bernoulli's apparatus	Standard make	1	For each batch

PROCEDURE :

1. Find the area of the measuring tank by measuring length (L) and width (B).
2. Note the area of piezometers at various gauge points.
3. Open the supply valve and adjust the flow so that the water level in the inlet tank remains constant.
4. Measure the height of water level in different piezometric tubes.
5. Measure the discharge of conduit with help of measuring tank.
6. Repeat the steps 3 to 5 for two more readings.
7. Plot the graph between the total head and distance of gauge point starting from the upstream side of the conduit.

OBSERVATION & CALCULATION:

1.Discharge measurement

Area of measuring tank, A= L x B =_____________ m^2

Time of collection of liquid = T =___________ sec

H= Rise in liquid level collected in measuring tank in T sec =________________

Table for measuring discharge

Run no.	Initial level of water in measuring tank H_1	Final level of water in measuring tank H_2	Rise in level of water in measuring tank $H=H_2-H_1$	Time T	Volume of water Ax H	Discharge Q=Volume/time
Units	In meter	In meter	In meter	sec	m^3	m^3/sec
1						
2						
3						

Table for calculation of total head/ Energy

Piezometer number		1	2	3	4	5	6	7	8	9	10	11
C/S area of pipe												
	Pr Head= p/ γ											
	Velocity, V= Q/A											
	Vel. head = $V^2/2g$											
	Datum head = Z											
	Total head=											

Run no 1	$p/\gamma + V^2/2g+Z$												
Run no 2	Pr Head= p/γ												
	Velocity, V=Q/A												
	Vel. head= $V^2/2g$												
	Datum head= Z												
	Total head= $p/\gamma + V^2/2g+Z$												
Run No 3	Pr Head= p/γ												
	Velocity, V=Q/A												
	Vel head= $V^2/2g$												
	Datum head= Z												
	Total head= $p/\gamma + V^2/2g+Z$												

RESULT:

Total head= $p/\gamma + V^2/2g+Z$

1. _______________ m
2. _______________ m
3. _______________ m

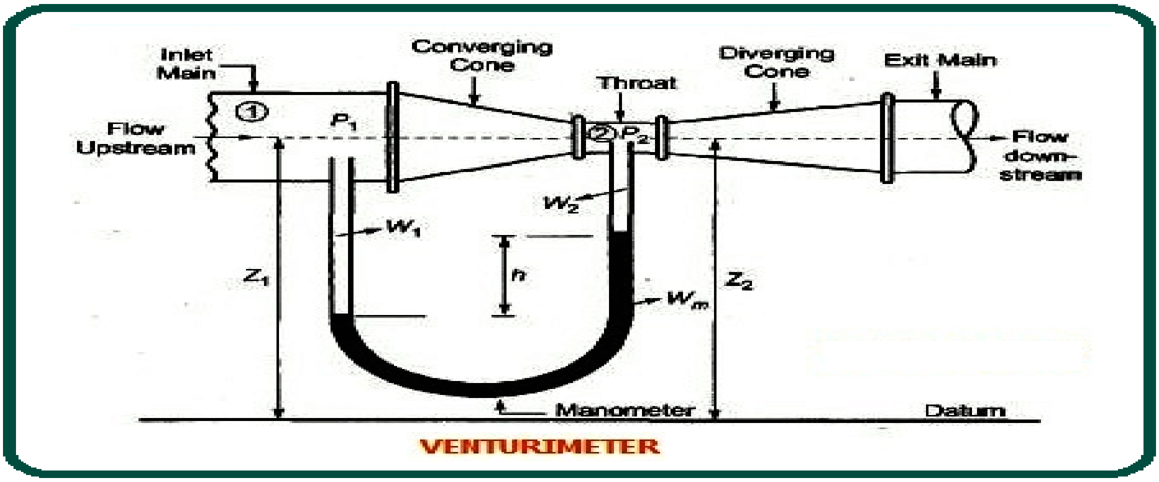
EXPERIMENT NO.4

AIM: Calibrate the Venturimeter to find out the discharge in a pipe

THEORY:

A Venturimeter is a device used to measure the rate of flow that is discharge of a fluid in a pipe. A Venturi meter may also be used to increase the velocity of any type of fluid in a pipe at any particular point. This device is permanently fixed in a pipe line. The calibrated Venturimeter can be used to measure discharge, wherever required.

Venturi meteris the practical application of Bernoulli's theorem. When a venturimeter is placed in a pipe carrying the fluid whose flow rate is to be measured, a pressure drop occurs from the convergent cone to the throat of the venturimeter.



Coefficient of discharge is the ratio of actual discharge to the theoretical discharge. Actual discharge is always less than theoretical discharge because of major and minor losses.

$$C_d = \frac{Q_{\ Actual}}{Q_{Theorotical}}$$

EXPERIMENTAL SETUP

RESOURCES REQUIRED:

Sr. No.	Particulars	Specification	Quantity	Remark (Photos)
1	Venturimeter fitted on pipeline	Standard make	1	For each batch
2	Discharge measuring tank fitted with a scale and piezometer tube	Standard make	1	For each batch
3	U- tube differential manometer	Standard make	1	For each batch

PROCEDURE:

1. Open the inlet regulating valve so that water starts flowing through the venturimeter.
2. Wait for some time so that flow gets steady.
3. Remove air bubbles if any entrapped, in piezometric tubes or U-tube differential manometer.
4. Note differential manometric reading h.
5. Measure the discharge by collecting a certain volume of water in measuring tank in predetermined time.
6. Repeat the procedure at least three times.

OBSERVATION & CALCULATION

Area of Measuring Tank = ____________________________ m^2

Diameter of large pipe (D) =____________________________m

Area of large pipe (A) = п/4 x D^2 = ______________________ m^2

Diameter of small pipe (d) = _____________________________m

Area of large pipe (A) = п /4 x d^2= _________________________ m^2

Sr. No.	Rise of water level in measuring tank (H) m	Volume of water collected V=A * H	Time T sec	Discharge Q actual = Volume/T m^3/s	Difference of manometric liquid between two limbs		Therotical discharge by formula = Q_{th}	Coefficent of discharge $C_d=Q_{act}/Q_{th}$	Average C_d
					Diff h_m (m)	□h= $h_m*(S_2/S_1 1)$			
1									
2									

3									
4									

Sample calculations

$$Q_{act} = \frac{Vol.of\ water\ collected\ in\ the\ tank}{Time}$$

$$Q_{th} = \frac{Aa}{\sqrt{A^2 - a^2}}\sqrt{2g\Delta h}$$

$$C_d = \frac{Q_{\ Actual}}{Q_{Theorotical}}$$

_EXPERIMENT NO.5

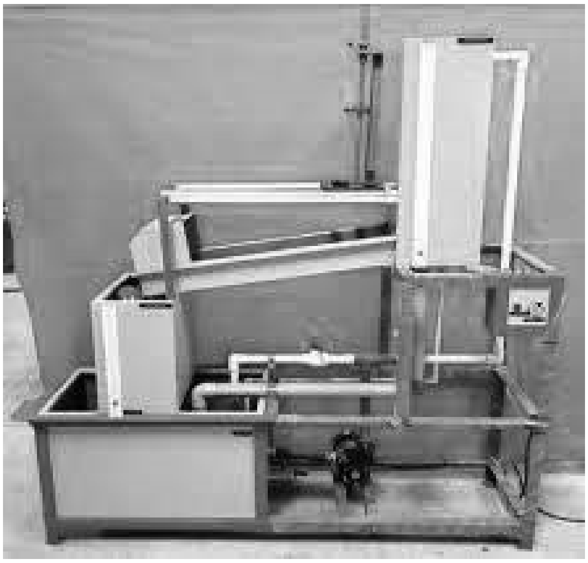
AIM: Calibrate the Orifice to find out the discharge through a tank.

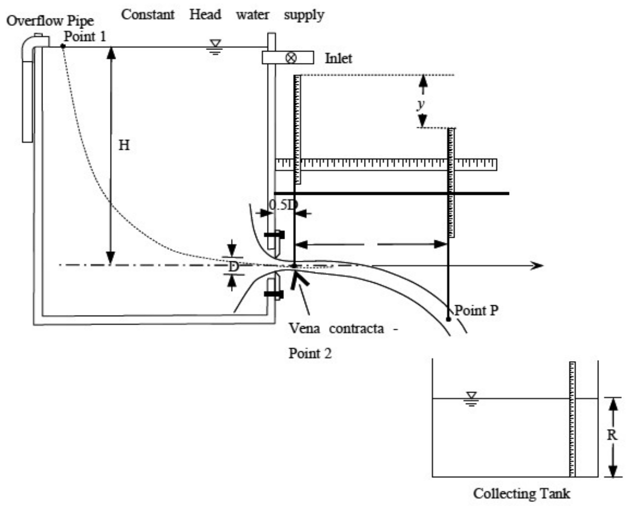
THEORY:

An orifice is an opening in the wall or base of a vessel through which fluid flows. The top edge of orifice is always below the free liquid surface. The water is allowed to flow through an orifice under a constant head 'H'. Fluid is discharged in the form of a jet of flow.

Orifice is an opening of any cross section such as circular, triangular, rectangular, on a side or on the bottom of the tank, through which a fluid flows. Orifices are used for measuring the rate of flow. It may be observed that liquid approaching the orifice is gradually converges towards orifice, to form a jet whose c/s area is less than that of the orifice, known as vena contracta.

EXPERIMENTAL SETUP:





RESOURCES REQUIRED:

Sr. No.	Particulars	Specification	Quantity	Remark
1	Supply tank with piezometer	Standard make	1	For each batch
2	Discharge measuring tank fitted with a scale and piezometer tube	Standard make	1	For each batch
3	Vernier Caliper	Standard make	1	For each batch
4	Stop watch	Standard make	1	For each batch

PROCEDURE:

1. Connect the desired size and shape of orifice to the opening in the sidewall of the intake tank.
2. Allow water to intake tank through the regulating valve and wait till the water level in the tank becomes steady.
3. Measure the head using the piezometric tube fixed to the intake tank.
4. Measure the discharge corresponding to each value of H.
5. Take minimum three readings.
6. Measure X and Y coordinates of the lower surface of the jet trajectory at four different points (origin to be taken at lowest point of the jet at vena contracta).

OBSERVATION & CALCULATIONS:

a. Shape of orifice =________________
b. Diameter of orifice =______________m
c. Cross sectional area of orifice (a) = ____________m^2
d. Cross sectional area of measuring tank (A) =_____________m^2
e. ΔH = rise in water level in measuring tank = _______________ m.

Sr. No.	ΔH	t	$Q_{ac} = \frac{A \times \Delta H}{t}$ cm³/s	Constant head at inlet H Cm	$Q_{ac} = a \times \sqrt{2gH}$	X cm	Y cm	$C_d = \frac{Q_{ac}}{Q_{th}}$	Mean C_d
1									
2									
3									
4									

Sr. No.	$C_v = \sqrt{\frac{X^2}{4yH}}$	Mean C_v	$C_c = \frac{C_d}{C_v}$	Mean C_c
1				
2				
3				
4				

Sample Calculations

$$C_d = \frac{Q_{actual}}{a\sqrt{2gH}}$$

$$C_v = \sqrt{\frac{X^2}{4yH}}$$

$C_c = C_d / C_v$

EXPERIMENT NO.6

AIM: Use the Friction factor Apparatus to determine friction factor for the given pipe

THEORY:

When water is flowing in a pipe, it experiences resistance to its motion whose effect is to reduce the velocity and finally reduces the discharge. It depends upon the roughness of the inside wall of the pipe. This resistance is known as frictional resistance and loss occurred is known as head loss due to friction. Head loss due to friction is to be found out and it is an important parameter in the design of pipe lines.

Total energy of fluid flow reduces in the direction of flow. The loss in energy is mainly (major reason of loss) due to friction and some minor losses.

Darcy's Weisbach Equationis used to find the Friction loss in flow through pipes,

$$h_f = f l v^2/2gD = \frac{f l Q^2}{12.1 D^5}$$

Where, f = Darcy's friction factor
l = length of the pipe,
V = velocity of flow,
D = Diameter of the pipe,
Q = Discharge,
g = acceleration due to gravity

EXPERIMENTAL SETUP:

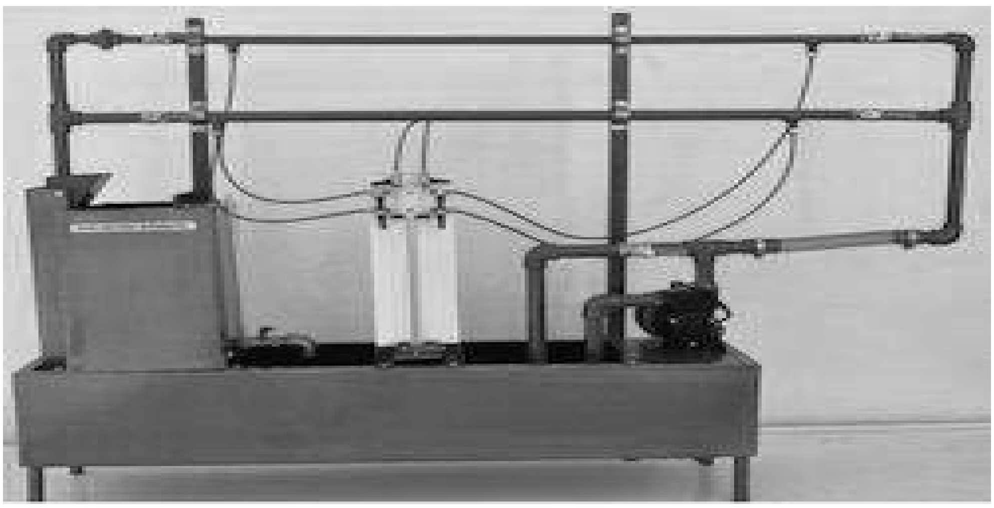


Figure 1. Pipe friction factor apparatus

RESOURCES REQUIRED:

Sr. No	Particulars	Specification	Quantity	Remark
1	Pipe friction factor apparatus	Standard make	1	For each batch

PROCEDURE:

1. Open the inlet valve and allow the flow to pass through the desired pipe.
2. From overhead tank allow water to flow through desired pipe for 2-3 minutes.
3. Open tapping of manometer on desired pipe.
4. Measure the rise in the level of water in the measuring tank for predetermined time interval and calculate the discharge.
5. Measure the height of mercury column in left as well as right limb of U tube differential manometer. The respective level of mercury in each limb is to be noted in the observation table.
6. Repeat procedure for 3-4 different discharge conditions by operating the inlet valve.
7. Repeat the steps 2-6 for pipes of different diameter by allowing the water to flow through the required pipe line by opening the respective valves.

OBSERVATION & CALCULATION:

1. Material of pipe =___________________________________
2. Area of Measuring tank = L x B =____________________ m.
3. Distance between pressure tappings, *l* =__________________ m^2
4. Specific gravity of fluid in pipe S_1 =_________________________
5. Specific gravity of fluid in manometer S_2 =___________________

Sr. No.	Dia Of Pipe, D	Manometer reading			$h_f = x(S_2/S_1-1)$	Rise of water in measuring tank in m, H	Time for collecting water in measuring tank, T sec	Q = LBH/T	Darcy's friction factor, f= $\frac{12.1 h_f D^5}{l Q^2}$
		1x	x_2	$x = x_1 - x_2$					
1									
2									

3									

Sample Calculations

$h_f = x(S_2/S_1 - 1)$

Darcy's factor, $f = \frac{12.1 h_f D^5}{l Q^2}$

RESULTS:

Darcy's friction factor, f =

i.________________________

ii.________________________

iii.________________________

EXPERIMENT NO.7

AIM: Determine the minor losses in pipe fittings due to sudden contraction and sudden enlargement.

THEORY:

When fluid flows through pipe, energy losses occur due to various reasons, in the direction of flow. Predominant loss is due to the friction (pipe roughness). The additional components like inlet, outlet, bend, valves, sudden enlargement and contraction add to the overall head loss of the system resulting in decrease in discharge. While designing pipe line total head loss is required, to be calculated.

When Energy is measured in "meters" is called head. The minor head losses are caused by certain local features or disturbances. The disturbances may be caused in thesize or shape of the pipe. This deformation affects the velocity distribution and may result in eddy formation.

Sudden Enlargement:- Two pipes of cross-sectional area A_1 and A_2 are as shown in figure 1. When the enters the larger section eddies will form resulting in turbulences and causing dissipation of energy.
The loss in head or energy due to sudden enlargement is given by:-**h**

enlargement= (V1-V2)2/2g

Sudden Contraction:- It represents a pipe line in which an abrupt contraction occurs.
The area of flow minimizes a little distance away from actual area of contraction of pipe is known as vena contracta, refer figure 2

$$h_{con} = \frac{0.5\, v^2}{2g} h_{con} = (\frac{1}{C_c} - 1)^2 \, \frac{v^2}{2g}$$

EXPERIMENTAL SETUP:

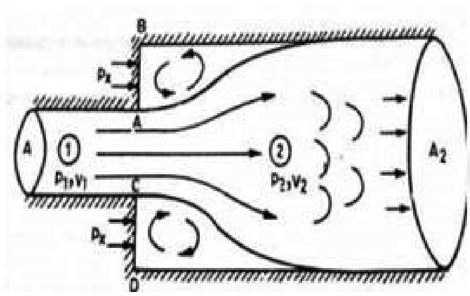


Figure 1.Sudden enlargement

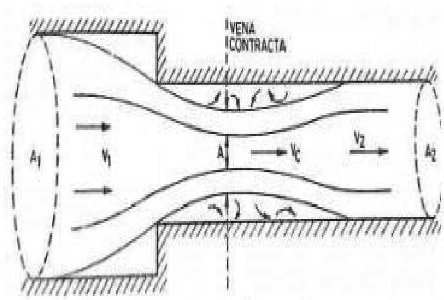


Figure 2.Sudden contraction

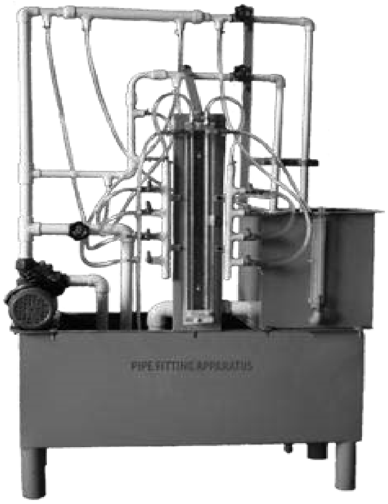


Figure 3. Experimental set up

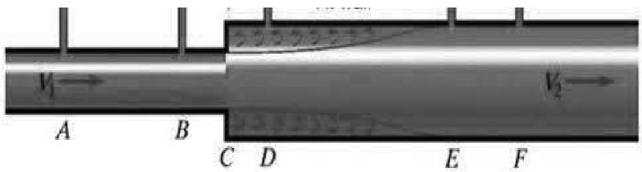


Figure 4. Sudden enlargement

RESOURCES REQUIRED:

Sr. No.	Particulars	Specification	Quantity	Remark
1	Pipe of known diameter fitted with sudden enlargement, sudden contraction.	Standard make	1	For each batch
2	Discharge measuring tank fitted with a scale and piezometer tube	Standard make	1	For each batch
3	U tube differential manometer	Standard make	1	For each batch

PROCEDURE:

1. Open the inlet valve, keeping the outlet valve closed.
2. Connect the manometer rubber tubing to one of the pipes/pipe fitting and check that there is no air bubble entrapped.
3. Open partially the outlet valve, keeping the common inlet valve fully open.
4. Allow the flow to get stabilized and then take manometer reading.
5. Measure discharge.
6. Repeat the procedure at least three times.

OBSERVATION :

Area of Measuring Tank = ____________________ m^2

Area of large pipe (A_1) = ____________________ m^2

Area of small pipe (A_2) = ____________________ m^2

Pipe fitting	Manometer Reading (for mercury manometer)*				Discharge measurement					Head loss obtain by discharge (calculations)	Head loss obtained by manometer reading (observations Hm)
Sudden enlargement	h_1	h_2	h = ($h_1 h_2$)	H = $h(\frac{S_2}{S_1} - 1)$	Volume = area of measuring tank x rise in water level in measuring tank	Time	Q= Volume /time	**V_1=Q/A_1**	**V_2 = Q/A_2**	**h= $\frac{(V_1 - V_2)^2}{2g}$**	
1											
2											
3											
Sudden contract -ion										**h_c = ($0.5v_2^2$/ 2g)**	
1											
2											

3											

*If manometric liquid is water then use h=H

Sample calulations

For sudden enlargement= $h_{enlargement} = (v_1 - v_2)^2/2g$

For sudden contraction= $h_{con} = (0.5 v_2^{2/}/2g)$

RESULTS

Average value of head loss in

Sudden enlargement = ______________________ m.

Sudden contraction = _______________________ m.

EXPERIMENT NO.8

AIM: Use the Triangular notch to measure the discharge through open channel

THEORY:

Notch is used to measure rate of flow in an open channel. Notch may be defined as opening provided in the side of tank or vessel such that the liquid surface in the tank is below the top edge of the opening. A notch may be regarded as an orifice with the water surface below its upper edge. It is used for measuring the rate of flow of a liquid through a small channel or a tank.

The main difference between a notch and weir is that the notch is of small size but the weir is of bigger one. Moreover a notch is usually made in a plate whereas a weir is usually made of masonry or concrete

A Notch is a device used for measuring the rate of flow of a liquid through a small channel or a tank. It may be defined as an opening in the side of a tank or a small channel in such a way that the free liquid surface is always below sill or edge of an opening. Consider a rectangular notch provided in channel or tank carrying water.

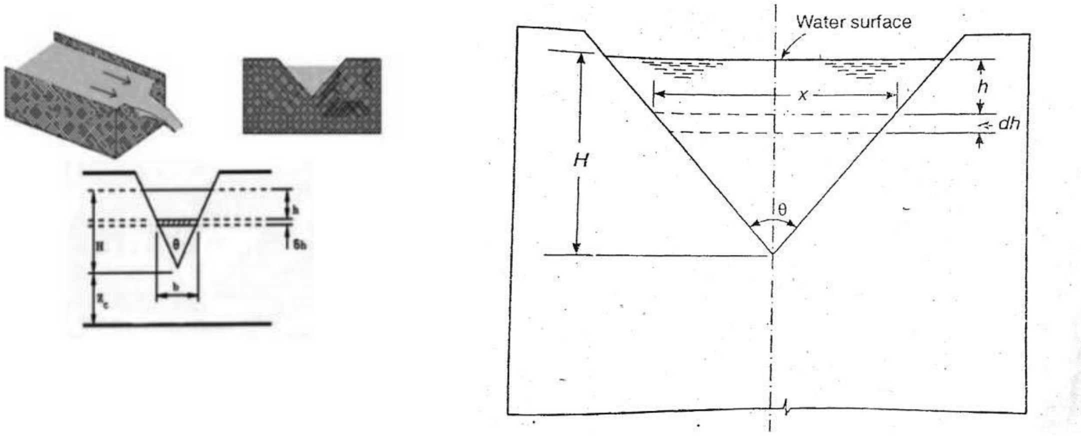
The triangular or V notch is advantageously used to measure (low discharge) the accurate discharge with lower head, over the crest .

$$Q = \frac{8}{15} C_d \sqrt{2g} \tan\frac{\theta}{2} \times H^{\frac{5}{2}}$$

EXPERIMENTAL SETUP:

Figure 1.Tringular Notch

Figure 2.Tringular Notch



Triangular Notch

RESOURCES REQUIRED

Sr. No.	Particulars	Specification	Quantity	Remark (Photos)
1	Notch	Standard make	1	One per batch
2	Discharge measuring tank fitted with a scale and piezometer tube	Standard make	1	One per batch
3	Stop watch	Standard make	1	One per batch

PROCEDURE:

1. Select desired size of triangular notch.
2. Measure angle of triangular notch.
3. Measure the sill level.
4. Record three different readings for three different heads over triangular notch by regulating the flow and measure the actual discharge.

OBSERVATION:

Sr. No.	Initial Level of water in measuring tank h_1	Final level of water in measuring tank in T sec $h = h_1 - h_2$	Time T sec	Actual Discharge Q_{act} = A x h/ T	Angle of v notch	Headover notch H m	Theorotical Discharge by formula	$C_d = \frac{Q_{Actual}}{Q_{th}}$	Avg C_d
1									

2									
3									

Sample Calculation

Area of measuring tank (A) = ___________________________ m^2 .

Actual Discharge= Q_{act} = A x h/ T = _____________________m^3/sec.

Theorotical Discharge

$$Q = \frac{8}{15} \times \sqrt{2g} \tan\frac{\theta}{2} \times H^{\frac{5}{2}}$$

EXPERIMENT NO.9

AIM: Use the Rectangular Notch to measure the discharge through open channel

THEORY:

Notch is generally used to measure rate of flow in an open channel flow. Notch may be defined as opening provided in the side of tank or vessel such that the liquid surface in the tank is below the top edge of the opening. A notch may be regarded as an orifice with the water surface below its upper edge. It is used for measuring the rate of flow of a liquid through a small channel or a tank.

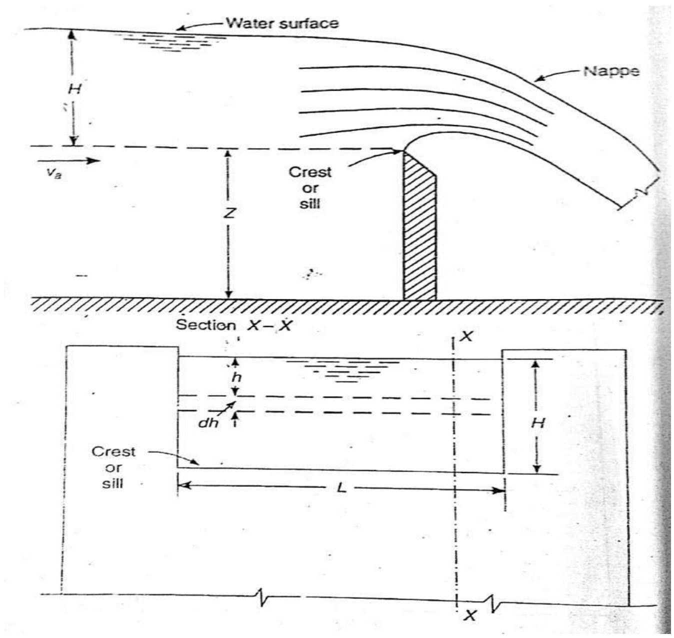
The main difference between a notch and weir is that the notch is of small size but the weir is of bigger one. Moreover a notch is usually made in a plate whereas a weir is usually made of masonry or concrete

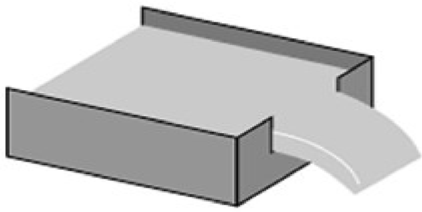
A Notch is a device used for measuring the rate of flow of a liquid through a small channel or a tank. It may be defined as an opening in the side of a tank or a small channel in such a way that the free liquid surface is always below sill or edge of an opening. Consider a rectangular notch provided in channel or tank carrying water.

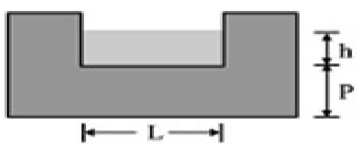
Rectangular Notch is used to find discharge . Discharge is calculated by formula

$$Q_{th} = \frac{2}{3} \times L\sqrt{2g}\, H^{\frac{3}{2}}$$

EXPERIMENTAL SETUP:







RESOURCES REQUIRED:

Sr. No.	Particulars	Specification	Quantity	Remark (Photos)
1	Notch	Standard make	1	Per Batch
2	Discharge measuring tank fitted with a scale and piezometer tube	Standard make	1	Per Batch
3	Stop watch	Standard make	1	Per Batch

PROCEDURE:

1. Select desired size of rectangular notch.
2. Measure dimensions of rectangular notch.
3. Establish the zero hook gauge reading corresponding to the level of the crest of the notch or take initial reading at crest.
4. Record three readings for head over triangular notch by regulating the flow and measure discharge.

OBSERVATION

Sr. No.	Initial Level of water in measuring tank h_1	Final level of water in measuring tank in T sec $h = h_1 - h_2$	Time T sec	Actual Discharge $Q_{act} = A \times h/T$	Length of rectangular notch	Head over notch H m	Theorotical Discharge by formula	$C_d = \frac{Q_{Actual}}{Q_{th}}$	Avg C_d
1									
2									
3									

SAMPLE CALCULATION

Area of measuring tank (A) =

Actual Discharge=$Q_{act} = A \times h/T$=

Theorotical Discharge $Q_{th} = 2/3 \times L\sqrt{2g} \times H^{2/3}$

$C_d = Q_{actual} / Q_t$

EXPERIMENT NO.10

AIM: Determine the efficiency of centrifugal pump.

THEORY:

Centrifugal pumps are used to transport all (viscous) type of fluids. Centrifugal pumps are used to transport fluids by the conversion of rotational kinetic energy to the hydrodynamic energy of the fluid flow. Common uses of the centrifugal pump include lifting of water, sewage, paper pulp, petroleum and petrochemical pumping. Centrifugal pumps are classified as roto dynamic type of pumps in which dynamic pressure is developed which enable the lifting of viscous liquids from lower to higher level. The basic principle on which a centrifugal pump works is that when a certain mass of liquid is made to rotate by an external force. ,it is thrown away from the central axis of rotation .and a centrifugal head is impressed which enables it to rise to a higher level.

$$\boldsymbol{overall\ efficiency = \frac{w \times Q \times H_m}{inputpower\ .} \times 100\ \%}$$

Where, w = Specific weight of liquid to be lifted N/ m^3.

Q = Discharge of pump m^3/ sec

H_m = Manometric Head m

Input power =.of the given pump

EXPERIMENTAL SETUP:

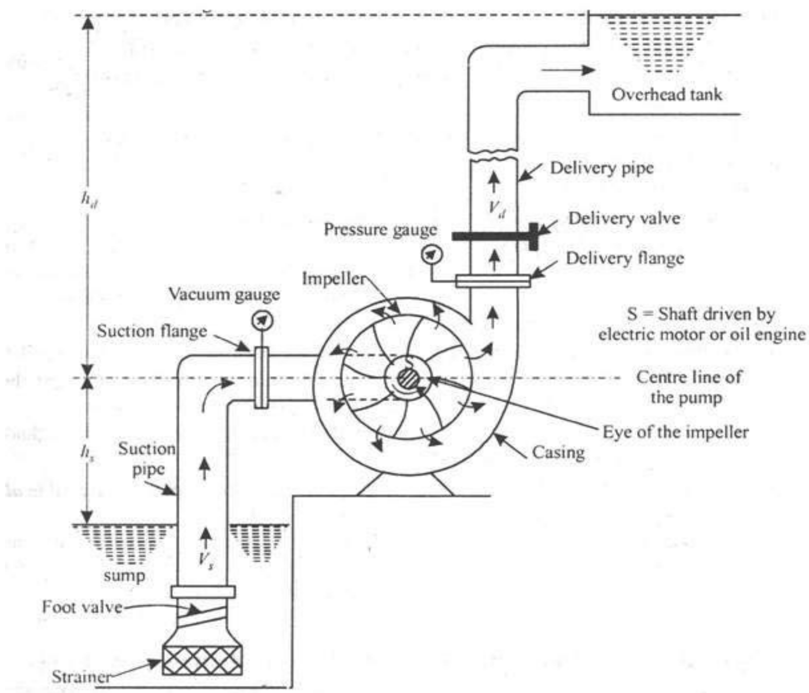


Figure 1. Component parts of Centrifugal Pump

RESOURCES REQUIRED:

Sr. No.	Particulars	Specification	Quantity	Remark (Photos)
1	Centrifugal pump with motor	Standard make	1	For each batch
2	Stop watch	Standard make	1	For each batch
3	Pressure gauge	Standard make	1	For each batch

OBSERVATION:

Sr. No	Rise in water level in tank h	Time of water collection in Tank T	Discharge Q = A x h/ T	Total Head Hm
1				
2				
3				

Sample Calculation

$$overall\ efficiency = \frac{w \times Q \times H_m}{inputpower\ .} \times 100\ \%$$