NAME # Qaiser Siddique

ID # 783

Semester # 6th

Assignment # 01

Subject :- Hydraulic Engineering.

SECTION :- "B"

Submitted to # Engr. FAWAD AHMAD

What is Venture flume ? Explain with detial ?

A Venturi flume is a critical flow open flame with a Constricted flow which causes a drop inthe hydralic grade line, creating critical depth.

It is used in flow measurment of very large Flow rate, usally given in millions of cubic units. A Venture meter would normally measure in mm, Where as a Venture flame measure in meters.

Measurment of discharge with venturo flame requires two dischar measurement, one upstream & and the throat, If the flow passes in a subcritical state through the flame, If the flame is desinged So as ab pass the flow from subcritical to super ceritical state while passing through the flame, a single measurment at a throat is sufficent for computation of discharge. To ensure the occurence of ceritical depth at the throat. the flame a hydralic jump onthe dwonstream side of the structre the flame is called standered wave flame.

Q. A 3m wide channel carries a total discharge of 12 m³/sec Calculate.

1, The critical depth

2, the minimum specific energy.

3. the alternate depth when E = 4m.

Sol. $b = 3m$

$Q = 12 \ m^3/sec$

a) Discharge per unit width

$$q = \frac{Q}{b} = \frac{12}{3} = 4 \ m^2 s^{-1}$$

then for rectangular channel.

$$h_c = \left(\frac{q^2}{g}\right)^{1/3} = \left(\frac{4}{9.81}\right)^{1/3} = 1.177m.$$

So critical depth = 1.18m

b) For rectangular channel.

$$E_c = \frac{3}{2} h_c = 3/2 \times 1.177 \ m = 1.765m$$

So minimum and specific energy is

1.77m.

As $E > E_c$, there are two possible depth for a given specific energy.

$$E = h + \frac{V^2}{2g} \quad \text{where} \quad V = \frac{Q}{A} = \frac{q}{h} \quad \text{(rectangular channel.)}$$

$$\Rightarrow E = h + \frac{q^2}{2gh^2}$$ Substituting value in meter-sec unit.

$$4 = h + \frac{0.8155}{h^2}$$

For a sub critical (slow, deep) sol, the first term associated with potential energy dominates. So rearrange.

$$h = +4 - \frac{0.8155}{h^2}$$

Iteration (from e.g $h = 4$) gives $h = 3.948$ m.

For the super critical (fast, shallow) sol, the second term associated with K.E dominates so rearrange as.

$$h = \sqrt{\frac{0.8155}{4-h}}$$

Iteration (for e.g $h = 0$) gives $h = 0.4814$m

alternate depth are 3.95 & 0.481m

NAME :- Qaiser Siddique

Section :- "B"

ID :- 7863

Assignment # 02

PROBLEM # 1

water Flow at a depth of 10cm of Valocity. of 6m/s in reactangular cannel. Is the Flow is sucrtical or supar crtical. what is the other mole dept:

Sol:-

Check Froode Number.

$$F_r = \frac{V}{\sqrt{gy}} = \frac{6\,m/s}{\sqrt{9.81/s^2 \times 0.1m}} = 6.66 > 1$$

So the flow is supracirtical.

$$E = y + \frac{V^2}{2g} = 0.1m + \frac{(6m/s)^2}{2 \times 9.81 m/s^2}$$

$$= 1.935 m.$$

Solving the altemaile depth for an..

$E = 1.935m$ yield $y_{ats} = 1.93m$.

Problem # 2

Water Flow with velocity. Neglet head loss.

Sol.– $E_1 = y_1 + \frac{V_1^2}{2g} = 3m + \frac{(2m/s)^2}{2\times 9.8\ m/s^2} = 3.20m$.

$E_2 = E_1 - \Delta_z = 3.20m - 0.60m = 2.60m$

Also,

$E_2 = y_2 + \frac{q^2}{2gy_2^2} = y_2 + \frac{(6\ m^3/s/m)^2}{2\times 9.81 m/s^2 - y_2^2} = 2.60m$.

So $y_2 = 2.24m$ – $\Delta y = y_2 - y_1 = -0.76m$.

So the water surface drop 0.16m For a downword a step of 15cm we have.

$E_2 = E_1 - \Delta z = 3.20m - (-0.15m) = 3.35m$.

giving $y_2 = 3.17m$ & $\Delta y = y_2 - y_1 = 0.17m$ So the water surface Nise 0.02 m – the maximum upstep possible before effecting upstream water surface is For For $y_2 = y$

$y = \sqrt[3]{\frac{q^2}{g}} = \sqrt[3]{\frac{6(m^3/s/m)^2}{9.81 m/s^2}} = 1.54m$.

NAME : Qaiser Siddique

CMD = 7863

Sec : B

Assignment :- 03

PROBLEM # 01.

A water passing from the sluice gets in Dm -----!

Given DATA:-

$y_1 = 3.6m$, $y_2 = 0.9m$

$b = 3.9m$

Sol:-

as we know that

$E_1 = E_2$

$$y_1 + \frac{V_1^2}{2g} = y_2 + \frac{V_2^2}{2g} \quad \text{—①}$$

Also. $Q = A_1 V_1 = A_2 V_2$

$b_1 y_1 \cdot V_1 = b_2 y_2 \cdot V_2$ $\quad (b = b_1 = b_2)$

$b y_1 V_1 = b y_2 V_2$

$y_1 V_1 = y_2 V_2$

$$V_2 = \frac{y_1}{y_2} \times V_1$$

$$V_2 = \frac{3.6}{0.9} \times V_1 = 4V_1 \quad \text{—②}$$

puting equation (1)

$$y_1 + \frac{V_1^2}{2g} = y_2 + \frac{V_2^2}{2g} \Rightarrow 3.6 + \frac{V_1^2}{2g} = 0.9 + \frac{(4V_1)^2}{2g}$$

$\boxed{V_1 = 1.879 \text{ m/sec}}$ put in (9) we get

$V_2 = 4V_1$

$Q_1 = A_1 V_1 = b y_1 \cdot V_1$

$= 39 \times 3.6 \times 1.879$

$\boxed{Q_1 = 96.38 \text{ m}^3/\text{sec}}$

$\Rightarrow Q_2 = A_2 V_2 = b - y_2 - V_2$

$0.9 \quad 7.516$

$= 3.9 \times 3.16 \times 1.879$

$\boxed{Q_2 = 96.38 \text{ m}^3/\text{sec}}$

$Q = Q_1 = Q_2 = 96.38 \text{ m}^3/\text{sec}$

(1) Froud number → At upstream side.

$Fr_1 = \frac{V_1}{\sqrt{g y_1}} = \frac{1.879}{\sqrt{9.81 \times 3.6}} = 0.31$ Subcritical flow.

(2) Froudnumber → At down stream side.

$Fr_2 = \frac{V_2}{\sqrt{g y_1}} = \frac{7.516}{\sqrt{9.81 \times 0.9}} = 2.52$ Super critical flow.