Name # Habibullah

ID # 7716

Section # "C"

Semester # 8th

Assignment # "02"

Date / / Day

(1)

Problem:

Establish the stage discharge relationship for a concrete rectangular box culvert.

Solution:

width = 1.2 m.
height = 0.6 m.
length = 30 m.
Slope = 1 in 1000;
Mannings n = 0.013

As

$H/D \leq 1.2$ for

$H < 0.6$ m, free flow open channel condition prevails

The depth in the inlet is critical.

for $H = 0.2$m

ignoring entry loss $y_c = (2/3) \times 0.2$

$y_c = 0.133$m

(2)

$V_c = 1.142\ m/s$

This gives the critical slope

$$(Vn)^2 / R^{4/3} = 0.00424$$

so

$$Q = 1.2y_o\left(1.2y_o/(1.2+2y_o)\right]^{2/3}$$

$$(0.001)^{1/2}/0.013$$

$$Q = 2.92\, y_o\left[1.2y_o/(1.2+2y_o)\right]^{2/3}$$

$y_o \simeq 0.6$	H(m)	$Q(m^3 s^{-1})$
	0.691 ←	0.715
	0.72 ↓	↑ 0.805
	1.00	1.364
	2.00	2.487
	3.00	3.242

During rising stages the barrel flows fall from $H = 0.72m$ and during falling stages the flow becomes free-surface

(3)

flow at m $A = 0.691 m$

The following table summarizes the results

H(m)	Q(m^3/s)	Type of flow
Rising stages		
0.236	0.165	open channel
0.467	0.451	"
0.691	0.785	"
0.720	0.805	Pipe flow
1.00	1.364	"
2.00	2.487	"
3.00	3.242	"
falling stages		
2.00	2.487	Pipe flow
1.00	1.369	"
0.72	0.805	"
0.691	0.723	"
0.691	0.785	open channel
0.467	0.451	"
0.236	0.165	"