

Name:- Abid Ullah Khan

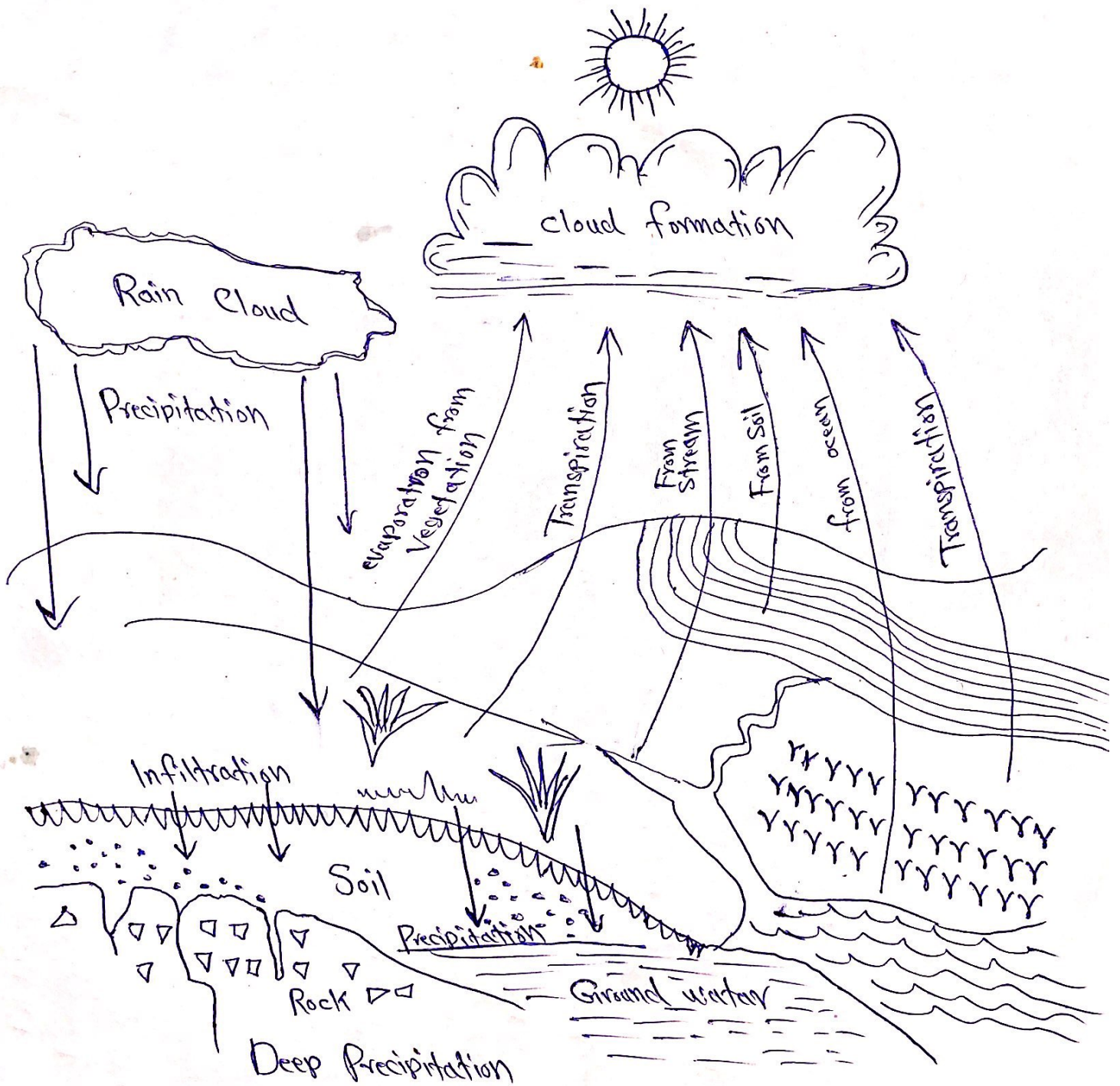
ID:- 7737

Sec:- "A"

Subj:- Hydraulic Structure

Assignment

Establish the Stage discharge relationship for a Concrete rectangular box Culvert
Use Suitable data of your own choice.



Total discharge	Discharge for each culvert	Discharge per foot of width	Inlet Control		Outlet Control		Present Channel		Control Channel						
Q $\frac{ft^3}{s}$	Q $\frac{ft^3}{s}$	$\frac{ft^3}{s}$ ft	HW ft	HW ft	K	H_t ft	d_c ft	$\frac{(d_c^2 + D^2)}{2}$ ft	e_{in} ft	LS ft	HW _{in} ft	TW e_{in} ft	HW _{out} e_{in} ft		
(14)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)		
3000	375	23.4	0.55	4.40	—	0.5	0.22	2.6	5.30	100.30	101.4	0.33	—	100.7	—
5000	625	39.1	0.77	6.16	—	0.5	0.60	3.6	5.80	100.80	102.4	0.33	102.57	101.6	101.87
8000	1000	69.5	1.08	8.84	103.97	0.5	1.40	4.4	6.45	101.45	103.0	0.33	104.07	102.6	103.67
10000	1250	78.1	1.31	10.48	105.81	0.5	2.00	5.7	6.85	101.85	104.5	0.33	105.17	103.6	104.67
12000	1563	97.7	1.61	12.28	108.21	0.5	3.00	6.7	7.35	102.35	104.5	0.33	106.67	103.0	106.27
15000	1875	117.2	2.01	16.08	111.41	0.5	4.10	7.5	7.75	102.75	104.5	0.33	108.27	104.0	107.77
20000	2500	156.2	—	—	—	0.5	6.50	9.1	8.00	103.00	104.5	0.33	111.67	104.8	110.97

Note:-

- 1) $H_{W1} = HW + 95.33$ (invert elevation at entrance end of Culvert = 95.33)
- 2) $h_a = (d + D)/2 + 95$ (invert elevation at outlet end of Culvert = 95.00)
- 3) $H_{W2} = H + TW - LS_a$ whichever is greater.
- 4) Tailwater elevation is higher than the computed elevation and open channel flow exists.
- 5) See example on exhibit 14-11
- 6) with channel improvement the control switches from outlet to inlet control b/w 5000 and 8000 ft^2/s .
- 7) See example on exhibit 14-6
- 8) If $d_e \geq D_r$ the outlet always Control
- 9) $(d_r + D)/2$ cannot exceed D .

Development of Stage discharge

(a) Direct Measurement

The most direct method of developing stage discharge curves for natural streams is to obtain velocity at selected point through a cross section. The most popular method is to use of dynamometers, floats, pilot tubes, chemical, electrical methods. From these velocities and associated cross sectional areas, the discharge is computed for various stages on the rising and falling side of a flood flow and stage discharge curve developed.

The velocity head rod may be used to measure flows in small stream or baseflow in larger streams. In making a measurement with a velocity head rod, a tape is stretched across the flowing stream, and both depth and velocity head readings are taken at selected point that represent the cross section of the channel.

(b) Indirect Measurement

Indirectly, discharge is measured by methods such as stop-crest, contracted-opening, flow over a dam, flow through a culvert and critical depth. These methods described in techniques of water resource investigation of the U.S. Geological Survey, Chapter 3-7, use information on the water-surface profile for a specific flood peak and the hydraulic characteristics of the channel to determine the peak discharge.