CEE3361 Water Resource Management

Solution for Assignment 3: Part A

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1. What is the after development **peak discharge** (m^3/s) for the rectangular weir? How long is the **delay in peak discharge** (min)?

Table 1.Supplementary Calculations

Storage Calculations					
Elevation (m)	ΔH (m)	Depth ( ) (m)	S (m3)	Q (m3/s) (m3/s)	(2s/Δt)+Q (m3/s)
55.8	0	0	0	0	0
56.1	0.3	0.3	141	0.443655	1.226989
56.7	0.6	0.9	1065	2.3053	8.221967
57.3	0.6	1.5	3330	4.960217	23.46022
57.9	0.6	2.1	7000	8.216611	47.1055
58.5	0.6	2.7	12301	11.97869	80.31758
59.1	0.6	3.3	18961	16.18582	121.5247
59.7	0.6	3.9	27071	20.79508	171.1895
60.4	0.7	4.6	37514	26.63793	235.049
Δt (s)	360				
L	1.5				

Where for a rectangular weir $Q = 1.8\ L\ H^{3/2}$

Table 2. Routing computations

Reservoir Routing Computations						
Time Index (j)	Time (s)	Inflow (m3/s)	i(j) + i(j+1) (m3/s)	2S(j)/Δt-Q(j) (m3/s)	2S(j+1)/Δt+Q(j+1) m/3/s	Q (m3/s)
1	0	0.42	1.13	0	1.13	0
2	360	0.71	1.98	0.312827852	2.292827852	0.408586
3	720	1.27	4.1	0.838191916	4.938191916	0.727318
4	1080	2.83	7.79	2.075480407	9.865480407	1.431356
5	1440	4.96	12.04	4.682190399	16.7221904	2.591645
6	1800	7.08	14.87	9.149650754	24.01965075	3.78627
7	**2160**	**7.79**	15.15	13.94512842	29.09512842	5.037261
8	2520	7.36	13.59	17.62263131	31.21263131	5.736249
9	**2880**	6.23	11.04	19.15689537	30.19689537	**6.027868**
10	3240	4.81	8.49	18.42093078	26.91093078	5.887982
11	3600	3.68	6.51	16.0400427	22.5500427	5.435444
12	3960	2.83	5.1	12.94676324	18.04676324	4.80164
13	4320	2.27	3.4	10.01267058	13.41267058	4.017046
14	4680	1.13	1.13	6.993347131	8.123347131	3.209662
15	5040	0	0	3.565239774	3.565239774	2.279054
16	5400	0	0	1.433323848	1.433323848	1.065958
17	5760	0	0	0.436185089	0.436185089	0.498569
18	6120	0	0	0.12075296	0.12075296	0.157716
19	6480	0	0	0.033429105	0.033429105	0.043662
20	6840	0	0	0.009254474	0.009254474	0.012087

Based on results in Table 2 we can see that the after development peak discharge is **7.79m^3/s**.

The delay in this peak discharge is given by the difference in time between the peak inflow and after development peak discharge which is (2880 s-2160 s)/60= **12 minutes.**

Note: Linear interpolation for last column of Table 2 is given below.

Table 3. Linear Interpolation to find discharge

Linear Interpolation					
x	x0	x1	y0	y1	y
1.13	0	1.226989	0	0.443655	0.408586
2.292828	1.226989	8.221967	0.443655	2.3053	0.727318
4.938192	1.226989	8.221967	0.443655	2.3053	1.431356
9.86548	8.221967	23.46022	2.3053	4.960217	2.591645
16.72219	8.221967	23.46022	2.3053	4.960217	3.78627
24.01965	23.46022	47.1055	4.960217	8.216611	5.037261
29.09513	23.46022	47.1055	4.960217	8.216611	5.736249
31.21263	23.46022	47.1055	4.960217	8.216611	6.027868
30.1969	23.46022	47.1055	4.960217	8.216611	5.887982
26.91093	23.46022	47.1055	4.960217	8.216611	5.435444
22.55004	8.221967	23.46022	2.3053	4.960217	4.80164
18.04676	8.221967	23.46022	2.3053	4.960217	4.017046
13.41267	8.221967	23.46022	2.3053	4.960217	3.209662
8.123347	1.226989	8.221967	0.443655	2.3053	2.279054
3.56524	1.226989	8.221967	0.443655	2.3053	1.065958
1.433324	1.226989	8.221967	0.443655	2.3053	0.498569
0.436185	0	1.226989	0	0.443655	0.157716
0.120753	0	1.226989	0	0.443655	0.043662
0.033429	0	1.226989	0	0.443655	0.012087
0.009254	0	1.226989	0	0.443655	0.003346