

CVG3120, FALL 2016 ASSIGNMENT 4

Due date: Friday, December 2, 2016, 23:59

PROBLEM 1

Because of right-of-way restrictions and policies on the allowable spread, the spread on a particular section of a proposed highway will be limited to 8 ft. If the 10-yr design discharge is $5.1 \text{ ft}^3/\text{sec}$, what cross-slope, z , and curb height, d , will be necessary? Assume a triangular gutter section, with $n = 0.015$ and a longitudinal slope S of 1.7%.

PROBLEM 2

Water is ponded behind a highway embankment to a depth of 5.6 ft above the invert of a culvert. Determine the pipe diameter needed to pass a flow of $74 \text{ ft}^3/\text{sec}$. Assume $C_d = 0.6$.

PROBLEM 3

A portion of a river is modeled with two reaches, A and B. Reach A extends from section 1 to section 2 and has a length of 15000 ft, $n = 0.07$, $S = 1 \%$, and $R_h = 4$ ft. Reach 2 extends from section 2 to section 3 and has a length of 17000 ft, $n = 0.05$, $S = 0.5\%$ and $R_h = 5$ ft. The hydrograph at Section 1 is (200, 300, 700, 600, 500, 400, 350, 300, 250, 225, 210, 205, 200), with a time increment, Δt of 10 min. Assume the initial discharge at downstream sections is 200. Using the Convex Routing Method, (a) route the hydrograph from section 1 to section 2 and then from section 2 to section 3.

PROBLEM 4

Assuming a routing time increment, Δt , of 15 min, determine the routing coefficient x and K for the Muskingum Method and the flowing hydrograph

I	0	210	530	840	920	870	610	380	190	80	20
O	0	10	90	230	480	620	710	690	540	440	190

PROBLEM 5

A surface-storage facility has a rectangular bottom ($L = 175$ ft, $W = 75$ ft), with vertical ends (i.e., the length remains constant) and the sides with slopes of 5:1(h:v). The facility is used to control runoff from a residential area. Determine the stage-storage-discharge relationship assuming that outflow from the basin is controlled by a weir with a 6-ft length and $C = 3.1$. The weir invert is the same as the elevation of the bottom of the storage basin.

Assuming that the initial storage and discharge are zero, route the following hydrograph through the structure using the storage-indication method.

t (min)	0	15	30	45	60	75	90	105	120	135	150	165
q	0	30	75	120	175	160	125	85	55	35	20	10