CE 365K Hydraulic Engineering Design **Spring 2016**

Assignment 3
Runoff Modeling

The solution to this homework should be posted in pdf format to the Canvas web site for this class under Assignment 3 by Thursday Feb 18.

1. Solve problem 4 on p.95 of Haested. This is concerned with using the Rational Method to determine the peak rate of runoff for development in Chicago on a land area whose time of concentration is 25 min.

2. Solve problem 5 (a) on p.96 of Haested. Use the NRCS CN method to determine the depth (inches) and the volume (ft3) of runoff from suburban watershed whose time of concentration is 2.5 hours. Do not attempt to solve problem 5(b) about using the SCS method to compute peak discharge.

3. Solve problem 6 on p.96 of Haested. Use the NRCS triangular unit hydrograph method and determine the peak discharge (cfs), and its time of occurrence (min) and the base time of the unit hydrograph (min). Draw the resulting triangular unit hydrograph. Verify that it contains 1 inch of direct runoff from this watershed.

4. During the last time that I taught CE 374K, I prepared a detailed exercise on how to set up a simple HEC-HMS model that you can find at: http://www.caee.utexas.edu/prof/maidment/CE374KSpr13/Hmwk5/IntroHECHMS.htm This is for HEC-HMS version 3.5 but the current version, Version 4.1 is not significantly different at the level I am asking you to use this model. **I would like you to use HEC-HMS version 4.1** which is obtainable at: http://www.hec.usace.army.mil/software/hec-hms/downloads.aspx This program is also running in the Learning Resource Center on the 2nd flood of ECJ, and in the CAEE Virtual Desktop, so you don't have to install the program on your own computer if you do not want to do so.

Use the tutorial referenced above and the HEC-HMS Quick Start Guide http://www.caee.utexas.edu/prof/maidment/CE365KSpr16/Docs/HECHMSQuickStart.pdf to prepare an HEC-HMS model for Eanes Creek at Bee Caves Rd in Rollingwood, Texas. The drainage area is 3.13 mi^2. Take the runoff curve number to be 84 and the lag time for the basin to be 60 min. Use the City of Austin Drainage Criteria Manual to obtain the design precipitation depth data for a 25 year storm. Use the SCS 24 hour design storm hyetograph to distribute the precipitation through time. Run the model for 2 days using a 5 min time step. You just have to develop a rainfall-runoff model for a single sub-basin. Do not worry about putting HEC-HMS routing reaches or reservoirs in your model yet. We'll come to that later.

Turn in a screen capture of the rainfall hyetograph and runoff hydrograph for this storm. What is the total rainfall (inches)? How much of this becomes excess precipitation (inches), and losses (inches). Verify using the SCS curve number method that this is the correct amount of excess precipitation. What is the peak discharge (cfs)? What is the time lag (min) between the peak rainfall intensity in the storm and the peak discharge in Eanes Creek at Bee Caves Rd?

5. Use your HEC-HMS model to determine the runoff (inches) and peak discharge (cfs) from a 100 year storm on Eanes Creek. By how much are these quantities increased from those for the 25 year storm? Is it possible to get a design discharge of 10,000 cfs from this watershed? If so, what curve number and lag time would be needed for a 100 year storm?