Name: _____

Utah State University
Department of Civil and Environmental Engineering
CEE 3430 Engineering Hydrology

Test 2.   Date: 3/31/2014
D.G. Tarboton   Time: 50 min
                                                 45 Points

Open Book. Answer all questions. **Please answer on this paper. Attach additional working sheets if necessary**. You may refer to the textbook, notes, solutions to homework and any other written or printed reference material that you have brought with you.

Calculator use. You may use a programmable calculator or equivalent calculating device (e.g. calculator functionality on a phone). You should limit the use of the calculating device to the performance of calculations. You may use programs that you have written to evaluate quantities commonly used in this class (e.g. infiltration quantities).

Computer use. You may use a laptop computer to access an electronic version of the textbook. You may use a program such as Excel, Smath studio or R to perform calculations. You may not send emails or messages or communicate in any way with anyone other than the instructor or moderator regarding solutions to these questions.

Even when using a calculator or computer you should write your work out on your solution paper as you will only be graded based on what you write down. Even when the answer is correct, you need to show how you got it. For partial credit in cases where the solution is not correct I need to see how you were approaching the problem.

1. For each of the following pictures that have been shown in class state <u>what</u> they show and what their <u>hydrologic significance</u> is.

A. [5 points]

Morphed composite: 2014-02-10 00:00:00 UTC

What:_____

_____

_____
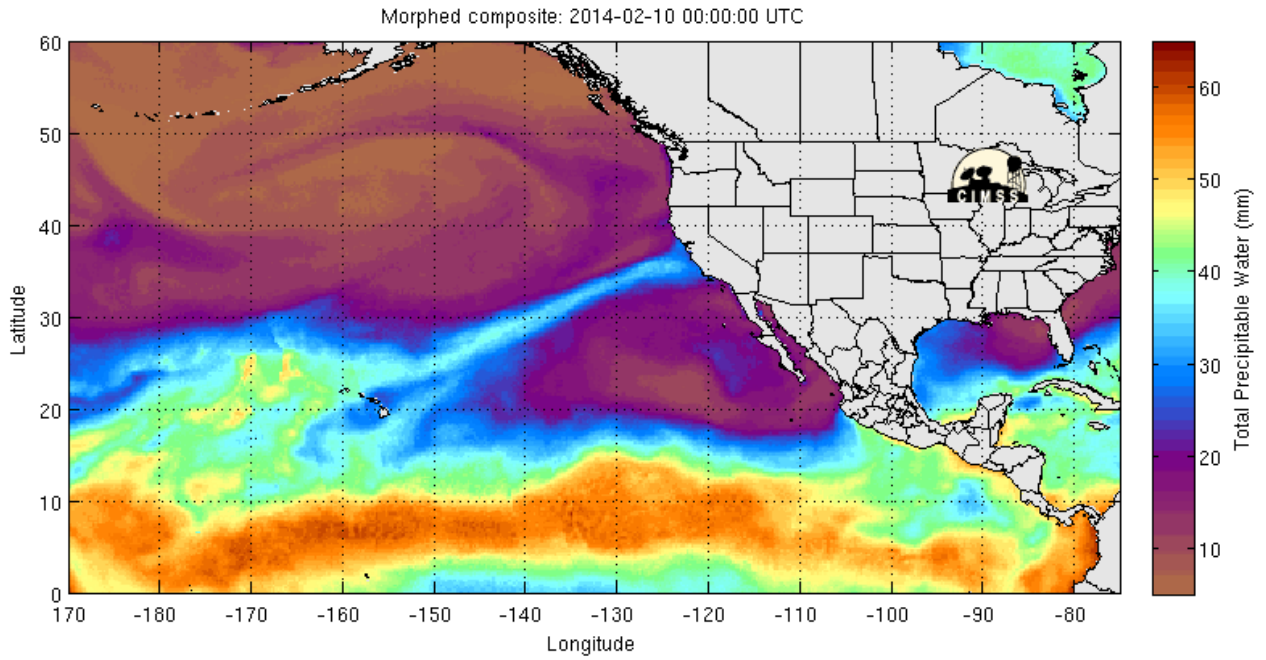
Hydrologic Significance: _____

_____

_____

B. [5 points]

What:_____

_____

_____

Hydrologic Significance: _____

_____

_____

C. From NOAA Atlas 2
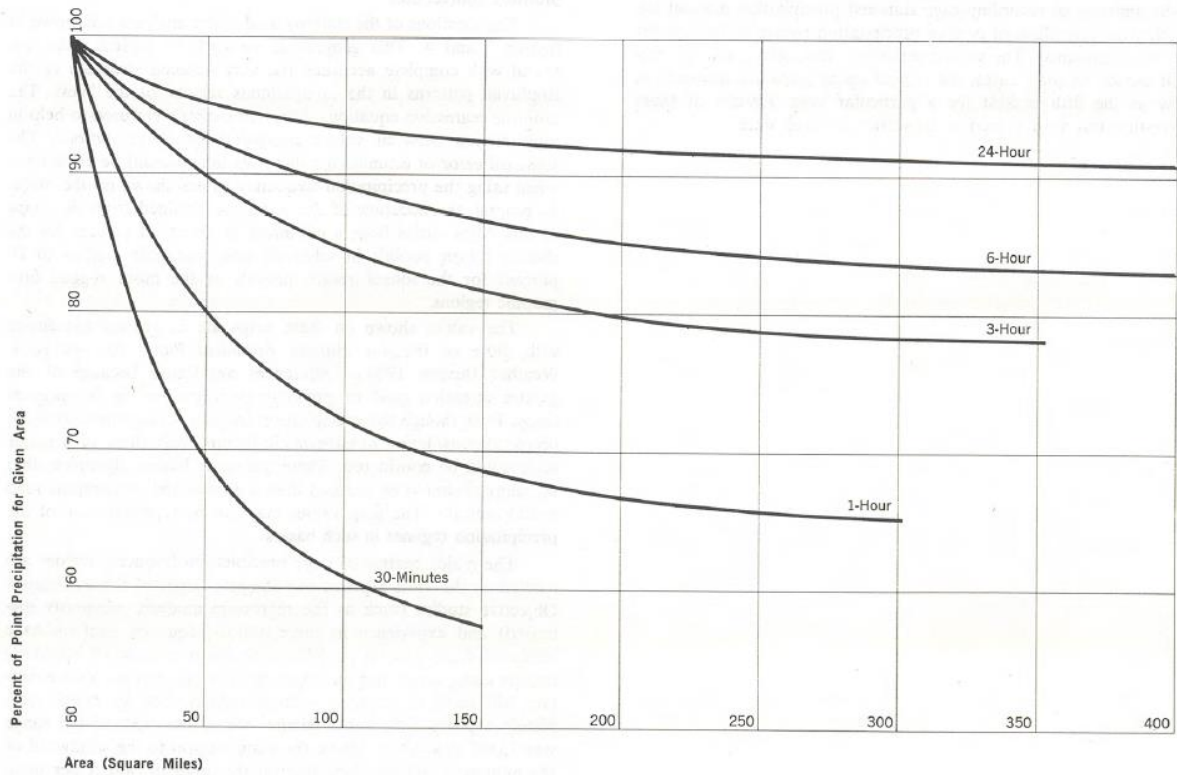   http://www.nws.noaa.gov/oh/hdsc/PF_documents/Atlas2_Volume5.pdf.   [5 points]

Figure 14. *Depth-Area curves.*

What:_____

_____

_____

Hydrologic Significance: _____

_____

_____

2. Consider the Green-Ampt infiltration model

   Following are the parameters determined from some soil testing

   Porosity $\eta = 0.42$
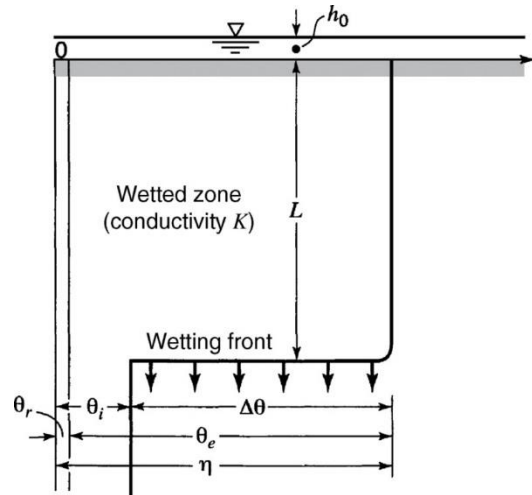   Effective porosity $\theta_e = 0.4$
   Initial moisture content $\theta_i = 0.15$
   Hydraulic conductivity $K = 0.7$ cm/h
   Wetting front suction $\psi = 14$ cm
   Assume $h_o = 0$.

   a) Determine the depth of the wetting front L when 2 cm of water has infiltrated. [5 points]

   b) Determine the potential infiltration rate with the wetting front at this depth. [5 points]

   c) In a rainstorm with continuously ponded conditions at the surface, how long would it take for the wetting front to penetrate to the depth L determined in (a). [5 points]

3. In a problem similar to Mays 8.8.1 in Homework 8 you have been given a SCS Triangular Unit Hydrograph for a watershed with the following properties.

Area = 4000 acres
Length = 14250 ft
Slope = 4%
CN = 85
t_p = 1.26 hr
t_R = 0.25 hr
t_c = 1.88 hr
t_b = 3.36 hr
Unit precipitation excess 1 inch

The person giving you this information neglected to provide a y-axis for the graph or to give you the unit hydrograph peak flow value.

SCS Triangular Unit Hydrograph

Hours
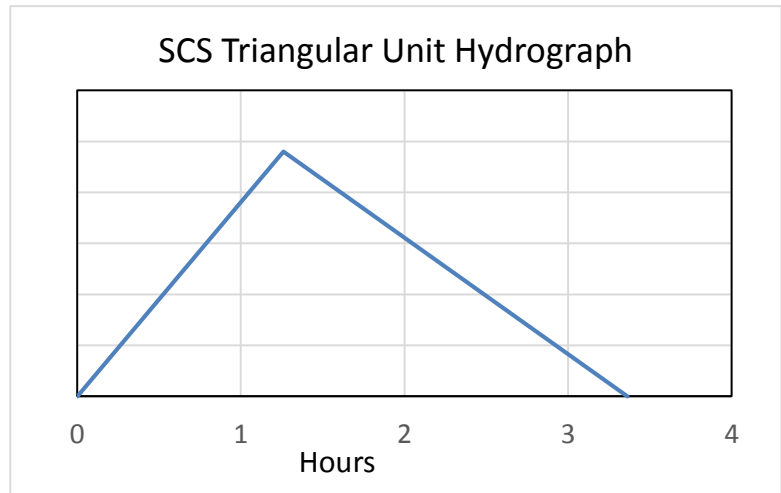
Conversions: 1 acre = 43560 ft². 1 mi = 5280 ft. 1 ft = 12 inches. 1 hr = 3600 s.

a) Determine the peak discharge of the triangular unit hydrograph given above in ft³/s per inch of excess precipitation. [5 points]

b) Consider a storm in which the precipitation is 0.75 inches in 30 minutes. Determine the excess precipitation in inches. [5 points]

c) Determine the peak of the resulting storm hydrograph in ft^3/s. There is no baseflow.   [5 points]