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

Test 2. Date: 4/4/2012
D.G. Tarboton Time: 50 min
35 Points

Open Book. Answer all questions. **Please answer on separate sheets of paper**. 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. saturation vapor pressure).

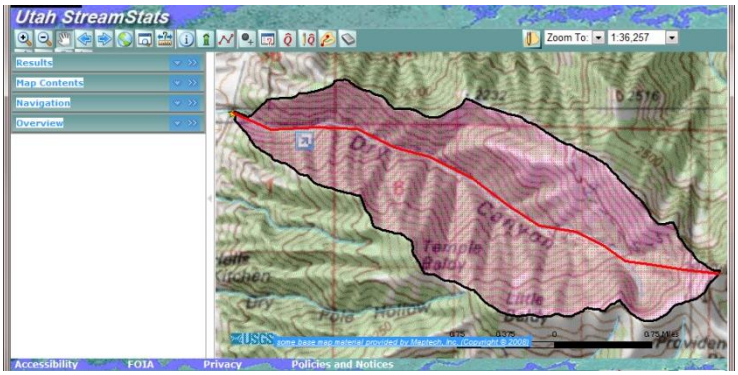
Computer use. You may use a laptop computer to access an electronic version of the textbook. You may not send emails or messages or communicate in any way with anyone other than the instructor or moderator regarding solutions to these questions.

1. Consider a watershed with silty clay loam soil and Green-Ampt parameters given in Mays Table 7.4.1 (page 317). Consider a storm where 3 cm of rainfall occurs in 2 hours. Assume that the soil is initially dry with initial moisture content equal to residual moisture content. Calculate the following using the Green-Ampt approach.

   a) The infiltration capacity after 2 cm of infiltration [3]
   b) The minimum infiltration capacity [3]
   c) Time to ponding [3]
   d) Depth of infiltration excess runoff generated from this storm [3]

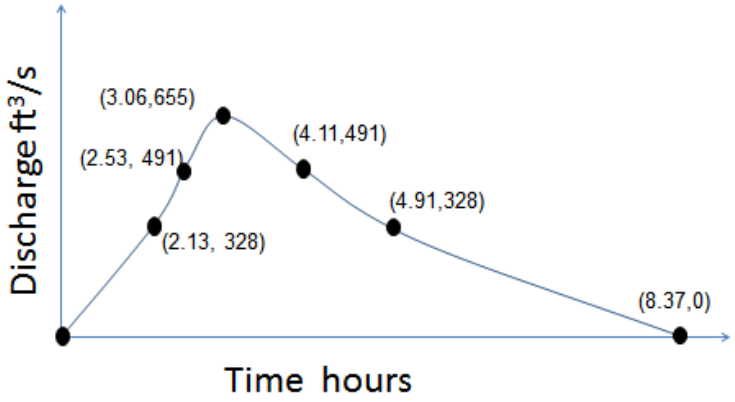
   [12 points]

2. In homework 7 you studied Logan Dry Canyon and determined a Snyder unit hydrograph that is given below



Peak $Q_p = 655\ ft^3/s$

0.5 hour Snyder Unit Hydrograph



Assume a hydrologic soil group C and land use with curve numbers as follows

Forest-range - Herbaceous (fair condition)	40 %	CN=80
Juniper-grass (fair condition)	60%	CN=73

Assume average antecedent moisture conditions. From the NOAA PDFS website (http://hdsc.nws.noaa.gov/hdsc/pfds) the 100 yr 30 min cumulative precipitation is 1.2 in and 60 min cumulative precipitation is 1.49 in. On the basis of these the hyetograph for a design storm is

Time	0-30 min	30-60 min
Rainfall	0.29 in	1.2 in

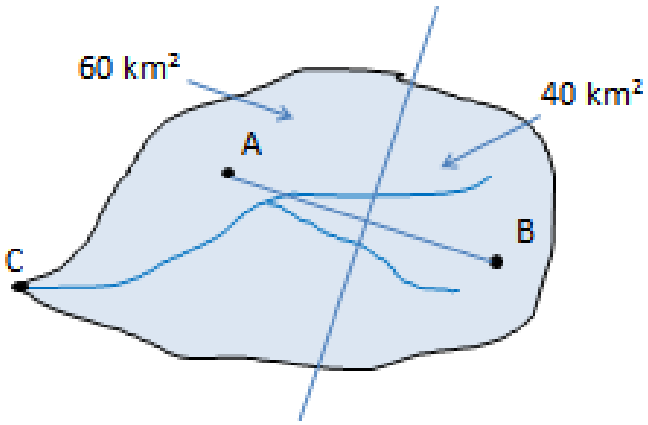
Determine the following

a) Excess precipitation in each time interval [5]

b) Peak discharge based on the Snyder Unit Hydrograph above [5]

[10 points]

3. A 100 km^2 total watershed has two precipitation gages in locations indicated



The accumulated rainfall in each gage is given below

Time (min)	A (mm)	B (mm)
0	0	0
30	0	0
60	10	5
90	25	15
120	25	20
150	25	20

An outlet hydrograph measured at location C is

Time (min)	Discharge at C (m^3/s)
0	20
60	20
120	140
180	110
240	70
360	20

Assume a constant baseflow of 20 m^3/s

a) Calculate the area average total precipitation from this storm [2]
b) Calculate the area average precipitation hyetograph for each 30 min increment from this storm [2]
c) Separate the baseflow from direct storm runoff using the assumed constant baseflow and calculate the volume and depth of direct runoff from this storm [4]
d) Assume a constant rate of abstractions and calculate the ϕ-index for this storm [3]
e) Draw a graph of the 30 min excess precipitation hyetograph for this storm [2]

[13 points]