

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

Test 2.
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Date: 4/11/2011
Time: 50 min
60 Points

Open Book. Answer all questions. **Please answer on separate sheets of paper.** You may refer to the textbook, notes, solutions to homeworks and any other written or printed reference material that you have brought with you.

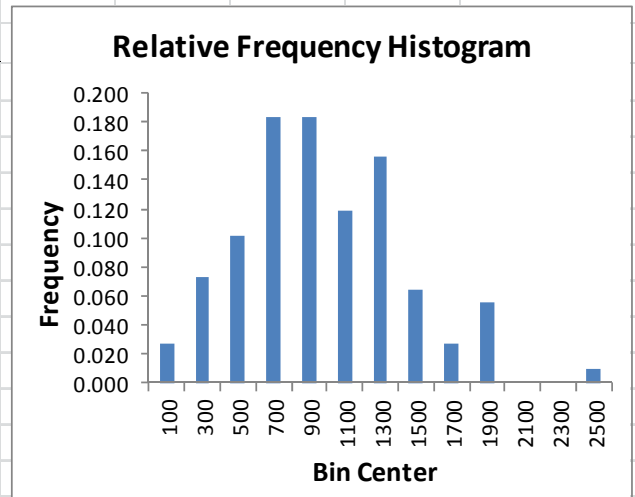
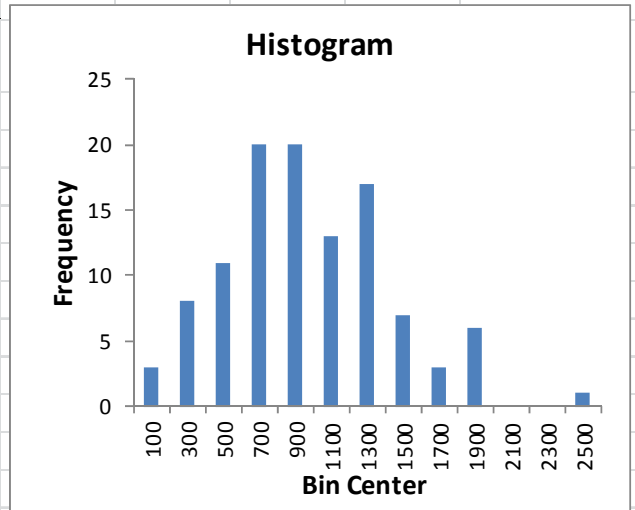
Calculator use. You may use a programmable calculator or equivalent calculating device (e.g. calculator functionality on a phone). You should limit the use of the calculating device to the performance of calculations. You may use programs that you have written to evaluate quantities commonly used in this class (e.g. infiltration rates). You may not use your calculating device to retrieve stored reference material in any form. You may not send messages or access the internet or communicate in any way with anyone other than the instructor or moderator regarding solutions to these questions. You may not use a computer.

1. In Homework 6 you studied flood frequency in the Logan River. The following page gives some of the results from this homework. The National Weather Service has determined a flow of 1800 cfs as a threshold for "moderate" flood impacts.
 - a) What is the probability of a peak annual flow greater than 1800 cfs occurring in any one year calculated directly from the data?
 - b) What is the return period of a flow of 1800 cfs calculated directly from the data?
 - c) If you assume that the City of Logan flood emergency plan is activated when a flow exceeds 1800 cfs and that this is budgeted on a five year budget cycle, **what is the probability of having to pay for flood emergency plan activation two or more times in any five year cycle?**
 - d) If you assume that Logan River peak annual flows are from a Normal Distribution, what is the return period of a flow of 1800 cfs?

[20 points]

Logan River Peak Flow Analysis from Homework 6

<i>Bin lower</i>	<i>Bin upper</i>	<i>Frequency</i>	<i>Relative Frequency</i>	<i>Cumulative Frequency</i>
0	200	3	0.028	0.028
200	400	8	0.073	0.101
400	600	11	0.101	0.202
600	800	20	0.183	0.385
800	1000	20	0.183	0.569
1000	1200	13	0.119	0.688
1200	1400	17	0.156	0.844
1400	1600	7	0.064	0.908
1600	1800	3	0.028	0.936
1800	2000	6	0.055	0.991
2000	2200	0	0.000	0.991
2200	2400	0	0.000	0.991
2400	2600	1	0.009	1.000



Logan Annual Flood Peak Statistics. Data in cfs.

	Actual Data	Log ₁₀ of Data
Mean	977.0	2.935
Variance	206107	0.05631
Std Dev	454.0	0.237
Skewness	0.589	-0.981
Number of years of flood records	109	

2. Consider the following storm

Time (hr)	0-0.5	0.5-1
Rainfall Intensity (cm/hr)	4	1

This falls over an area that has infiltration capacity given by Horton's equation with parameters: $f_0=5$ cm/hr, $f_1=1.5$ cm/hr and $k=3.5$ hr⁻¹.

Determine the infiltration and depth of runoff generated from the area in each half hour time step.

[20 points]

3. Consider a channel with Muskingum parameters: $K=3$ hr, $x=0.15$.

Given the following inflow hydrograph:

Time (hr)	Inflow (ft ³ /s)
0	0
2	20
4	8
6	0

Calculate the **peak** flow rate, **time to peak** and **volume** of the outflow hydrograph at the downstream end of the reach.

[20 points]