Assignment 6: Flooding

Name:

myUH ID#

In this assignment, you will investigate peak yearly discharges for Buffalo Bayou using data collected by a USGS stream gauge since 1949 (after construction of the Barker and Addicks reservoirs). Discharge is the amount of water flowing through a stream, given in cubic feet per second (cfs). Be sure to download the Excel file. You may need to get help from a TA in the GLC. Due Monday, April 29.

Rules Acknowledgement:

1. Before beginning the assignment, acknowledge that you know the rules of the assignment as listed above. Type "I understand answers need to be written in my own words in full sentences with the exception of values in tables. I also know screenshots/images need to be my own" **(3 pts)**

Part 1: Basic analysis of peak yearly discharge data for Buffalo Bayou

In the Excel spreadsheet, use the first tab labeled "Buffalo Bayou Discharge". This is the peak discharge in Buffalo Bayou every year since 1949 (75 years).

2. Create a scatterplot with the dates on the x-axis and the peak discharge on the y-axis. Select the scatterplot option that only has points plotted, no lines. Copy/paste your graph into the answer sheet. **(6 pts)**

3. Describe what the graph shows you (how would you explain this graph to someone else?). **(4 pts)**

4. You may be able to notice a trend or pattern in your graph. To more accurately determine that pattern, create a linear trendline and display the R-squared value. What is the R-squared value? **(3 pts)**

5. Describe the trend in your data and what it means. **(4 pts)**

6. Some people may be quick to blame climate change for this trend, for example, saying that Houston has received increased precipitation. The "Houston Rainfall" tab in the Excel document contains yearly rainfall totals for Houston since 1970. Create a scatterplot of the data with years on the x-axis and rainfall total on the y-axis. Paste your graph. **(6 pts)**

7. Create a linear trendline for this data. Has there been any significant change in the amount of rainfall that Houston received over the past 54 years? **(4 pts)**

8. Explain why the yearly peak discharge has increased even though Houston hasn't received increased precipitation. **(5 pts)**

9. **READ CAREFULLY**: There is a trend as to what month or months of the year Buffalo Bayou reaches its peak discharge, which indicates our rainy seasons. First, you'll need to determine what month each peak discharge occurs. Using the empty column A to the left of the Date column, type =TEXT(B2,"mmmm"). Copy this formula down the rows. This will extract the name of the month from each date. Now, you need to figure out how many times each month had a peak discharge on the bayou. We are going to use a new function in Excel, the countif function. The names of the months are in column G. Go to cell H2 and type =COUNTIF(A2:A$76, G2). This will look at all the names of the months in column A and tell you how many times January (which is the G2 value) appears. Copy that formula down to December to see the data for each month.

   Fill in the table: **(6pts)**

Month	**Number of Peak Discharges**
January	
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	

10. Now create a line graph of this data with months on the x-axis and the number of peak discharges on the y-axis (data from columns G and H). Use the "Line with Markers". Be sure to use the line graph, not the scatter plot. Paste your graph in the answer sheet. **(6 pts)**

11. Interpret your graph and discuss what time or times during the year Buffalo Bayou is most likely to reach its peak discharge. Which time or times of the year is it least likely to reach peak discharge? What does this say about our seasonal weather? **(4 pts)**

Part 2: In-depth analysis of flooding recurrence on Buffalo Bayou

12. In the Excel file, complete the rank column on the "Buffalo Bayou Discharge" sheet by ranking all of the peak discharges from 1 to 75, with 1 being the highest discharge and 75 being the lowest discharge. What are the dates of the highest and lowest peak discharges? **(4 pts)**

Date of highest discharge (1):
Date of lowest discharge (75):

13. Now, calculate the recurrence intervals for each discharge (nearest whole number). N is the number of years on record (75), and m is the rank. What are the recurrence intervals (R) for the following peak discharges? **(6 pts)**

Date	Discharge	R
5/26/15	17,400	
9/13/08	10,100	
3/12/97	7,650	

14. Create a scatter plot with recurrence interval on the x-axis and discharge on the y-axis. Copy and paste your graph in the answer sheet. **(8 pts)**

15. Which type of trendline best fits this data? Look for the one with the highest R-squared value. **(3 pts)**

16. Add the trendline and show the line equation and R-squared value. What is the R-squared value for this data? **(4 pts)**

17. You've probably heard that Hurricane Harvey was a 100+ year storm event. However, your current graph doesn't show that. In your data, what is the recurrence interval for the flooding from Hurricane Harvey, and why isn't it over 100? **(5 pts)**

18. Using your trendline equation, you can calculate what the discharge of a 100-year event should be. You know what m, x, and b are in the equation; substitute the values. What is the discharge for the 100-year event based on the trendline? **(4 pts)**

19. Compare the highest discharge in Buffalo Bayou (row 70, 8/28/17) to what you calculated a 100-year event should be. What is the difference. Should hurricane Harvey be great than or less than a 100-year event? **(5 pts)**

20. So, what is the true recurrence interval for the discharge seen during Hurricane Harvey? For this question, we'll need to solve for x in the line equation instead of y because now we know what y is (32,600 cfs), and we need to figure out x. You can manipulate the line equation variables with algebra to isolate x; we've done this on several previous assignments. Enter this equation in excel =exp((y-b)/m) and substitute the y, b, and m values accordingly. What is the recurrence interval for the stream discharge associated with Hurricane Harvey? **(5pts)**

21. Complete this questionnaire about assignments and the use of Excel and Google Earth in this class. You'll need to be logged into your cougarnet account. **(5 pts)**