UTSC **2019-2020**

EESB04
"PRINCIPLES OF HYDROLOGY", Professor Mitchell

ASSIGNMENT #1: Rainfall data analysis
(Total Marks: /49)

You are provided records of rainfall for this assignment in Quercus in Microsoft Excel format. One of the files ("Hourly Precip Data June 2018.xlsx") is rainfall collected at hourly intervals at a particular site covering the month of June 2018. The other file ("Daily Precip Data.xls") is rainfall data collected at the same site, but at a daily time scale for the entire year of 2018. All of the precipitation data in these files is in mm. I have left other data in the files to help you out if you really want to dig deep. Use these two data files and knowledge gained both in tutorial and lecture to answer the questions in this assignment. Be mindful of significant digits and that Excel generally does NOT deal with precision / significant digits correctly. This assignment is worth 10% of your final grade.

A. Analysis of Annual Precipitation (use "Daily Precip Data.xlsx") (15 marks)

1. Using the file called "Daily Precip Data.xls", make a hyetograph (1-day intervals) for all of 2017 using Excel or a similar spreadsheet program. (5 marks)

2. What was the total annual precipitation at this site (in mm)? (1 mark)

3. Given that this precipitation fell in a watershed that has an area of 9672 hectares, how many km^3 of water fell in this watershed during 2018? (2 marks)

4. Given that annual evapotranspiration from this watershed during 2017 was 617 mm, that there was net accumulation of groundwater in the watershed of 23 mm and that storage decreased (it became more dry) in the watershed by 26 mm over this period what was the likely runoff from this watershed during 2018 (in m^3)? (3 marks)

5. Given the total precipitation amount and runoff at this site, ascribe what type of climate (humid-temperate, rainforest, or desert) it is and where you think (geographically) this rain gauge might be located. Why do you say this? (4 marks)

B. Rainfall Intensity and Duration Analysis (use "Hourly Precip Data June 2018.xls") (19 marks)

1. Given the data for June 4 and June 10 only, find the *maximum* amount of rain to fall in 1, 2, 3, 6, 12, and 24 hours (do not cross outside of the date), *and* find the rainfall intensity during each of these periods. For ease of formatting, provide your answer in two separate tables (1 for each date) using the headings below. For an example calculation, show how you calculated maximum rainfall intensity over 3 hours only. (7 marks)

Date __/__/__

Duration (hours)	Amount of precip. (mm)	Precip intensity (mm/hr^{-1})

2. Plot intensity against duration for both events as a scatterplot graph (i.e. 6 points for each chart) *on the same graph* using logarithmic y and x scales. Run a line of best fit through your data (one that looks linear when both axes are logarithmic) and provide the equation for each line and its associated R^2 coefficient. Describe the relationships you observe for both periods. Make sure to label and annotate your charts properly. (8 marks)

3. Ascribe mechanisms to the events (i.e. what type of rainfall producing mechanism might have resulted in charts such as these). Why do you think this? (4 marks)

C. Tipping Bucket Rain Gauges (10 lines text maximum) (5 marks)

1. Describe how a tipping bucket rain gauge works. For the data given here, what depth of rainfall do you think is represented by a single tip? (5 marks)

ATTENDANCE AT TUTORIALS #0 AND #1: (/10)