**Swinburne University of Technology**

**School of Engineering**

**CVE30001 – Urban Water Resources**

**Assignment 1**

Submission Deadline: 30 March, 2022 by 11.59pm.

Before you start, you need to use two multipliers “1.X” and “1.Y”. “X” and “Y” are the fourth and fifth digits of your student ID. If any of the numbers (X, Y) is “0”, then use “05” instead, i.e. if your fourth digit is “0”, your “1.X” is “1.05”.

Flow in an urban stream has been measured continuously using an automatic stream gauge between 31/07/1971 and 25/03/1996. The maximum daily stream flow recorded each day during this period is provided in the file “Assignment 1 Data.xls”. In the file multiply the flow values with 1.X for the years 1971-84 and with 1.Y for the years 1985-96. As there are numerous data, it is recommended that you use Excel.

Do the following with your data:

**Annual Series Flood Frequency Analysis**

a) Find the maximum flood for each year of record, rank these floods from highest to lowest magnitude and calculate the log10 for each flood magnitude.

b) Calculate the mean (*M*), standard deviation (*S*) and coefficient of skewness (*g*) for each log10 flood value. In Excel, to calculate “M” use “=Average (…)” function, to calculate “S” use “=STDEV (….)” function and to calculate “g” use “=SKEW (…)” function.

c) Determine the frequency factors (Ky) for 50 years and 100 years ARI. The frequency factors from Australian Rainfall and Runoff (2000) are also provided in the file “Assignment 1 Data.xls”. You may have to interpolate between the given values, to find the appropriate value for your “g”.

d) Estimate flood discharges for 50 years and 100 years ARI using ‘Analytical method’ (Analytical equation provided in the lecture slides).

e) Rank each of these floods assigning “m” value (m=1 for highest flood and m=2 for the second highest flood and so on). Calculate the plotting position (for Annual Series Flood Frequency Analysis) for each flood event (Equation provided in the lecture slides). Plot them on a graph, in X-axis AEP (log scale) and in Y-axis flood values (normal scale).

f) Extend the graph and estimate flood discharges for 50 years and 100 years AEP using Graphical method.

**Partial Series Flood Frequency Analysis**

g) Define a flood threshold and find the set of independent floods that exceed this threshold. Set the threshold so that you have at least one flood for each year of record (i.e. extract all the annual maximum values, then the smallest value among all these values can be a threshold).

h) Rank each of these floods from highest to lowest magnitude, assigning “m” value (m=1 for highest flood and m=2 for the second highest flood and so on).

h) Calculate the plotting position for each flood event and plot on a graph, with the flood magnitude on the Y axis (normal axis), versus plotting position (ARI) on the X axis (log scale).

i) Fit a line of best fit (Trendline in Excel) through the data values. Adopt the logarithmic trendline, which should be a straight line on your graph. Remember to include the trendline equation on the graph.

j) Estimate the 50 years and 100 years ARI discharges that you would expect in the stream.

k) Compare the 100 years ARI flood discharges estimated in different methods.

You can submit your Excel sheet with solutions, you need to have a final page showing the following table.

|  |  |  |
| --- | --- | --- |
|  | Q50 | Q100 |
| Annual Series (analytical) |  |  |
| Annual Series (graphical) |  |  |
| Partial Series (graphical) |  |  |