Assignment #1
CE 764 Hydroinformatics
Fall 2017.
Maximum marks: 10. Due Date: 11 pm, 6 Aug, 2017.
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Question 1 [2 Marks]

i. Write an expression for computing the sum of even integers from 1 to 100.
ii. Write an expression for computing the square of the sum of 150 numbers equally spaced from 1 to 10.
iii. Create a vector Z = [5 4 2 *x y*], where x= last but one digit of your roll number, y = last digit of your roll number. Switch the 1st and the 3rd elements between themselves. Add 2 to the 2nd, 4th & 5th element of the new vector obtained.

Question 2 [2 Marks]

i. Create a matrix Y = $\begin{bmatrix} x & 6 & 8 \\ 7 & y & 1 \\ 3 & 9 & 2 \end{bmatrix}$. Subtract 2 from the first row. Replace 1st column by 2nd, 2nd column by 3rd and 3rd column by 1st. Add 21 to the element corresponding to 2nd row and 2nd column.
ii. Write a 'for' loop to convert the matrix Y (given in **2.i**) to a matrix of dimension [row=1, column=9] such that each row is horizontally concatenated one after the other.

Question 3 [3 Marks]

i. Write a function called 'trans' that takes as input a matrix Y and returns the transpose of Y.
ii. Write another function that takes as input a matrix Y, and the returns the product of Y and the transpose of Y. The function should call 'trans' (ref **3.i**).

Question 4 [3 Marks]

Given is a dataset of area-weighted seasonal and annual rainfall (in mm) for 6 meteorological subdivisions (SD) from 2001 to 2010. The SDs are 1. Assam & Meghalaya, 2. Bihar, 3. Uttaranchal, 4. West Rajasthan, 5. Marathwada and 6. Telengana. (*Source: https://data.gov.in/catalog/area-weighted-monthly-seasonal-and-annual-rainfall-mm-36-meteorological-subdivisions.*)
Import the dataset into the programming workspace. Choose a pair of subdivisions (A, B) to analyse. Students with roll numbers ending in an even (odd) digit, choose both subdivisions with even (odd) subdivision ID. Mention clearly the subdivision(s) chosen for analysis.

i. Generate a scatter plot of June-September seasonal rainfall (one value every year) for subdivision A for the years 2001-2010. On the same figure, plot the June-September seasonal rainfall for subdivision B with a different colour. Also, write a script to generate the following features in the figure.
    a. Use appropriate axes limits
    b. Label the axes
    c. Insert legend
    d. Give a title for the plot.
ii. Plot a pie-chart showing contribution of each season to the total annual rainfall for the year 2005 in subdivision B. Write a script to execute the following tasks.
    a. Generate the pie chart
    b. Label the pie chart
    c. Give a title for the plot.
iii. Mark the average annual rainfall for the period 2001-2010 in the 6 sub-divisions on a map of India using the following color-coding scheme: average annual rainfall <400mm (red), 400-1000mm (yellow), 1000-2000mm (green) and >2000mm (blue). In the figure, each subdivision's area (read from the shapefiles) should be coloured according to the value of the average annual rainfall for the subdivision. The *.shp* files for the boundary map for India and for the boundary map of the subdivisions are provided.

-----Violation of honour code will result in penalty------
**********End**********