**Date: 2024-02-11**

**Assignment 4**

This assignment consists of the programming questions related to the topics of week 1 and week 2. The main topics of questions are: Python numpy and pandas.

All the students are required to follow the format of the program as specified in the guideline below.

1. All the programs should have initial **doc string** comment (‘’’ description of program‘’’) mentioning what your program will do.
2. Try to maintain single/multi-line comments in the place where needed to make the program understandable.
3. Maintain proper indention and newline spaces to increase the readability of the program.
4. The deliverable are 2 type of files (a single word file and multiple python program files):
   1. Separate python program files with **.py** extension (e.g. program\_name.py). Provide a relevant name to your program file on the basis of functionality of the program.
   2. A word file describing the working of all the programs according to their number. The details required in this is the description of program, screenshot of the testing (input given and output obtained in the execution environment such as IDLE or Command prompt or terminal whichever you prefer.). It is preferred that you work with multiple inputs and outputs.

**Questions**

1. Write a program to generate a numpy array of numbers (e.g. [1, 2, 3, 4, 5]). Perform the numpy array operations on it such as:
   1. Sum of elements in array
   2. Average of elements in array
   3. Identify maximum and minimum values in the array
2. Write a program to input a array of numbers from the user (at least 10 elements in list), sort them and perform slicing operations to get elements between indexes such as 2-5, 5-8, 2-9.
3. Create an array of random integer numbers as a numpy array, sort them and perform operations such as reshaping of the array into matrix of feasible dimensions. (e.g., if we have an array of 1 \* 10, then we can reshape it into 2 \* 5 or 5 \* 2 matrix.) [Hint: Use the array of reshape (row \* column) ]
4. Write a program to input 2 matrices of certain dimensions and perform the matrix operations such as additions, subtraction, multiplication using numpy. Validation of matrix size should be done before the operations are performed. Mismatch of size for operations should raise the exception.
5. Write a program to read the csv file “weight\_height.csv” using Pandas. Plot the data as a scatterplot (weight vs height, age vs weight, height vs age, gender vs height, gender vs weight) using Matplotlib library.
6. Read the data from csv file “weight\_height.csv” in a data frame using Pandas. Add 2 additional columns (BMI and Risk) in the existing dataframe. Add the data according to the calculations given below.

BMI = Weight / Height

Risk values vary according to the conditions given below:

BMI less than 18.5 : Nutrient deficient

BMI between 18.5 and 24.9: lower risk

BMI between 25 and 29.9: Heart disease risk

BMI between 30 and 34.9: Higher risk of diabetes, heart disease

BMI 40 or higher: Serious health condition risk

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***End of Assignment 4** \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*