Python Programming (FM-409) G2

BS Financial Mathematics

University of Karachi

Lecturer: Engineer Syed Umaid Ahmed **Time Allowed: 3 hours**

Note: Attempt any five questions. Each question carries equal marks. **Total Marks: 50**

Question no.1: **(10 marks)**

Write a code to explain arithmetic operators with example. Make a simple calculator using functions in Python Programming. It is necessary to use at least two arguments with input function as a must.

OR

Use a list comprehension to square each odd number in a list. The list is input by a sequence of comma-separated numbers.

Suppose the following input is supplied to the program:

1,2,3,4,5,6,7,8,9

Then, the output should be:

1,3,5,7,9

Question no.2: **(10 marks)**

Write a function that will calculate the 107^{th} term of the given Geometric Progression and also calculate the sum of given Arithmetic Progression to 100 terms. The mathematical formula for the geometric progression and Arithmetic Progression is given below:

$$\boldsymbol{T_n = ar^{n-1}}$$

$$\boldsymbol{S_n = \frac{n}{2}[2a + (n-1)d]}$$

GP Sequence: **2, 4, 8, 16, 32, ...**

AP Sequence: **1, 3, 5, 7, 9, ...**

Question no.3: **(10 marks)**

Write a program to print output of any two of these patterns.

```
*          * * * * *          *
* *        * * * * *        * * *
* * *      * * * * *      * * * * *
* * * *    * * * * *      * * *
* * * * *  * * * * *        *
```

Question no.4: **(10 marks)**

Write a program using tkinter library that will generate a screen with five to seven buttons. The buttons will be properly arranged using grid function. On the 7th button, use built-in function to close the Graphical User Interface (GUI) automatically.

OR

Make a simple feedback form or calculator using tkinter library.

Question no.5: **(10 marks)**

Write a program that will use numpy library to generate matrices. After generating two valid matrices. Calculate the determinant, Inverse and multiplication result of both of them.

It is necessary to calculate the solution of **AX=B** using numpy linear algebra function.

Question no.6: **(10 marks)**

What is Linear Regression Model? How we can predict the home price or GDP of a country using the concept. We have an excel sheet named as 'predictions.csv'. Write a python program that will help in performing these tasks.

(a) Details of rows and columns
(b) Calculate the Mean, Median and Standard Deviation of each column
(c) Find the maximum and minimum values
(d) Write a simple technique to drop the unnecessary data

Question no.7: **(10 marks)**

Write a function that will check whether the input word is a palindrome or not. Use the concept of functions and list. Explain the output of the program using valid comments or flowchart.

OR

Write a short piece of code that will calculate the integral of the given expression. It is required to use scipy library and numpy function to calculate the final solution.

$$\int_{0}^{1} 4x^3 - 12x^2 - 4x + 12 \; \boldsymbol{dx}$$

Question no.8: **(10 marks)**

How we can solve Sudoku puzzle in the shortest possible time? Write three rules and you have learned to solve it. For the given output, write a program to find and print zero's location in Python IDLE. Also solve this puzzle manually.

```
0 0 0 | 5 2 0 | 0 0 9
0 2 0 | 0 2 8 | 0 3 0
0 0 0 | 0 0 0 | 4 7 0
- - - - - - - - - - -
0 0 0 | 0 3 4 | 0 0 0
0 8 0 | 6 0 2 | 0 0 0
4 6 0 | 0 7 1 | 0 0 0
- - - - - - - - - - -
1 4 0 | 0 0 0 | 0 0 6
0 0 0 | 0 0 7 | 0 2 0
7 0 0 | 0 0 0 | 0 9 0
```