Software Engineering (663) Python Programming

MSc Department of Mathematics

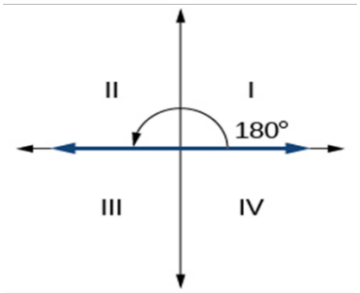
University of Karachi

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)**

(a) Write a short piece code to control the fan of the servo motor. There should be a continuous movement from 0° to 180° and 180° to 0° in forward and reverse directions (both). Use "for" and "while" loop with range function to print the angle values.



(b) Write the use of each of the following libraries namely numpy, matplotlib, scipy, math, sklearn.

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

Write a function that will calculate the 407th term of the given Geometric Progression and also calculate the sum of given Arithmetic Progression to 100 terms. The mathematical formulae for the geometric progression and Arithmetic Progression are 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: **88, 78, 68, 58, 48, ...**

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

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

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

(b) Find the sum of all the numbers present in a list using "for" and "while" loop in the given list.

numbers = [6, 5, 7, 12, 14, 67, 98, 12, 9]

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

(a) Write a program using tkinter library that will act as a data collection or feedback unit having at least 5 entries with a submit button. It should have the capability to save all the data in a separate *.txt file on closing.

OR

Make a simple calculator using tkinter library.

(b) What is the difference between **"="** and **"= ="**? Explain both of the operators using relevant programming examples. Also write one line about the significance of **" ! = "** and " ** ".

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

Write a program that will print all the values from the trigonometric function of $Sin\theta$. The values of θ ranges from $-\pi$ to $+\pi$. It will take around 50 steps to find all the values. Use the *linspace function* and *numpy library* to perform all the steps.

It is necessary to plot all the results on a graph. Assign the title, legend and labeling on both axes.

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
(e) Write any one use of bar plot and scatter plot

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

(a) Write a function that will check whether the input word is a palindrome or not. Use the concept of functions and list. The input function can be used as a plus. Explain the output of the program using valid flowchart.

It is necessary to explain the written piece of code using suitable comments.

Hint: A palindrome is a word, number, phrase, or other sequence of characters which reads the same backward as forward, such as madam or racecar.

(b) Write a short piece of code that will calculate the double integral of the given expression. It is required to use scipy library and numpy function to calculate the final solution. Also solve the given question manually.

$$\int_{\pi}^{2\pi} \int_{0}^{\pi} y\,sin(x) + x\,cos(y)\,dy\,dx$$

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

(a) How we can solve Sudoku puzzle in the shortest possible time? Write three rules and also name the algorithm you have learned to solve it. For the given output, write a program to print this output in Python IDLE. Also write a function to find empty values i.e., zeros positions in the given puzzle.

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

(b) Solve the above puzzle manually first and then write the logic in form of pseudo code to check for the basic three rules of the sudoku puzzle defined in Backtracking Algorithm.

The best preparation for tomorrow is doing your best today

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