DHANAMANJURI UNIVERSITY

Examination- 2025 (June)

Four-year course B. Sc./B. A 6th Semester (NEP)

Name of Programme : **B.Sc./B. A Mathematics**
Paper Type : **SEC (Theory)**
Paper Code : **SMA-011**
Paper Title : **Python Programming**
Full Marks : **32**
Pass Marks : **12**
Duration: 2 Hours

The figures in the margin indicate full marks for the questions:

1. Choose and rewrite the correct answer for each of the following: $1 \times 4 = 4$

i) Python is a
   a) Symbolic computation software
   b) Numerical computation software
   c) General purpose programming language
   d) Visualization software

ii) Which of the following gives the ASCII value of the character "A"?
   a) chr(A)
   b) ord(A)
   c) chr('A')
   d) ord('A')

iii) Which one of the following is mutable?
   a) String
   b) Tuple
   c) Int
   d) List

iv) The python code to open a file for writing is
   a) file=open("Demo.txt", "r")
   b) file=open("Demo.txt", "w")
   c) file=open("Demo.txt", "a")
   d) file=open("Demo.txt")

2. Write very short answer for each of the following: $1 \times 4 = 4$

i) Write in brief the purpose of input function in python.
ii) Write python code to add the number 5 to the tuple myTuple = (1, 2, 3, 4).
iii) Write in brief the properties of set class.

iv) Write python code to find the matrix multiplication of matrices M and N along with the import of python package containing the function for matrix multiplication.

3. Write very short answer for each of the following: $4 \times 3 = 12$

i) Write a python program to bubble sort and display the contents of the list MyList = [30, 50, 45,1,6,3,20, 90, 78] before and after sorting.

ii) Write a python program to implement Newton Raphson method using recursive function to approximate the solution of $x^3 - 4x - 9 = 0$ to within a tolerance of 1e-6 starting at $x_0 = 2.5$.

iii) Write a python program to implement Simpson's three-eighth rule to approximate $\int_0^{\pi} sinx\, dx$ with 13 evenly spaced grid points over the whole interval and display the error in the approximated value from the exact value.

4. Answer any two of the following questions: $6 \times 2 = 12$

i) Write a python program to make a 2 by 3 subplot of scatter plot, bar plot, stem plot, histogram, box plot and pie plot of the data: x = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12] and y = [4, 6, 8, 12, 18, 24, 20, 22, 14, 8, 4, 6] with proper labelling and title.

ii) Write a python program to solve the following system of linear equations using Gauss–Seidel method with a tolerance of $\varepsilon = 0.01$

$$5x_1 + 2x_2 + x_3 = 12,$$
$$x_1 + 4x_2 + 2x_3 = 15,$$
$$x_1 + 2x_2 + 5x_3 = 20$$

iii) Write a python program to approximate the solution of the differential equation $\frac{dy}{dx} = x + y$ with the initial condition $y(0) = 1$ using the Runge-Kutta fourth order method between 0 and 1 in increments of 0.1. Find the exact solution and plot both the approximated solution and the exact solution in the same figure.

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