DHANAMANJURI UNIVERSITY

Examination- 2026 (June)

Name of Programme : **B.A./ B.Sc. Mathematics**
Semester : **6th**
Paper Type : **SEC**
Paper Code : **SMA-011**
Paper Title : **Python Programming**
Full Marks : **30**
Pass Marks : **12**
Duration: 2 Hours

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

1. Choose the correct one and rewrite it from the following: $1 \times 3 = 3$

a) What does the Floor Division (//) operator return when applied between two operands of type int?

i) Float ii) Complex
iii) Int iv) The remainder

b) To improve readability and management, a large program can be divided into small independent modules called:

i) Expressions ii) Statements
iii) Functions iv) Libraries

c) Simpson's Three-eighth Rule approximates the area over three consecutive subintervals by fitting which type of polynomial?

i) A linear polynomial ii) A quadratic polynomial
iii) A cubic polynomial iv) A constant function

2. Write very short answer for *each* of the following: $1 \times 3 = 3$

a) What are the loop statements that Python provide?

b) What is the primary purpose of the 'return' statement in a Python function?

c) Write python commands to find the second order derivative of $f(x) = sin(x)$ with respect to x symbolically.

$3 \times 3 = 9$

3. Answer the following:

a) Differentiate between python modules and packages. 3

Or

What are python tokens? Explain briefly the various categories of python tokens. 1+2=3

b) Write a python function that calculates the factorial of a number recursively. 3

Or

Write a python program to return prime numbers from the list, myList = [3, 17, 9, 2, 4, 8, 97, 43, 39]. 3

c) Write a python function mybisection(f, a, b, tol) that approximates a root r of function f, bounded by a and b to within $\left|f\left(\frac{a+b}{2}\right)\right| < \text{tol}$. 3

Or

Write a python program to implement Simpson's one-third rule to approximate $\int_0^{\pi} cos\ x\ dx$ with 11 evenly spaced grid points over the whole interval and also display the error in the approximated value from the exact value. 3

4. Answer the following: $5 \times 3 = 15$

a) What is an algorithm? Explain briefly the properties of an algorithm. Write an algorithm to compute the average of ten numbers. 1+2+2=5

Or

What is a flowchart? Explain briefly the commonly used flowchart symbols. Draw a flow chart to find the sum of first 10 natural numbers.

b) Write a python program to convert a decimal number to its equivalent binary number. 5

Or

Write a python program to make a 1 by 2 subplot of 3D plots - surface plot and wireframe plot of the surface $z = sin(x) \cdot cos(y)$ within the rectangular region $-5 \leq x, y \leq 5$ with a title of each plot.

c) Write a python program to find the Lagrange's interpolating polynomial for the data points x = [0, 1, 2], y = [1, 3, 2] using the lagrange function from SciPy and plot the interpolating polynomial together with the given data points with proper title and labels. 5

Or

Write a python program to find the numerical derivative of the function $y(x) = cos(x)$ in the interval $[0, 2\pi]$ using forward difference and plot it together with the actual derivative for comparison.

*****