



Gandhi Institute of Engineering and Technology University, Odisha, Gunupur (GIET UNIVERSITY)

M.Sc. (Second Semester – Regular/Supplementary) Examinations, May – 2026

24MPEMA12004 – Programming Using Python

Mathematics

Time: 3 hrs

Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A

(2 x 5 = 10 Marks)

Q.1. Answer **ALL** questions

	CO #	Blooms Level
a. Justify why Python lists are mutable but tuples are immutable with one use-case each.	CO1	K2
b. Explain LEGB rule of variable scope with example.	CO1	K2
c. How does polymorphism improve code reusability?	CO2	K2
d. What problem does NumPy broadcasting solve?	CO3	K2
e. When would you prefer contour plot over line graph?	CO4	K2

PART – B

(10 x 5 = 50 Marks)

Answer **ALL** the questions

	Marks	CO #	Blooms Level
2. a. A number is said to be “special” if it satisfies: Design a Python program to identify all such numbers in a given range and justify your logic	5	CO1	K4
b. Develop a program to approximate the value of e using series expansion up to n terms. Analyze the accuracy for increasing n . (OR)	5	CO1	K4
c. Explain the role of higher-order functions in functional programming. Illustrate using <code>map()</code> and <code>filter()</code> .	5	CO1	K3
d. Write a Python program to generate all prime numbers within a given interval using an optimized approach.	5	CO1	K3
3.a. Design a class Matrix with operations: addition, multiplication, and transpose. Explain how abstraction is achieved.	5	CO2	K4
b. Implement binary search and experimentally compare its performance with linear search for large datasets. (OR)	5	CO2	K4
c. Derive the recurrence relation for Tower of Hanoi and verify it using a Python program.	5	CO2	K4
d. Implement merge sort and trace execution for a non-trivial input. Comment on stability and efficiency.	5	CO2	K4
4.a. Explain how vectorization in NumPy improves computational efficiency over Python loops.	5	CO3	K3
b. Given a matrix, compute its determinant, inverse, and rank using NumPy and interpret the results. (OR)	5	CO3	K4
c. Discuss grouping and aggregation in Pandas with real-life dataset scenarios.	5	CO3	K3

d.	Write a program to clean a dataset (handle missing values, duplicates) and compute correlation matrix.	5	CO3	K4
5.a.	Compare different visualization techniques (line, scatter, histogram) for representing mathematical data.	5	CO4	K4
b.	Plot $y = e^{-x} \sin(x)$ over a suitable interval and analyze behavior.	5	CO4	K4
(OR)				
c.	Explain contour plotting and its use in representing multivariable functions.	5	CO4	K4
d.	Given a dataset, visualize distribution using histogram and boxplot and infer skewness.	5	CO4	K4
6.a.	Explain exception hierarchy in Python and design a custom exception for invalid matrix operations.	5	CO2	K4
b.	Write a Python program to read a text file, compute word frequencies, and handle all possible exceptions.	5	CO2	K4
(OR)				
c.	Analyze stack and queue operations in terms of time complexity and real-world usage.	5	CO2	K4
d.	Implement stack using Python and simulate expression evaluation	5	CO2	K4
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