

**M. Sc. IN DATA SCIENCE AND
ANALYTICS (MSCDSA)
Term-End Examination
June, 2026**

**MCS-063 : DATA STRUCTURES USING
PYTHON**

Time : 3 Hours

Maximum Marks : 100

Note : *Question No. 1 is compulsory. Attempt any **three** questions from the rest. All programs should be written nearer to Python programming language.*

1. (a) Explain the principles for designing classes in Python. 10

- (b) Explain the difference between mutable and immutable data types in Python. Provide an example of each. 10
- (c) Define a Python Class named RECTANGLE with attributes 'Length' and 'Width'. Include a method 'Area()' to calculate the area and demonstrate how to instantiate an object of this class. Make necessary assumptions. 10
- (d) Define Recursion. What are the *two* essential components every recursive function must have to work correctly and avoid infinite loops ? 10
2. (a) Define Asymptotic analysis and explain the significance of Big-O notation in measuring algorithm performance with the help of suitable example. 10

- (b) Determine the time complexity (in Big-O notation) for the following scenarios :
- (i) Accessing an element in an array by its index. 4
 - (ii) Searching for an element in an unsorted list of 'n' elements using linear search. 3
 - (iii) Standard matrix multiplication of two $n \times n$ matrices. Make necessary assumptions. 3
3. (a) Compare and contrast Python 'Lists' and 'Tuples'. Also, indicate a scenario where a tuple is preferred over a list. 10
- (b) Explain the concept of 'Amortized Time Complexity' in the context of dynamic array resizing. 10
4. (a) Explain the LIFO and FIFO principles. Indicate the data structures which follow the above principles. 10

- (b) Describe an application of the following data structures : 10
- (i) a Stack and
- (ii) a Queue
5. (a) Explain the three types of traversals of Binary Trees, namely, Pre-order, In-order and Post-order with the help of an example. 10
- (b) Explain the properties of a Binary Heap. How is a Min-Heap used to efficiently implement a Priority Queue ? 10

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