

Dr. Babasaheb Ambedkar Open University
Term End Examination January – 2026

Course	: BSCIT	Date	: 06/03/2026
Subject Code	: BSCIT-203	Time	: 11:30am to 01:45pm
Subject Name	: Data Structure	Duration	: 02.15 Hours
		Max. Marks	: 70

Section A

Answer the following (Attempt any three)

(30)

1. Define Data Structure. Explain the difference between Linear and Non-Linear data structures with appropriate examples for each.
2. What is a Stack? Write a C program to implement the PUSH and POP operations of a stack using an array.
3. Explain the concept of a Binary Search Tree (BST). Demonstrate the step-by-step insertion of the following values into an empty BST: 45, 22, 77, 11, 33, 66, 88.
4. What is a Sparse Matrix? Explain how a sparse matrix is represented in memory to save space compared to a conventional 2-Dimensional array.
5. Explain Dijkstra's Shortest Path Algorithm. Describe its application in computer networking for routing data packets.

Section B

Answer the following (Attempt any four)

(20)

1. Differentiate between a Singly Linked List and a Doubly Linked List. Highlight the advantages of a Doubly Linked List in terms of traversal.
2. Explain the Bubble Sort algorithm. Provide a tracing example showing the first two iterations for the array: [56, 22, 76, 18, 11].
3. Define an AVL Tree. Explain the importance of the balance factor and why height balancing is necessary in search trees.
4. Compare and contrast Linear Search and Binary Search in terms of their requirements and time complexities.
5. What is Hashing? Explain how hashing techniques are used to access records directly in a file structure.
6. Explain the basic operations performed on a Queue (Enqueue and Dequeue) and the FIFO principle.

Section C

Part – A (Multiple Choice Questions)

(10)

1. Which data structure follows the LIFO (Last In First Out) principle?
A) Queue B) Stack C) Array D) Tree
2. The address of the first node in a Linked List is typically stored in a pointer named:
A) Tail B) Head/First C) Null D) Next
3. In a Binary Search Tree, the left child of a node is always:
A) Greater than the parent B) Smaller than the parent C) Equal to the parent D) None of these

4. Which sorting algorithm uses a "Pivot" element to partition the array?
A) Bubble Sort B) Quick Sort C) Insertion Sort D) Selection Sort
5. A matrix where most of the elements are zero is known as a:
A) Identity Matrix B) Sparse Matrix C) Scalar Matrix D) Symmetric Matrix
6. What is the time complexity of a Binary Search algorithm?
A) $O(n)$ B) $O(\log n)$ C) $O(n^2)$ D) $O(1)$
7. A Circular Queue is used primarily to solve the problem of:
A) Underflow B) Memory wastage in linear queues C) Overflow D) Slow searching
8. Depth First Search (DFS) traversal in a graph is implemented using which data structure?
A) Queue B) Stack C) Linked List D) Array
9. The process of visiting every node in a tree exactly once is called:
A) Sorting B) Traversal C) Hashing D) Mapping
10. Which of the following is a non-linear data structure?
A) Stack B) Queue C) Graph D) Linked List

Part – B (State whether the following statements are true or false)

(10)

- 1 Array indices in the C programming language always start from 0.
- 2 A Queue data structure follows the FIFO (First In First Out) principle.
- 3 In a Singly Linked List, it is possible to traverse the list in both forward and backward directions.
- 4 Hashing is a technique used to calculate the direct location of a data record on a disk.
- 5 A Tree is a cyclic data structure with a parent-child relationship.
- 6 In a stack implementation using an array, the 'top' variable is initialized to -1 when the stack is empty.
- 7 Merge Sort is an example of an internal sorting technique.
- 8 Breadth First Search (BFS) uses a Stack data structure for its implementation.
- 9 An AVL Tree is a height-balanced Binary Search Tree.
- 10 Deletion in a Linked List requires contiguous memory shifting of all subsequent elements.
