What is the time complexity of accessing an element in an array?

1. O(1)
2. O(n)
3. O(log n)
4. O(n log n)

Answer: A) O(1)

2. Which data structure uses LIFO (Last In First Out) order?

1. Queue
2. Stack
3. Array
4. Linked List

Answer: B) Stack

3. Which of the following is a disadvantage of an array?

1. Fast access time
2. Fixed size
3. Easy to implement
4. Allows dynamic resizing

Answer: B) Fixed size

4. Which data structure is best for implementing a recursive function?

1. Queue
2. Stack
3. Array
4. Linked List

5. What is the worst-case time complexity of a binary search?

1. O(n)
2. O(log n)
3. O(n log n)
4. O(1)

6. Which of the following algorithms has the best time complexity in sorting?

1. QuickSort
2. MergeSort
3. InsertionSort
4. BubbleSort

7. Which of the following is NOT a characteristic of a linked list?

1. Dynamic size
2. Random access
3. Insertions and deletions are easier than arrays
4. Uses pointers

8. What is the time complexity of inserting an element at the beginning of a singly linked list?

1. O(1)
2. O(n)
3. O(log n)
4. O(n log n)

9. What is the space complexity of a binary tree?

1. O(n)
2. O(log n)
3. O(1)
4. O(n^2)

10. Which of the following is a non-linear data structure?

1. Array
2. Stack
3. Tree
4. Queue

11. What is the primary advantage of a hash table?

1. It allows quick searching
2. It allows quick insertion
3. It allows sorting
4. Both A and B

12. Which of the following is an example of a divide and conquer algorithm?

1. Bubble Sort
2. Merge Sort
3. Selection Sort
4. Insertion Sort

13. In a priority queue, which element is removed first?

1. The element with the lowest priority
2. The element with the highest priority
3. The first inserted element
4. The last inserted element

14. Which of the following is a valid operation in a queue?

1. Push
2. Pop
3. Enqueue
4. Peek

15. What is the time complexity of accessing an element in a hash table (on average)?

1. O(1)
2. O(n)
3. O(log n)
4. O(n log n)

16. Which traversal method is used in depth-first search (DFS) of a graph?

1. Pre-order
2. In-order
3. Post-order
4. All of the above

17. What is the worst-case time complexity of QuickSort?

1. O(n)
2. O(n^2)
3. O(log n)
4. O(n log n)

18. What is the height of a binary search tree (BST) in the worst case?

1. O(log n)
2. O(n)
3. O(n log n)
4. O(1)

19. Which of the following is a type of binary tree where every node has 0 or 2 children?

1. Complete Binary Tree
2. Full Binary Tree
3. Perfect Binary Tree
4. Balanced Binary Tree

20. Which of the following is NOT a valid operation on a heap?

1. Insert
2. Delete
3. Peek
4. Sort

21. Which of the following is a linear data structure?

1. Binary Tree
2. Queue
3. Graph
4. Tree

22. In a doubly linked list, each node contains:

1. Data and a pointer to the next node
2. Data, a pointer to the next node, and a pointer to the previous node
3. Only a pointer to the next node
4. Only a pointer to the previous node

23. Which sorting algorithm is known for its worst-case time complexity of O(n^2)?

1. MergeSort
2. QuickSort
3. InsertionSort
4. HeapSort

24. Which of the following is true about a stack?

1. Elements are inserted at the rear and removed from the front
2. It follows FIFO (First In First Out) order
3. It follows LIFO (Last In First Out) order
4. It is implemented using a queue

25. What does a graph’s adjacency matrix represent?

1. A list of all vertices in the graph
2. A list of edges and their weights
3. A matrix where the cell at (i, j) indicates if there is an edge between vertex i and vertex j
4. A list of vertices with their degree

26. What is the primary use of a hash function in a hash table?

1. To store elements in sorted order
2. To map keys to specific locations in the table
3. To ensure all elements are unique
4. To balance the table

27. In which scenario would you typically use a breadth-first search (BFS)?

1. Finding the shortest path in a graph with unweighted edges
2. Sorting elements in a list
3. Searching for an element in a sorted array
4. Traversing a binary tree in pre-order

28. Which algorithm is most efficient for searching a sorted array?

1. Linear Search
2. Binary Search
3. Jump Search
4. Exponential Search

29. Which of the following is an example of a greedy algorithm?

1. Dijkstra’s Shortest Path Algorithm
2. MergeSort
3. Depth-First Search
4. Dynamic Programming

30. In which case will a binary search tree become inefficient (degenerate)?

1. When all nodes have two children
2. When nodes are inserted in random order
3. When nodes are inserted in sorted order
4. When the tree is balanced
   1. Which algorithm solves the problem of finding the shortest path in a graph with weighted edges?
5. Kruskal’s Algorithm
6. Prim’s Algorithm
7. Dijkstra’s Algorithm
8. Floyd-Warshall Algorithm

Answer: C) Dijkstra’s Algorithm

* 1. What is the time complexity of performing a binary search on a sorted array?

1. O(n)
2. O(log n)
3. O(n log n)
4. O(n^2)

Answer: B) O(log n)

* 1. Which of the following is used in the implementation of a depth-first search (DFS)?

1. Queue
2. Stack
3. Priority Queue
4. Hash Map

Answer: B) Stack

* 1. In a graph, what is a leaf node?

1. A node with no outgoing edges
2. A node with no incoming edges
3. A node with only one child
4. A node with no neighbors

Answer: A) A node with no outgoing edges

* 1. Which of the following is the best sorting algorithm for large datasets?

1. Bubble Sort
2. QuickSort
3. Selection Sort
4. Merge Sort

Answer: D) Merge Sort

* 1. What is the time complexity of deleting an element in a doubly linked list?

1. O(1)
2. O(n)
3. O(log n)
4. O(n log n)

Answer: A) O(1)

* 1. What type of tree is balanced and ensures that the left and right subtrees of every node differ in height by no more than one?

1. AVL Tree
2. Binary Search Tree
3. Red-Black Tree
4. B-tree

Answer: A) AVL Tree

* 1. Which of the following is the correct time complexity for inserting an element into a binary heap?

1. O(1)
2. O(log n)
3. O(n)
4. O(n log n)

Answer: B) O(log n)

* 1. What is a self-balancing binary search tree that maintains balance using red and black coloring of nodes?

1. AVL Tree
2. Splay Tree
3. Red-Black Tree
4. Binary Search Tree

Answer: C) Red-Black Tree

* 1. Which algorithm is used to find the minimum spanning tree in a weighted graph?

1. Dijkstra’s Algorithm
2. Bellman-Ford Algorithm
3. Kruskal’s Algorithm
4. Floyd-Warshall Algorithm

Answer: C) Kruskal’s Algorithm

* 1. What is the time complexity of inserting an element at the beginning of a doubly linked list?

1. O(1)
2. O(n)
3. O(log n)
4. O(n log n)

Answer: A) O(1)

* 1. Which of the following is the best sorting algorithm in terms of worst-case time complexity?

1. MergeSort
2. QuickSort
3. BubbleSort
4. InsertionSort

Answer: A) MergeSort

* 1. What is the space complexity of the recursive version of MergeSort?

1. O(1)
2. O(n)
3. O(log n)
4. O(n log n)

Answer: B) O(n)

* 1. Which of the following is true for the time complexity of insertion in a heap?

1. O(1)
2. O(log n)
3. O(n)
4. O(n log n)

Answer: B) O(log n)

* 1. What is the worst-case time complexity of the Insertion Sort algorithm?

1. O(n)
2. O(n log n)
3. O(n^2)
4. O(log n)

Answer: C) O(n^2)

* 1. Which of the following data structures can be used to implement a breadth-first search (BFS)?

1. Stack
2. Queue
3. Priority Queue
4. Linked List

Answer: B) Queue

* 1. What is the time complexity of accessing an element in a linked list?

1. O(1)
2. O(n)
3. O(log n)
4. O(n log n)

Answer: B) O(n)

* 1. In a binary search tree (BST), which of the following operations has a worst-case time complexity of O(n)?

1. Searching for an element
2. Insertion
3. Deletion
4. All of the above

Answer: D) All of the above

* 1. What is the time complexity of the peek operation in a stack?

1. O(1)
2. O(n)
3. O(log n)
4. O(n log n)

Answer: A) O(1)

* 1. Which of the following sorting algorithms has the worst-case time complexity of O(n^2) but is efficient in practice for small datasets?

1. QuickSort
2. MergeSort
3. BubbleSort
4. InsertionSort

Answer: D) InsertionSort

* 1. Which traversal algorithm uses a queue to store nodes to visit next?

1. Pre-order traversal
2. Post-order traversal
3. Level-order traversal
4. In-order traversal

Answer: C) Level-order traversal

* 1. What is the best case time complexity of QuickSort?

1. O(n)
2. O(n log n)
3. O(n^2)
4. O(1)

Answer: B) O(n log n)

* 1. Which of the following is a feature of a priority queue?

1. Elements are removed in the order they were inserted
2. Elements with the highest priority are removed first
3. The priority of elements can be updated during runtime
4. It operates based on LIFO

Answer: B) Elements with the highest priority are removed first

* 1. What is the worst-case time complexity of selecting the kth smallest element in an unsorted array using QuickSelect?

1. O(log n)
2. O(n log n)
3. O(n^2)
4. O(n)

Answer: C) O(n^2)

* 1. What is a circular queue?

1. A queue in which the first element is removed from the rear
2. A queue where the last element points to the first element, making the queue circular
3. A priority queue
4. A deque (double-ended queue)

Answer: B) A queue where the last element points to the first element, making the queue circular

* 1. Which algorithm uses the divide-and-conquer approach for sorting?

1. MergeSort
2. QuickSort
3. HeapSort
4. Both A and B

Answer: D) Both A and B

* 1. In a graph, what is the time complexity of checking if an edge exists in an adjacency list?

1. O(1)
2. O(n)
3. O(log n)
4. O(n log n)

Answer: B) O(n)

* 1. What is the primary disadvantage of a linked list over an array?

1. Lack of random access
2. Slow insertion and deletion
3. Fixed size
4. Complex memory management

Answer: A) Lack of random access

* 1. What is the time complexity of deleting a node in a doubly linked list, given the pointer to the node?

1. O(1)
2. O(n)
3. O(log n)
4. O(n log n)

Answer: A) O(1)

* 1. In a min-heap, what property is maintained?

1. The parent node is smaller than both its child nodes
2. The parent node is greater than both its child nodes
3. The parent node is equal to its child nodes
4. The heap is not sorted

Answer: A) The parent node is smaller than both its child nodes