Q1. What is the time complexity of the quicksort algorithm in the average case?

Ans1. The average-case time complexity of Quicksort is O(n log n).

Q2. Explain the concept of a hash table and its advantages?

Ans2. A hash table is a data structure that provides fast key-value pair storage and retrieval, offering constant-time average-case access.

Q3. What is the difference between a stack and a queue in data structures?

Ans3. A stack is a Last-In-First-Out (LIFO) data structure where the last element added is the first to be removed, while a queue is a First-In-First-Out (FIFO) data structure where the first element added is the first to be removed.

Q4. What is dynamic programming, and how does it differ from greedy algorithms?

Ans4. Dynamic programming breaks complex problems into smaller subproblems and stores their solutions, while greedy algorithms make locally optimal choices at each step.

Q5. Define the term "Big O notation" and its significance in algorithm analysis?

Ans5. Big O notation is a mathematical notation used to describe the upper bound or worst-case behavior of an algorithm's time or space complexity, providing a way to analyze and compare algorithm performance as input sizes grow.

Q6. What is the primary purpose of binary trees in computer science?

Ans6. The primary purpose of binary trees in computer science is to efficiently organize and store data, enabling quick searching, insertion, and deletion operations, making them essential for tasks like sorting, searching, and hierarchical data representation.

Q7. Describe the breadth-first search (BFS) algorithm in graph traversal?

Ans7. Breadth-First Search (BFS) is a graph traversal algorithm that systematically explores the vertices of a graph layer by layer, starting from a selected source vertex, by visiting all neighboring vertices before moving to their neighbors, ensuring that it visits the closest vertices first, making it useful for shortest path and connectivity problems.

Q8. Explain the concept of recursion in programming and provide an example?

Ans8. Recursion in programming is a technique where a function solves a problem by calling itself with smaller instances of the same problem.

Q9. What is the difference between an array and a linked list in terms of memory allocation?

Ans9. Arrays allocate memory in a contiguous block with fixed size, while linked lists allocate memory dynamically for each element and use pointers to connect them, allowing for more flexible memory allocation.

Q10. Discuss the importance of a priority queue and its use cases?

Ans10. A priority queue is a vital data structure for managing elements with assigned priorities, used in applications like graph algorithms, task scheduling, and data compression.