Data Structures and Algorithms - Answer Sheet

1. An array is a fixed-size data structure that stores elements in contiguous memory locations. Advantages: Fast access using index. Disadvantages: Fixed size and costly insertion/deletion.

2. A singly linked list allows traversal in one direction, while a doubly linked list supports traversal in both directions.

3. Stack operations include push, pop, and peek. Example code:
int stack[MAX]; int top = -1;
void push(int val) { stack[++top] = val; }

4. A queue follows FIFO order. A normal queue removes elements from the front, while a circular queue allows reuse of empty slots.

5. Merge Sort works by dividing the array into subarrays, sorting them individually, and merging them back. It has a time complexity of O(n log n).

6. A binary search tree (BST) does not allow duplicate values. It supports insertion, deletion, and searching in O(log n) time.

7. DFS explores as deep as possible before backtracking, while BFS explores level by level using a queue.

8. A max heap ensures that the largest value is at the root. Insertion follows heapify-up, and deletion follows heapify-down.

9. Dynamic programming solves problems by breaking them into overlapping subproblems. Example: Fibonacci sequence using memoization.

10. QuickSort works by selecting a pivot, partitioning the array around it, and recursively sorting subarrays. Its worst-case time complexity is O(n^2), but on average, it's O(n log n).