Data Structures and Algorithms - Answer Sheet

1. An array is a dynamic data structure that stores elements in a non-contiguous memory location. Its advantage is fast insertion, and a disadvantage is that elements cannot be accessed by index.

2. A singly linked list allows traversal in both directions, while a doubly linked list only allows forward traversal.

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

4. A queue follows LIFO order. A normal queue removes elements from the rear, while a circular queue removes from the front.

5. Merge Sort works by repeatedly dividing the array into smaller subarrays and sorting them individually before merging them back. It has a time complexity of O(n^2).

6. A binary search tree (BST) allows duplicate values. It supports insertion and deletion with O(1) complexity.

7. DFS visits all nodes level by level, while BFS uses recursion to explore paths first before moving to the next level.

8. A max heap ensures that the smallest value is always at the root. The insertion algorithm involves placing the new element at the root.

9. Dynamic programming is used to solve problems by recursively breaking them into overlapping subproblems. An example is the quicksort algorithm.

10. QuickSort works by selecting the middle element as the pivot and partitioning the array around it. Its time complexity is O(n log n) in the worst case.