Q1: What do you mean by a Data Structure?

Ans: A Data structure is a particular way of organizing data in a computer so that it can be used effectively. Basic data structures are arrays, lists, maps etc.

Q2: What are some applications of DS?

Ans: A data structure is a particular way of organizing data in a computer so that it can be used effectively. The real-time applications of all the data structures are

**Application of Arrays:** 2D arrays, commonly known as, matrix, are used in image processing.

**Application of Linked List:** The music players also use the same technique to switch between music

**Application of Stack:** Converting infix to postfix expressions.

**Application of Queue:** Operating System uses queue for job scheduling.

**Application of Graph:** Dijkstra algorithm or the shortest path first algorithm also uses graph structure to finding the smallest path between the nodes of the graph.

Q3. What are the advantages of a Linked List over an array?

Ans:

- An array is the data structure that contains a collection of similar type data elements whereas the Linked list is considered as non-primitive data structure contains a collection of unordered linked elements known as nodes.

- In the array the elements belong to indexes, i.e., if you want to get into the fourth element you have to write the variable name with its index or location within the square bracket.

- In a linked list though, you have to start from the head and work your way through until you get to the fourth element.

- Accessing an element in an array is fast, while Linked list takes linear time, so it is quite a bit slower.

- Arrays are of fixed size. In contrast, linked lists are dynamic and flexible and can expand and contract its size.

- In an array, memory is assigned during compile time while in a Linked list it is allocated during execution or runtime.

Q4: Syntax to create a linked list node in C?

Ans: typedef struct node

  {

    int num;

    struct node *nextptr;

  } *stnode;

Q5: What is the use of a doubly-linked list when compared to that of a single linked list?

Ans: Doubly linked list has some more complex implementation where the node contains some data and a pointer to the next as well as the previous node in the list

Doubly linked list allows element two-way traversal.

Q6: What is the difference between an array and stack?

Ans:

| Array | Stack |
|---|---|
| • In the array the elements belong to indexes. | • Stacks are based on the LIFO principles. |
| • Insertion and deletion in array can be done at any index in the array. | • Insertion and deletion in stacks take place only from one end of the list called the top. |
| • Array has a fixed size. | • Stack has dynamic size. |
| • Array contains elements of same data type. | • Stack can contain elements of different data type. |
| • We can do both linear and Binary search | • We can do only linear search |

Q7: Minimum number of queues required to implement a priority queue?

Ans: The minimum number of queues required to implement a priority queue are 2 Queues, one for storing data and one for the priorities.

Q8: What are different types of tree traversal techniques in a tree?

Ans: Tree traversal techniques are:

- In order traversal (Left → Root → Right)
- Pre order traversal (Root → Left → Right)
- Post order traversal (Left→ Right → Root)

Q9: Why is it said that searching a node in a binary search tree is efficient than that of simple binary tree.

Ans: Using a binary search tree, length of tree traversal is reduced by comparing the search value with the root. The traversal path is reduced using this comparison, if the search value is greater than the root then the right side is traversed and left side is traversed in case of lower value.

Hence the searching complexity of binary tree O(n) is reduced to O(h) where h is the height of the tree

Q10: What are the applications of Graph DS?

Ans: In Computer science graphs are used to represent the flow of computation. Graph is used for modelling networks such as social media networks etc.

Q11: Can we use binary search algorithm to a sorted linked list?

Ans: Yes, Binary search is possible on the linked list if the list is ordered and you know the count of elements in list. But While sorting the list, you can access a single element at a time through a pointer to that node i.e. either a previous node or next node. This increases the traversal steps per element in linked list just to find the middle element. This makes it slow and inefficient.

Q12: When can you tell that a Memory Leak will occur?

Ans: In computer science, a memory leak is a type of resource leak that occurs when a computer program incorrectly manages memory allocation in a way that memory which is no longer needed is not released. A memory leak may also happen when an object is stored in memory but cannot be accessed by the running code.

Q13: How will you check if a given Binary Tree is a binary search tree or not?

Ans:  A binary tree is said to be binary search tree if

- The left subtree of a node contains only nodes with keys less than the node's key.
- The right subtree of a node contains only nodes with keys greater than the node's key.
- Both the left and right subtrees must also be binary search trees.

Q14: Which data structure is ideal to perform recursion operation and why?

Ans: Stack. Because of its LIFO (Last in First Out) property it remembers its 'caller' so knows whom to return when the function has to return. Recursion makes use of system stack for storing the return addresses of the function calls.

Q15: Most important applications of Stack?

Ans:

- Converting infix to postfix expressions.

- Backtracking Procedure which is used to find the solution for Knight Tour problem or N-Queen Problem etc.

- Stacks are used to implement recursion.

Q16: Convert the below given expression to its equivalent prefix and post notations.
Ans: –

Q17: Sorting a stack using a temporary stack

Ans:

Q18: Program to reverse a queue

Ans:

Q19: Program to reverse first k elements of a queue

Ans :

Q20: Program to return the nth node from the end in a linked list.

 Ans :

Q21 : Reverse a linked list

Ans:

Q22: Replace each element of the array by its rank in the array.

 Ans:

Q23: Check if a given graph is a tree or not?

Ans:

Q24: Find out the Kth smallest element in an unsorted array?

Ans:

Q25: How to find the shortest path between two vertices?

Ans: