**Q1. What do you mean by a Data structure?**

Ans. Data Structure is a way of collecting and organising data in such a way that we can perform operations on these data in an effective way. Data Structures is about rendering data elements in terms of some relationship, for better organization and storage. For example, we have some data which has, player's name "Virat" and age 26. Here "Virat" is of String data type and 26 is of integer data type.

**Q2. What are some of the applications of DS?**

Ans. 1.Search , 2. Sort , 3. Insert , 4. Update , 5. Delete

And problems that can be solved using DS:-

* Fibonacci number series
* Knapsack problem
* Tower of Hanoi
* All pair shortest path by Floyd-Warshall
* Shortest path by Dijkstra
* Project scheduling

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

Ans. 1.Dynamic size

2.Ease of insertion and deletion

Q4. Write the syntax in C to create a node in the singly linked list.

Ans. struct Node {

int data;

struct Node\* next;

};

**Q5.What is the use of a doubly-linked list when compared to that of a singly**

**linked list?**

Ans.

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | Complexity | In singly linked list the complexity of insertion and deletion at a known position is O(n) | In case of doubly linked list the complexity of insertion and deletion at a known position is O(1) |
| 2 | Internal implementation | In singly linked list implementation is such as where the node contains some data and a pointer to the next node in the list | While 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 |
| 3 | Order of elements | Singly linked list allows traversal elements only in one way. | Doubly linked list allows element two way traversal. |
| 4 | Usage | Singly linked list are generally used for implementation of stacks | On other hand doubly linked list can be used to implement stacks as well as heaps and binary trees. |
| 5 | Index performance | Singly linked list is preferred when we need to save memory and searching is not required as pointer of single index is stored. | If we need better performance while searching and memory is not a limitation in this case doubly linked list is more preferred. |
| 6 | Memory consumption | As singly linked list store pointer of only one node so consumes lesser memory. | On other hand Doubly linked list uses more memory per node(t |

Q6.What is the difference between an Array and Stack?

Ans.

***Stack***  ***Array***

|  |  |
| --- | --- |
| Stacks are based on the LIFO principle, i.e., the element inserted at the last, is the first element to come out of the list. | 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 eg arr[4] |
| Insertion and deletion in stacks takes place only from one end of the list called the top. | Insertion and deletion in array can be done at any index in the array. |
| Stack has a dynamic size. | Array has a fixed size. |
| Stack can contain elements of different data type. | Array contains elements of same data type. |
| We can do only linear search | We can do both linear and Binary search |

**Q7.What are the minimum number of Queues needed to implement the priority Queue?**

Ans. Minimum two queues needed to implement the priority queue.

**Q8.What are the different types of traversal techniques in a tree?**

Ans. There are three types of traversal techniques in a tree.

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

Ans. Because binary search tree is a type of Binary tree which keeps the keys in a sorted order for fast lookup.

It follows a definitive order to how the nodes should be organized in a tree.

It is mainly used for insertion, deletion, and searching of elements.

**Q10. What are the applications of Graph DS?**

Ans. Google maps uses graphs for building transportation systems, where intersection of two(or more) roads are considered to be a vertex and the road connecting two vertices is considered to be an edge, thus their navigation system is based on the algorithm to calculate the shortest path between two vertices.

* In Facebook, users are considered to be the vertices and if they are friends then there is an edge running between them. Facebook’s Friend suggestion algorithm uses graph theory. Facebook is an example of undirected graph.
* In World Wide Web, web pages are considered to be the vertices. There is an edge from a page u to other page v if there is a link of page v on page u. This is an example of Directed graph. It was the basic idea behind [Google Page Ranking Algorithm](https://www.geeksforgeeks.org/page-rank-algorithm-implementation/).
* In Operating System, we come across the Resource Allocation Graph where each process and resources are considered to be vertices. Edges are drawn from resources to the allocated process, or from requesting process to the requested resource. If this leads to any formation of a cycle then a deadlock will occur.

**Q11. Can we apply 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.

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

Ans. A memory leak is a type of resource leak that occurs when a computer program incorrectly manages memory allocations 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. To see if a binary tree is a binary search tree, check:

1. If a node is a left child, then its key and the keys of the nodes in its right subtree are less than its parent’s key.
2. If a node is a right child, then its key and the keys of the nodes in its left subtree are greater than its parent’s key.

**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. Every recursive function has its equivalent iterative (non-recursive) function.

**Q15.What are some of the most important applications of a Stack?**

Ans. Stacks can be used for expression evaluation.

1. Stacks can be used to check parenthesis matching in an expression.
2. Stacks can be used for Conversion from one form of expression to another.
3. Stacks can be used for Memory Management.
4. Stack data structures are used in backtracking problems.