

# DATA STRUCTURE

## ASSIGNMENT-3

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I BCA  
II sem

### Two Marks Important Questions

1) Define Data Structures.

Ans A data structure is a way of organising and storing data in a computer so that it can be accessed and used efficiently.

2) What are linear data structures? Name any two linear data structures.

Ans Linear data structures are data structures in which data elements are stored in a linear sequence. They include array and linked lists.

3) What is dynamic memory allocation?

Ans Dynamic memory allocation is a process of allocating memory during the runtime of a program. It allows the programmer to allocate memory at runtime for variables and data structures.

4) What is abstract data type?

Ans: An abstract data type in data structures is a kind of data type whose behavior is defined with the help of some attributes and some functions. Generally, these attributes and functions are written inside a class or a structure so that we can use an object of the class to use that particular abstract data type.

5) Write an algorithm to traverse a linear array

Ans: 1. Start

2. Initialize a variable  $i$  to 0

3. Repeat the following step until  $i$  is less than the length of the array:

a) Print the value of the element at index  $i$ .

b) Increment  $i$  by 1.

4. End

6) What is a circular linked list?

Ans A circular linked list is a linked list where all nodes are connected to form a circle. In a circular linked list, the first node and the last node are connected to each other which forms a circle. There is no NULL at the end.

7) Mention different operating performed on singly linked list.

Here are some of the operations that can be performed on a singly linked list:

1) Insertion: An element can be inserted at the begining, end, or any position in the list.

2) Deletion: An element can be deleted from the begining, end, or any position in the list.

3) Traversal: The list can be traversed from begining to end to perform some operation on each element.

4) Searching: An element can be searched for in the list  
5) Sorting: The list can be sorted in ascending or descending order based on some criteria.

8) What is time complexity and space complexity?

- Time complexity refers to the amount of time it takes for an algorithm to run as a function of the size of its input. It is usually expressed using big O notation.
- Space complexity refers to the amount of memory an algorithm requires as a function of the size of its input. It is also usually expressed using big O notation.

9) What is recursion? Give an example

Recursion is a process in which a function calls itself as a subroutine. This allows the function to be repeated several times since the function will call itself during its execution.

Here is an example of a recursive function that calculates the factorial of a number:

```
function factorial(n) {  
    if (n==0)  
        {  
            return 1;  
        }  
    else  
        {  
            return n * factorial(n-1);  
        }  
}
```

10) what are different types of arrays? Give an example.  
Ans: There are several types of arrays in programming.  
Some of the most common types are:

1) one-dimensional array: An array that has a single row of elements.

2) Two-dimensional array: An array that has multiple rows and columns.

3) Three-dimensional array: An array that has multiple rows, columns & depth.

11) what is sparse matrix?

A sparse matrix is a matrix in which many or most of the elements have a value of zero.

12) what is doubly linked list?

A doubly linked list is a linked data structure that consists of a set of sequentially linked records called nodes. Each node contains three fields: two link fields (references to the previous and to the next node in the sequences of nodes) and one data field.

13) what are different types of recursion?

Recursion is mainly of two types depending on whether a function calls itself from within itself or whether two functions call one another mutually. The former is called direct recursion and the latter is called indirect recursion.

14) What is sorting? Name different sorting algorithms  
Sorting is the process of arranging data in a particular order.  
Some of the most common sorting algorithm are:

- 1) Selection sort
- 2) Bubble sort
- 3) Insertion sort
- 4) Merge sort
- 5) Quick sort

15) What is a linked list? Mention different types of linked list.

A linked list is a linear data structure in which elements are stored in nodes and each node points to the next node using a pointer. There are several types of linked list:

- \* Singly linked list: Each node has only one pointer which points to the next node in the list.
- \* Doubly linked list: Each node has two pointers which point to the previous and next nodes in the list.
- \* Circular linked list: The last node points to the first node in the list.
- \* Doubly circular linked list: A combination of doubly and circular linked lists.

16) Mention advantages of linked list over arrays?

linked lists have several advantages over arrays:

- \* linked list can be resized dynamically, whereas arrays cannot.
- \* Insertion and deletion operations are easier and faster in linked lists than in arrays.
- \* Linked lists can be used to implement stacks and queues.

17) Define binary search or Describe binary search technique.

Binary search is a search algorithm that searches for an element in a sorted list or array by repeatedly dividing the search interval in half.

18) What is Posterior Analysis?

Posterior analysis is a technique used in the analysis of algorithm. It involves analysing the performance of an algorithm on a particular input distribution. The goal of posterior analysis is to determine the expected running time of an algorithm on a given input distribution.

19) What is linear search?

Linear search is a simple search algorithm that searches for an element in a list (or) array by iterating through each element one by one until the desired element is found or the end of the list is reached.

20) List out the characteristics of the Algorithm.

An algorithm is a set of instruction that are used to solve a problem or perform a task. The characteristic of an algorithm are:

1) Input: An algorithm should have zero or more inputs

2) Output: An algorithm should have one or more outputs

3) Definiteness: Each step of an algorithm should be clear & unambiguous.

4) Finiteness: An algorithm should terminate after a finite number of steps.

5) Effectiveness: Each step of an algorithm should be effective, meaning it should be able to be carried out in practice.