Unit -1 Introduction to Data Structure

1.1 Introduction

Data structure is a way of organizing all data items and establishing relationship among those data items.

- Data structures are the building blocks of a program.

Data structure mainly specifies the following four things:

- Organization of data.
- Accessing methods
- Degree of associativity
- Processing alternatives for information

To develop a program of an algorithm, we should select an appropriate data structure for that algorithm. Therefore, algorithms and its associated data structures form a program.

Algorithm + Data structure = Program

A static data structure is one whose capacity is fixed at creation. For example, array. A dynamic data structure is one whose capacity is variable, so it can expand or contract at any
time. For example: linked list, binary tree etc.

1.2 Operations on different Data Structure:

There are different types of operations that can be performed for the manipulation of data in every data structure. Some operations are explained and illustrated below:

1. **Traversing:** Traversing a Data Structure means to visit the element stored in it. It visits data in a systematic manner. This can be done with any type of DS.
2. **Searching:** Searching means to find a particular element in the given data-structure. It is considered as successful when the required element is found.
3. **Insertion:** It is the operation which we apply on all the data-structures. Insertion means to add an element in the given data structure. The operation

of insertion is successful when the required element is added to the required data-structure. It is unsuccessful in some cases when the size of the data structure is full and when there is no space in the data-structure to add any additional element.

4. Deletion: It is the operation which we apply on all the data-structures. Deletion means to delete an element in the given data structure. The operation of deletion is successful when the required element is deleted from the data structure.
5. Inserting- It is used to add a new data/item into the data structure. Before we insert an item into the data structure, we have to find an appropriate location where we want to insert the item. We cannot insert an item into a data structure which is already full.
6. Sorting- It is used to arrange the data items in some order i.e. in ascending or descending order in case of numerical data and in dictionary order in case of alphanumeric data .
7. Merging- It is used to combine the data items of two sorted files into single file in the sorted form.

1.3 Abstract Data Types (ADTs)

An abstract data type is a data type whose representation is hidden from, and of no concern to the application code. For example, when writing application code, we don't care how strings are represented: we just declare variables of type String, and manipulate them by using string operations.

Once an abstract data type has been designed, the programmer responsible for implementing that type is concerned only with choosing a suitable data structure and coding up the methods. On the other hand, application programmers are concerned only with using that type and calling its methods without worrying much about how the type is implemented.