DATA STRUCTURE

introduction;

In the world of today where one needs information to survive the harsh condition of life. information is one of the powerful equipment available to any organization that wants to not only conquer but rise to the top in the everyday competition of who will be the best and stand out as one of the successful persons. The more information within your reach, the more the better solutions to problems and obstacles open up. Before we begin discussing about data structures, let's take a look at the meaning of the two different words DATA and STRUCTURE.

what is data? Data is the discrete unit of information.

what is structure? the arrangement and relationship between something complicated.

Data structure; Data structures are a special way of organizing data in a specialized format on a computer so that the information can be organized, processed, stored, and retrieved quickly and effectively. They are a means of handling information, rendering the data for easy use.

Data is information, and algorithms are rules and instructions that turn the data into something useful to programming.

we have two types of data structure;

- linear data structure

- non-linear data structure

linear data structure is arranged in series, one after another. it is arranged in a particular order making it simple to understand and execute the necessary actions needed.   under linear data structure we have;

a. Array data structure

b. linked list data structure

c. stack data structure

a.   **Array data structure**; Array is a collection of memory elements in which data is stored series example one after another. In other words, an array is a structure of fixed-size, which can hold items of the same data type. This organization of data is done with the help of an array of data structures. The type of elements that can be stored in the form of arrays is determined by the programming language. Elements are accessed using an integer index to specify which element is required.

b.   **Linked list data structure**; it's a series of arrangement that contains a sequence of items in linear order which are linked or connected together. it is a linear collection of data elements of any type, called nodes, where each node has itself a value, and points to the next node in the linked list.

c.   **Stack data structure**; In stack data structure, elements are stored in the last in, first out principle. The element placed at last can be accessed at first, which is commonly found in many programming languages.

d.   **Hash table**; a data structure that stores values that have keys associated with each of them. it supports lookup efficiently if we know the key associated with the value.

e.   **Heap** is a special case of a binary tree where the parent nodes are compared to their children with their values and are arranged accordingly.

f.   **Queue** is a collection of entities that are maintained in a sequence and can be modified by the addition of entities at one end of the sequence and the removal of entities from the other end of the sequence.

Non-linear data structure; elements in non-linear data structures are not in any series. rather they are arranged in a hierarchical manner where one element will be connected to one or more elements. under non-linear data structure, we have;

a. **Tree;** is a widely used abstract data type that represents a hierarchical tree structure with a set of connected nodes. Each node in the tree can be connected to many children (depending on the type of tree), but must be connected to exactly one parent, except for the root node, which has no parent.

b. **Bin;** a data structure that allows efficient region queries. Each time a data point falls into a bin, the frequency of that bin is increased by one.

c. **Graph;** is an abstract data type that is meant to implement the undirected graph and direct graph concepts from the field of graph theory within mathematics. A graph data structure consists of a finite set of vertices called nodes, together with a set of unordered pairs of these vertices for an undirected graph or a set of ordered pairs for a directed graph.

REFERENCE;

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