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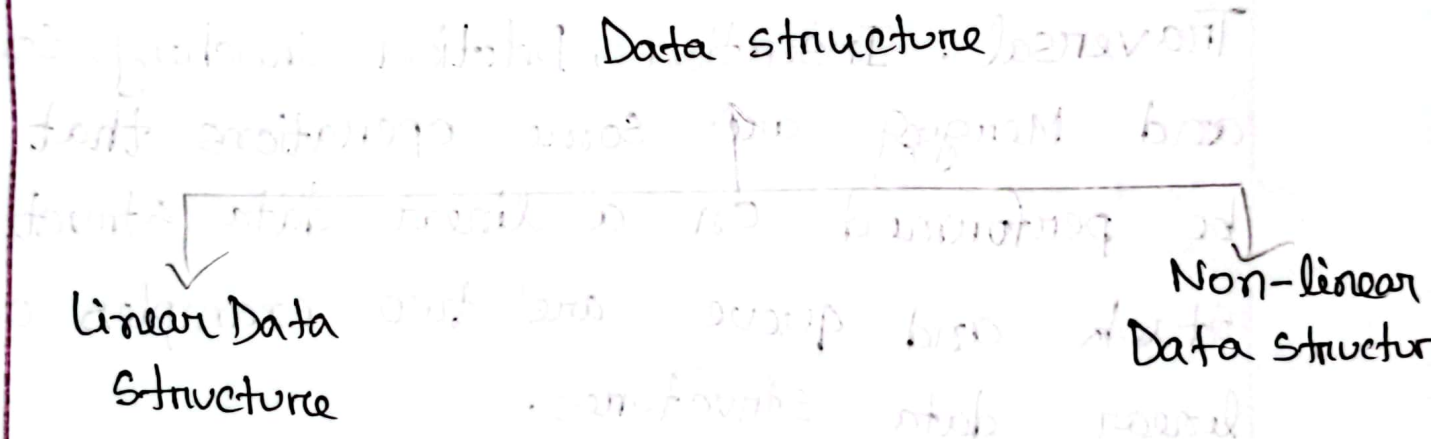
Course code- CSI 217

Course title- Data structure

Ans to the Ques. No-1(a)

In computer science, an array is a data structure consisting of a collection of elements, of same memory size, each identified by at least one array index or key.
An array is stored such that the position of each element can be computed from its index tuple by a mathematical formula.



A data structure is a way of organize and storing data in a computer so that it can be accessed and used efficiently it refers to the logical or mathematical representation of data. as well as the implementation in a computer program.

Ans to the Ques. No- 1(b)

Data structures allow us to organize and store data, while algorithms allow us to process that data in a meaningful way. Learning data structure and algorithms will help you become a better programmer. You will be able to write code that is more efficient and more reliable.

Traversal, Insertion, Deletion, Searching, Sorting and Merging are some operations that can be performed on a linear data structure. Stack and queue are two examples of linear data structures.

Ans to the Ques. No- 1(c)

There are two common types of arrays: linear arrays and associative arrays. Linear arrays store elements in a linear order, meaning their index beings from 0 and goes up incrementally as new elements are added. Associative arrays store elemenents that keys can access and their index is not bassed on linear order.

The basic operations in the Arrays are insertion, deletion, searching, display, travers, and update. These operations are usually Performned to either modify the data in the array or to report the status of the array.

Ans to the Ques. No - 2(a)

The following are the basic operations served by stacks. 'Push': Adds an elements to the top of the stack. 'pop': Removes the topmost element from the stack. 'is Empty': checks whether the stack is empty two operations that can be performed on the stacks are push and pop. Push is used to insert element into the stack and pop operation is used to remove element from the top of the stack.

Ans to the Ques.No-2(b)

Representation of Graphs in Data. Structures

Graphs in data structures are used to represent the relationships between objects. Every graph consists of a set of points known as vertices or nodes connected by linear known as edges.

The vertices in a network represent entities.

Graphical representation refers to the use of charts and graphs to visually display, analyze, clarify and interpret numerical data, functions and other qualitative structures.

Ans to the Ques. No-2(c)

It simply involves taking the sum of a group of numbers, then dividing that sum by the count of the numbers use in the series.

Arithmetic mean represents a number that is obtained by dividing the sum of the elements of a set by the numbers of values in the set. So you can use the layman term Average or be a little bit fancier and use the word "Arithmetic mean".

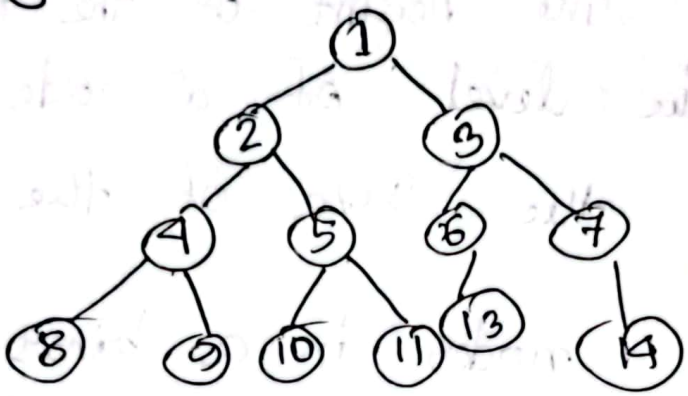
Arithmetic Mean Formula,

If any data set consisting of the values $b_1, b_2, \ldots, b_n$ then the arithmetic mean B is defined as:

$$= \frac{1}{n} \sum_{i=1}^{n} b_i = \frac{b_1 + b_2 + b_3 + \cdots + b_n}{n}$$

Ans to the Ques.No-3(a)

3(a) Ans :Define Binary tree – Binary tree is defined as a tree Data structure where each node hat at most 2 children. Since catch element in a binary tree can have only 2 children, we typically nance Ham the left and child.



Binary tree Representation – A binary tree is representation by a pointer to the top most node. (commonly knows as the root) of the tree.

Following part –

(1) Data, (2) Pointer to left child

(3) Pointer to right child.

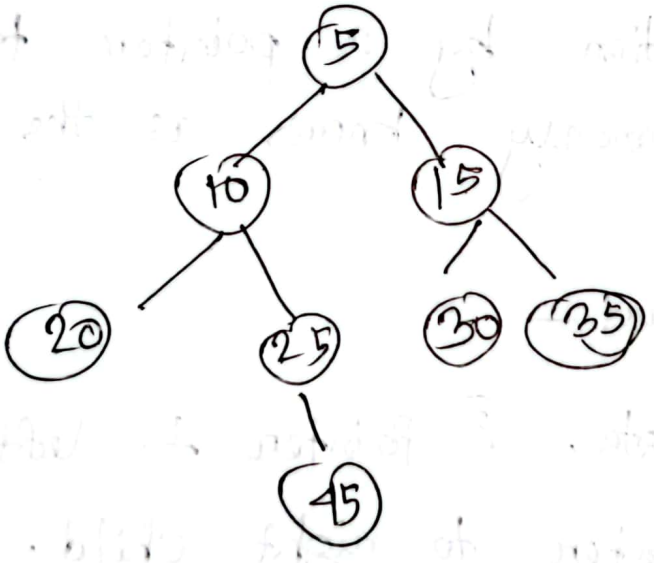
Basic operation on Binary tree—

① Inserting an element ② Removing an element ③ searching for an element. ④ Traversing the tree.

Auxiliary operation on binary tree:—

① Finding the height of the tree
② Find the level of a node the tree.
③ Finding the size of the tree.

Given nodes in a binary tree, find the distance between them.



→ Distance between (20, 45) = 3
→ Distance between (30, 35) = 2
→ Distance between (20, 35) = 4

Approch —

① Distance (x,y) = Distance (root, x) + Distance (root, y) - 2* (Distance (root to LCA) (x, y).

② Where LCA (x, y) = Lowest common Ancestor of x, y

③ In the above Example if Distance (20, 45) = 3

④ Distance (root, 20) = 2

⑤ Distance (root, 45) = 3

⑥ LCA (20, 45) = 10

⑦ Distance (root, 10) = 1

⑧ Distance (20, 45) = 2 + 3 - 2*1 = 3

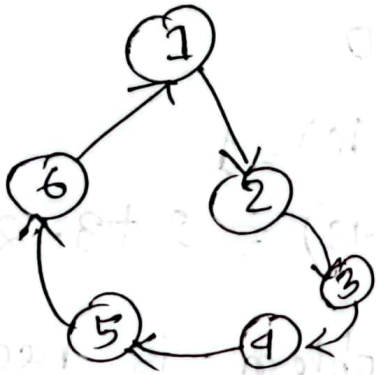
⇒ Now the problem is reduced to How to Find distance from root to any given node

⇒ related problem —

⇒ Print All the nodes which are x distance from the left Node (Medium)

⇒ Reverse a linked list in group of given size k (medium)

③ (b) Graph— Graph is Data structure are non-liner data structures made up of a finite Number of nodes or vertices and the edges that connect them. Graph in data structure are used to Addre real-word problems in which it present the problem area as a Network like telephone Networks and social Networks.



The Application of graph data structur is used in computer Since, mathmatics and physics and has many practical applicatio in fields such as computer Networks. Artificial intelligence and logistics.

4) Application of Graph Data Structure —
Real-life of graph data structure in various fields are:

⇒ Computer Science: Graph are used to model many problems and solutions in computer science, such as re-prequenting Networks, web page, and social media connection.

⇒ Social Network: Graph represent and analyze social Network. Such as the connection between between individuals and group.

⇒ Transportation – Graph canbe used to model transportion system, such as roads and fights and to find the shotest of quickest routrest between location.

⇒ Computer Vision – Graph represent and analyze image and video, such as tracking objects

⇒ Telicommunication.