KESHAV MEMORIAL INSTITUTE OF COMMERCE & SCIENCES

(Affiliated to Osmania University)

Narayanaguda, Hyderabad.

Department of Computer Science

II B.Sc (MSCs/MPCs) III Semester

Subject : DataStructures Using C++

Bit Question Bank

UNIT I

MULTIPLE CHOICE QUESTIONS

1. From following which is not the operation of datastructure ( )
   A.Operations that manipulate data in some way
   B.Operations that perform a computation
   C.Operations that check for syntax
   D.None

2. A pictorial representation of an algorithm is called ( )
   A.F**lowchart** B. Structure chart C. Pseudo code D.Algorithm

3.Which of the following is a part of Abstract data type description? ( )
   A.Data B.Operation C. **Both** D.None.

4.The space factor when determining the efficiency of an algorithm is measured by( )
   A.Counting the maximum memory needed by an algorithm
   B.Counting the minimum memory needed by an algorithm
   C. Counting the average memory needed by an algorithm
   D.None

5.Which of the following datastructure is Linear type ( )
   A.Strings B.Lists C.Queues **D.All**

6.Which of the following datastructure is Non -Linear type ( )
   A.Strings B.Lists C.Stacks **D.None**

7.The smallest element of an array's index is called its ( )
   A. L**ower bound** B.Upper bound C.Range D.Extraction

8.Which of the following is the infix expression? ( )
   A. **A+B*C** B.+A*BC C.ABC+* D.None

9.What is the postfix form of the following prefix expression ? *+AB-CD ( )
   A. **AB**+**CD**-* B.ABC+*- C.AB+*CD- D. AB+* CD-

10.Which one of the following is an application of Stack Data Structure? ( )

   A. Managing Function Calls C.Arithmetic Expression Evaluation
   B. Towers of Hanoi **D.All of these**

11.What will be the value of top,if there is a size of stack STACK_SIZE is 5 ( )
   A. 5 B.6 C.**4** D.None

12.The method of deleting an element from a stack is called _____operation. ( )
   A.Insertion B.Push C. **POP** D.Deletion

13.Stack follows the sequence: ( )

A.**last In first out** B. first in last out C.last in last out D.first in first out

14.If the size of the stack is 10 and we try to add the 11th element in the stack then the condition is known as ( )

A.Underflow B.Garbage collection **C.Overflow** D.None

15.When a pop() operation is called on an empty queue, what is the condition called? ( )

A.Overflow **B.Underflow** C.Syntax Error D.Garbage Value

16.The type of expression in which operator succeeds its operands is? ( )

A. Infix Expression B. Prefix Expression **C. Postfix Expression** D. None

17.The result of evaluating the postfix expression 6 3 2 4 + – * is? ( )

A.60 **B. -18** C. 50 D.52

18.If the elements "A", "B", "C" and "D" are placed in a stack and are deleted one at a time, what is the order of removal? ( )

A. ABCD **B. DCBA** C. DCAB D. ABDC

19.The postfix form of the expression (A+ B)*(C*D- E)*F / G is? ( )

A. AB+ CD*E – FG /** C. AB + CD* E – F **G /

B. AB + CD* E – *F *G / D. AB + CDE * – * F *G /

20. What is the time complexity of an infix to postfix conversion algorithm? ( )

A. O(N log N) **B. O(N)** C. $O(N^2)$ D. O(M log N)

FILL IN THE BLANKS

1. A Mathematical model with a collection of operations defined on that model is called DataStructure.
2. **Dynamic** data structures are structures that expand and contract as a program runs.
3. **Algorithm** is a method of representing step-by-step procedure for solving a problem.
4. Algorithm written in English languge is called P**seudocode**.
5. Basic Data structure used to implement ADT are **Array and linked list**.
6. Two main measures for the efficiency of an algorithms are **Time Complexity and Space Complexity.**
7. Representation of data structure in memory is known as **Abstract DataType.**
8. Full form of LIFO is **Last in First Out**.

9. When the user tries to delete the element from the empty stack then the condition is said to be a **Underflow**
10. Stack is a **Dynamic** DataStructure.
11. In Stack, memory allocation and deallocation is performed in **LIFO**.
12. **Stack** data structure is required to convert the infix to prefix notation
13. Process of inserting an element in stack is called Push and removing an element from stack is called POP.
14. Prefix form of A+B*C is +A*BC
15. Prefix notation is also known as **Polish** Notation.
16. Postfix notation is also known as **Reverse Polish** Notation.
17. The value of the postfix expression 6 3 2 4 + – * is **-18**
18. Three types of cases:
    i) **Best Case** is the minimum number of steps that can be executed for the given parameters
    ii) **Worst Case** is the maximum number of steps that can be executed for the given parameters ,
    iii) **Average Case** is the average number of steps that can be executed for the given parameters.
19. **Order of Time Complexity means:**
    i) O(1) means Computing time is Constant
    ii) O(n) means Computing time is Linear.
    iii) O(n^2) means Computing time is Quadratic.
    iv) O(n^3) means Computing time is Cubic.
    v) O(2^n) means Computing time is Exponential.
20. **BigOhNotation** is the formal way to express upper bounds of an algorithm running time.

SHORT QUESTION AND ANSWERS

1. What is Data Structure and its example

Data Structure is a way of collecting and organizing data in such a way that we can perform operations in an effective way.Examples of Data Structures are arrays, Linked List, Stack, Queue, etc.

2.What is ADT
Mathematical model of a user defined type along with the collection of all primitive operations on that model.

3.Define Time Complexity
The amount of time needs to run to completion is called Space Complexity.

4.Define Space Complexity.
The amount of memory needs to run to completion is called Space Complexity.

5.Differentiate Linear data Structure & Non Linear DataStructure

Linear Data Structures	Non Linear Data Structures
The data items are arranged in sequential order, one after the other.	The data items are arranged in non-sequential order (hierarchical manner).
All the items are present on the single layer.	The data items are present at different layers

6.Define Stack with exxmple
Stack is a linear data structure which follows a particular order in which the operations are performed from one end. Ex: Stack of plates

7.Write the applications of Stack
Expression Evaluation ,Expression Conversion like Infix to Postfix, Infix to Prefix, Postfix to Infix etc,Backtracking,Memory Management.

8.How Stacks can be implemented
Stacks can be implemented using Arrays and Linked Lists.

9.What is the difference between a stack and an array?

The stack has a dynamic size. The array has a fixed size. The stack can contain elements of different data types. The array contains elements of the same data type

10.What is multiple stack in data structure?

A single stack is sometimes not sufficient to store a large amount of data. To overcome this problem, we can use **multiple stack**.

UNIT II

MULTIPLE CHOICE QUESTIONS

1. An algorithm that calls itself directly or indirectly is known as ( )
   A.Sub algorithm **B.Recursion** C.Polish Notation D.Traversal Algorithm

2. Which of the following data structures finds its use in recursion? ( )
   A.Stacks B.Arrays C.Linked Lists D.Queues

3. Recursion uses more memory space than iteration because ( )
   A. It uses Stack instead of Queue **B.Every Recursive call has to store** C.Both D.None

4. A linear list of elements in which deletion can be done from one end (front) and insertion can take place only at the other end (rear) is known as _____ ( )
   A) Queue B) Stack C) Tree D) Linked list

5. Queue works on the principle: ( )
   A.LIFO **B.FIFO** C.Ordered Array D.Linear tree

6. If the elements "A", "B", "C" and "D" are placed in a queue and are deleted one at a time, in what order they will be removed? ( )
   A.DCAB B.ABDC **C.ABCD** D.ACBD

7. Which one of the following is not the operation that can be performed on Queue ( )
   A. Insertion B.Deletion C.Retreival **D.Traversal**

8. In a circular queue the value of r will be ( )
   A. r=r+1 B.r= (r+1)% (QUEUE_SIZE-1) **C. r= (r+1)% (QUEUE_SIZE)** D.None

9. Which of the following is a type of dequeue ( )
   A.Input Restricted Queue B.Output Restricted Queue **C.A & B** D.None

10. What is the time complexity to insert a node based on key in a priority queue? ( )
    A. O(nlogn) B. O(logn) **C.O(n)** D. $O(n^2)$

11. A Linear Collection of data elements where the linear node is given by means of pointer is called? ( )
    A.Linked List B.Node List C.Primitive List D.None

12. A Linked List is which type of datastructure ( )
A.Linear B.Non-Linear C.Hierarchical D.None

13. The List with no node is called ( )
A.Empty List **B.Null List** C.Zero List D.None

14. In double Linked Lists, traversal can be performed? ( )
A.Forward direction **B.Forward and Backward Direction**
C.Backward Directions D.None

15. In Linked Lists, there are no NULL links in ( )
A.Single Linked List B.Doubly Linked List **C.CircularLinked List** D.None

16. In a Circular Linked list, insertion of node requires modification of ? ( )
A. One Pointer **B.Two Pointers** C.Three Pointers D.None

17. In linked representation of stack which one of the following holds the elements( )
of the stack.
A.INFO Fields B.TOP Fields C.LINK Fields D.NULL Fields

18.LLink is the pointer pointing to the ( )
A.Successor Node **B.Predecessor Node** C.Head Node D.Last Node

18. In linked list implementation of a queue, where does a new element be ( )
inserted?
A.At the head of link list B.At the centre position in the link list
C.At the tail of the link list D.At any position in the linked list

20.When does the top value of the stack changes? ( )
A.Before Deletion B.At the time of Deletion C. Checking Underflow **D.After Deletion**

FILL IN THE BLANKS

1. A Mathematical Model with a collection of operations defined on that model is called **Abstract Data Type.**
2. **Travsersal** refers visiting each node in a list.
3. Insertion and Deletion operation in Queue is known as **Enqueue and Dequeue**
4. A **Linear Array** does not keep track of address of every element in the list.
5. In a Queue, the insertion operation is performed at a position which is known as **rear.**
6. In a Queue,the deletion operation is performed at a position which is known as **Front.**

7. Circular Queue is also known as **Ring Buffer.**
8. In **Double ended** Queue, insertion and deletion operations are performed at both the ends (Front & Rear).
9. Insertion of an element at the middle of a linked list requires the modification of **two** pointers
10. In Linked list, the pointer component contains the **address** of the next structure.
11. In a **Doubly Linked List**, insertions and deletions can be done easily from both the ends.
12. Double Linked List has **left and right** pointers.
13. **Sparse** Matrix has most of the elements (not all) as Zero
14. In a Sparse Matrix, it contains more number of **ZERO** values then **NON-ZERO** values.
15. Each node in a linked list must contain at least **two** fields.
16. In a **Priority Queue**, insertion and deletion take place at **any** position.
17. A **Circular** Linked List can be used for both Stack & Queue.
18. The elements are removal from a stack in **reverse** order.
19. In Linked Representation of Stack ,when you push a new node onto a stack , **new node is placed at the front of the linked list**
20. In linked list implementation of a queue, item is deleted at the **front** of the list.

SHORT QUESTION AND ANSWERS

1. **What is Recursion ?**
   A function that calls itself is known as a recursive function. And, this technique is known as recursion.

2. **List out various types of Recursion?**
   Direct Recursion , Indirect Recursion,Tail Recursion, Tree Recursion,Linear Recursion

3. **Define Linked List.**
   A linked list is **a data structure which consists of nodes where each node contains a data field and a reference(link) to the next node in the list**.

4. **Write the applications of Linked Lists**
   - Implementation of stacks and queues,
   - Implementation Adjacency list representation of graphs
   - Dynamic memory allocation

- representing sparse matrices

5. **List out various types of Linked Lists**
   There are 3 types : Single Linked List,Double Linked List & Circular Linked

6. **What is Circular queue**
   A Circular Queue is a special version of queue where the last element of the queue is connected to the first element of the queue forming a Circle.

7. **Write the applications of Queues**
   Memory Management & Traffic system

8. **What is Circular Linked List**
   In a circular linked list, the last node of the list contains a pointer to the first node of the list.

9. **Define Double Linked List**
   A Double Linked list is a two way list in which all nodes will have two links.

10. **Differences between arrays and linked lists**

    An array is a grouping of data elements of equivalent data type. A linked list is a group of entities called a node. The node includes two segments: data and address.

UNIT III

MULTIPLE CHOICE QUESTIONS

1.Which of the following is not an advantage of trees? ( )
A.Hierarchial Structure B.Faster Search
C.Router Algorithms **D.Undo/Redo Operations in a notepad**

2. The operation of processing each element in the list is known as ( )
A.Sorting B.Merging C.Inserting **D.Traversal**

3. Which of the following is the name of the node having child nodes? ( )
A. Brother B. Sister C. Mother **D. Parent**

4.In Binary Trees , nodes with no successor are called ( )
A.End Nodes **B.Terminal Nodes** C.Final Nodes D.Last Nodes

5. A Binary Tree has a height of 5, What is the minimum number of nodes it can have?( )
A.1 B.15 **C.5** D.10

6. A Binary search tree whose left and right sub tree differ in height by atmost 1 is called as ( )
A.AVL Tree B.Threaded Binary Tree C.Red Black Tree D.None

7. The postorder traversal of a binary tree is DEBFCA. Find out the preorder Traversal( )
A.ABFCDE B.ADBFEC **C.ABDECF** D.ABDCEF

8. Which indicates Preorder Traversal ( )
A.Leftsubtree, Root, Right Subtree **B.Root ,Left Subtree,Right Subtree**
C.Leftsubtree, right subtree,root D.Right Subtree, Leftsubtree, Root

9. What is a threaded binary tree traversal? ( )
A.a binary tree traversal using stacks
B. a binary tree traversal using queues
C. a binary tree traversal using stacks and queues
D.a binary tree traversal without using stacks and queues

10.If a node having two children is to be deleted from binary search tree , it is replaced by its ( )
A.Inorder Predecessor **B.Inorder Successor**
C.Preorder Predecessor D.None

11.The number of edges from the node to the deepest leaf is called _____ of the tree. ( )

A.Height B. Depth C. Length D. Width

12.In which of the following tree, parent node has a key value greater than or equal to the key value of both of its children? ( )

A. Binary Search Tree B. AVL Tree C) Max-Heap **D.Both A & C**

13.What is the best case complexity of Quick Sort ( )

A. O(nlogn) B. O(logn) C. O(n) D. O(n2)

14.What are the disadvantages of normal binary tree traversals. ( )

A.Improper Traversals **B.There are many pointers which are null and thus useless**
C.Complexity in implementing D. There is no traversal which is efficient

15.Which type of traversal of binary search tree outputs the value in sorted order. ( )

A.Pre-Order B**.In-Order** C.Post-Order D.None

16.In threaded Binary Tree which points to higher nodes in tree. ( )

A.Info B**.Threads** C.Root D.Child

17.If Node N is a terminal node in a binary tree then its ( )

A.Right tree is empty B.Left Tree is Empty
C.Both Left and Right subtrees are empty **D.Rootnode is empty**

18.What is the maximum height of anyAVL Tree with 7 nodes?Assume that the height of a tree with a single node is 0. ( )

A. 2 **B.3** C.4 D.5

19. Time complexity of bubble sort in best case is ( )

A.O(n) B.O(nlogn) C.O(n2) D.O(nlogn)

20. Binary Search works only on ( )

A. Sorted Arrays B.UnSorted Arrays C.Both A & B D.None

FILL IN THE BLANKS

1. Examples of Non Linear Data Structures are: **Trees & Graphs**
2. **Tree** is a non-linear data structure which organizes data in hierarchical structure..
3. If we have N number of nodes then we have a maximum of **N-1** number of links.
4. The connecting links between any two nodes in a tree is called **Edge.**
5. A **Binary tree** can have maximum of two children.
6. A Graph with undirected edges is called **UnDirected Graph**

7. Terminal node of a Binary Tree is called **Leaf..**

8. In Binary Search Trees, the keys of all elements are **unique**.

9. **Traversal** is a process of visiting every node in a tree atleast once.
10. **Merge Sort Or Quick Sort** uses Divide and Conquer Approach
11. Traversals of Binary tree are **Inorder , Preorder and Postorder**.
12. **Sorting** is a technique of organizing data.
13. In **Postorder traversal** of Binary Tree ,the root node is visited last.
14. Childrens of same parent are called **Siblings.**
15. Linear Search is also known as **Sequential Search**.
16. Applications of Binary Tree are : **Decision Tree, Huffmain Coding, Expression Tree.**
17. The Topmost element of the tree is **Root.**
18. **Searching** is a process of finding the location of element from a list of elements or array.
19. In AVL Tree, The Different types of rotations are **LL,LR,RR,RL.**
20. Binary Trees with threads are called as **Threaded Binary Tree.**

SHORT QUESTION AND ANSWERS

1.Define Tree

Ans: A tree is a non linear data structure represented in hierarchical manner.It contains finite set of elements .

2.Define Binary Tree.Write Traversals of Binary Tree

Ans: A binary tree is a tree data structure in which each parent node can have at most two children. There are three traversals of Binary Tree: Inorder, Preorder & Postorder

3. What is Binary search tree?

Ans: A Binary Search Tree (BST) is **a tree in which t**he value of the key of the left sub-tree is less than the value of its parent (root) node's key and the value of the key of the right sub-tree is greater than or equal to the value of its parent (root) node's key.

4. Define Threaded Binary Tree.

Ans: A threaded binary tree is a type of binary tree data structure where the empty left and right child pointers in a binary tree are replaced ...

5.Write binary tree ADT?

Ans. Create() ,isempty(), leftchild(), rightchild(),data().

6.What is Searching?Write the types of Searching

Ans.Searching is an operation or a technique that helps finds the place of a given element or value in the list. There are 2 types of Searching : Linear Search,Binary search.

7.Write the Applications of Binary Tree

Ans:Few applications are :Huffman Coding,Decision Tree,Expression Tree

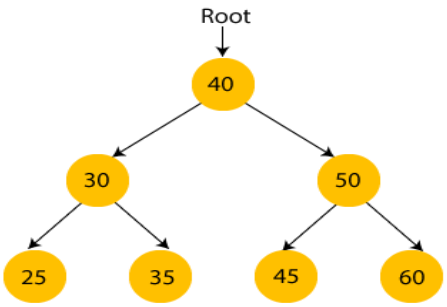
8. Define Sorting. List out any five Sortings available in data structure

Ans: Sorting is the Process of rearranging the elements in an order.The most common types of sorting in data structure are insertion sort, selection sort, bubble sort, quick sort, heap sort, and merge sort.

9.what is AVL tree?

Ans: AVL tree is binary search tree with additional property that difference between height of left sub-tree and right sub-tree of any node can't be more than 1.

10.Write one example for binary search tree



UNIT IV

MULTIPLE CHOICE QUESTIONS

1.A Graph is a collection of ( )
A. Rows and Columns **B.Vertices and Edges** C.Equations D.None

2.Which of the following is true? ( )
A. A graph may contain no edges and many vertices
B. **A graph must contain at least one vertex.**
C. A graph may contain no edges and no vertices
D. A graph may contain no vertices and many edges

3. What is the number of edges present in a complete graph having n vertices? ( )
A. (n*(n+1))/2 **B. (n*(n-1))/2** C. n D. None

4.Which of the following ways can be used to represent a graph? ( )
A.Adjacency List and Adjacency Matrix B.Adjacency Array
C.AdjacencyQueue D.None

5.The number of elements in the adjacency matrix of a graph having 7 vertices is ( )
A. 7 B. 14 C. 36 **D. 49**

6.In the Case of Depth First Search Tree, the following Concept is used ( )
A. Queue **B.Stack** C.Tree D.Linked List

7.Which of the Following graph in which every edge is directed ( )
A.Directed Graph B.UnDirected Graph C.Mixed Graph D.Acyclic Graph

8.Level order traversal of a tree is formed with the help of ( )
A.Dijkstra's Algorithm B.Prim's Algorithm
C. Breadth First Search D.DepthFirstSearch

9.Kruskal's algorithm is used to ( )
A. **find minimum spanning tree** B. find single source shortest path
C.find all pair shortest path algorithm D. traverse the graph

10.In Depth First Search, how many times a node is visited? ( )
A. Once B.Twice **C. Equivalent to number of indegree of the node** D. Thrice

11.Which of the following is false in the case of a spanning tree of a graph G? ( )
A. It is tree that spans G B.It is a subgraph of the G
C.It includes every vertex of the G D**. It can be either cyclic or acyclic**

12.Prim's algorithm is a ( )

A. Divide and conquer algorithm **B. Greedy algorithm**

C. Dynamic Programming D. Approximation algorithm

13.What is a hash table? ( )

A. A structure that maps values to keys **B. A structure that maps keys to values**

C. A structure used for storage D.A structure used to implement stack and queue

14,If Several elements are competing for the same bucket in the has table ,what is it called?( )

A.Diffusion B.Replication **C.Collision** D.Duplication

15.What is hash Function? ( )

A.A Function has allocated memory to keys.

B.A Function that computes the location of the key in the array.

C.A Function that creates an array.

D.A Function that computes the location of the values in the array.

16.In Simple Chaining, what datastructure is appropriate. ( )

A.Single Linked List B.Double Linked List C.CircularLinked List D.None

17.Which of the following is not a Collision Resolution Technique. ( )

A.Seperate Chaining B.Linear Probing C.Quadratic Probing **D.Hashing**

18.On which algorithm is heap sort based on? ( )

A. Fibonacci heap B.Binary tree **C.Priority Queue** D.FIFO

19.Consider a complete graph G with 4 vertices. The graph G has following ( )
spanning trees.

A. 15 B. 8 **C. 16** D.13

20.In heap sort, after deleting the last minimum element, the array will contain ( )

elements in?

A.increasing sorting order **B.Decreasing sorting order**

C. tree inorder D.Tree preorder

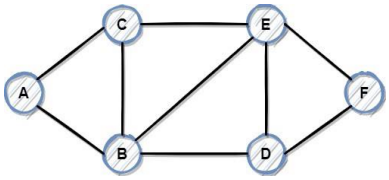
FILL IN THE BLANKS

1. Graph is a **non-linear datastrucure** consisting of vertices and edges.
2. In Graph ,Every individual data element is called a **vertex or a node**.
3. **Edge** is Connecting link between two nodes or vertices.
4. A graph that has a value associated with every edge is called **Weighted Graph**.
5. A minimum Spanning Tree is a **Spanning Subgraph.**
6. Applications of Graphs are :**Social Networks, Google Maps,Block Chains**
7. BFS stands for **Breadth First Search and DFS** DFS stands for **Depth First Search.**
8. The **adjacency matrix** is a connection matrix containing rows and columns used to represent a simple labelled graph
9. A **mixed graph** in which both directed and undirected edges may exist.
10. **Graph traversal** is the process of visiting or updating each vertex in a graph.
11. In DFS, **Stack** data structure can be used.
12. An **adjacency list** represents a graph as an array of linked lists.
13. In BFS, **Queue** data structure can be used.
14. The two algorithms that are used to find the minimum spanning tree are **Prim's and Kruskals' Algorithm**
15. **Linked List** data structure is appropriate in Separate Chaining.
16. **Path** represents a sequence of edges between the two vertices.
17. **Hashing** is the problem of finding an appropriate mapping of keys into addresses.
18. Hashing function for separate Chaining is **h(x)= x mod hashtablesize**.
19. A **Heap** is a special Tree-based data structure in which the tree is a complete binary tree
20. **Heap sort** is a comparison-based sorting technique based on Binary Heap data structure.

SHORT QUESTION AND ANSWERS

1.Define Graph.Give one Example

A Graph is a non-linear datastrucure consisting of nodes or vertices and edges.



2. List out various Representations of Graph ADT.

Ans: Graph data structure is represented using following representations...

1. Adjacency Matrix
2. Adjacency List
3. Adjacent Multilists

3.Define Spanning Tree

Ans: A spanning tree is a sub-graph of an undirected connected graph, which includes all the vertices of the graph with a minimum possible number of edges.

4.Write the ADT of Graph

Create( ), InsertEdge( ), RemoveEdge( ), InsertVertex( ),RemoveVertex( )

5.What is Hashing?

Hashing is a technique or process of mapping keys, values into the hash table by using a hash function.

6.List out various collision resolution technologies

Ans: The Collison resolution technologies are

Linear Probing, Quadratic Probing, Double Hashing & Separate Chaining

7.Define Minimum Spanning Tree

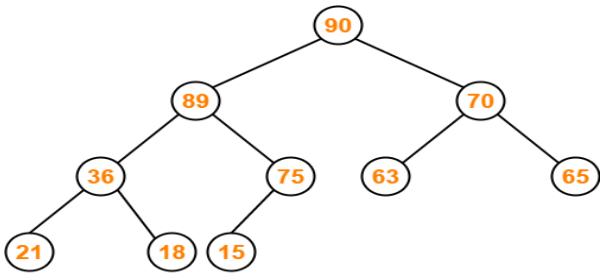
Ans:A minimum ***spanning tree*** is a spanning tree in which the sum of the weight of the edges is as minimum as Possible

8.Define Heap. Write its types

Ans:A heap is a tree-based data structure in which all the nodes of the tree are in a specific order. There are two types of the heap: 1)**Min Heap 2) Max heap.**

9.Define Max-heap.Give an example

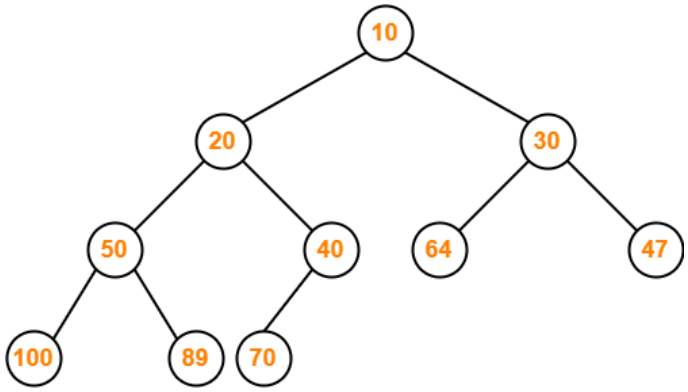
Ans:A max-heap is a complete binary tree in which the value in each internal node is greater than or equal to the values in the children of that node.



Max Heap Example

10. **Define Min-heap.Give an example**

Ans:A min-heap is a complete binary tree in which the value in each internal node is lessr than or equal to the values in the children of that node



Min Heap Example

11.What are the Different types of Traversals in Graph.

Ans: There are two types of Traversals:

a.) Depth First Search(DFS) b) Breadth First Search(BFS)