New Papers

Data Structure in C

Section-A

(1) Variable that stores address of another variable.

a) Pointer.

(2) Array is a _____ data structure.

a) Linear

(3) Binary trees with threads are called as _____

c) Threaded trees

(4) A linear list in which the last node points to the first node is _____

c) Circular linked list

(5) POP operation in empty stack may result in overflow.

b) False

(6) When the function calls itself it is called _____

c) recursion.

(7) What is the value of top, if there is a size of stack, Stack_size is 5?

d) 4

(8) _____ is a pile in which items are added at one ends and removed from the other.

c) Queue

(9) A doubly linked list has _____ pointers with each node.

b) 2

(10) Binary search is applied to the _____ list of the elements-

a) Sorted.

Section-B

(11) What is Bubble Sort?

Bubble Sort is a straight forward sorting algorithm that checks and swaps elements if they are not in the intended order.

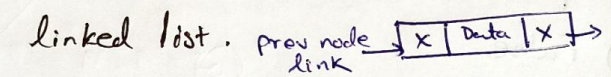
(12) What do you mean by Traversing?

In Data Structure, Traversing means to visit the element stored in it.

(13) What is the purpose of Rear in Queue?

Rear is used to get the last item from a queue. We insert elements from rear end pointer of the queue.

(14) Define doubly linked list.



Doubly linked list is a complex type of linked list in which a node contains a pointer to the previous as well as the next node in the sequence.

(15) The operation that combines the element of A and B in a single sorted list C is called _____.

Merging.

(16) Give prefix notation of A+B-C/D.

/-+ABC

(17) The identifier whose value remain fixed during execution of program is called _____.

Constant.

(18) Define stack.

Stack is a linear data structure which follows a particular order in which the operations are performed. The order may be LIFO or FILO.

(19) What is the height of a tree.

The height of node X can be defined as the longest path from the node X to the leaf node.

(20) Give formulae to calculate the size of one dimensional Array.

Size of array = UB - LB + 1.

Section-C

(21) What is Primitive & non-primitive data structure? Explain any two Non Primitive Data Structure.

Explained in previous.

Two - non-primitive data structures are -

explained in previous.

(22) What do you mean by traversal of a Tree? Explain in detail with example.

The process of visiting the nodes of a tree is known as Tree traversal.

It is classified in 2 categories:

- DFS → Depth - First Search
- BFS → Breadth-First Search.

- **DFS -**

→ DFS is technique used for traversing tree.

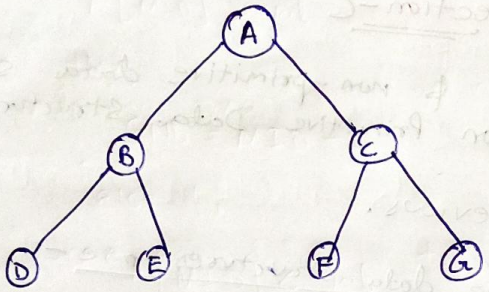
→ Backtracking is used for traversal.

→ Here, first the deepest node is visited and then it back-tracks to it's parent node if no siblings of that node exist.

DFS is of 3 types :-

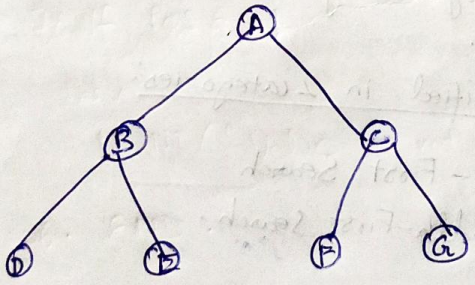
- In-order (Left, Root, Right)
- Preorder (Root, Left, Right)
- Postorder (Left, Right, Root)

- **In-order traversal -**



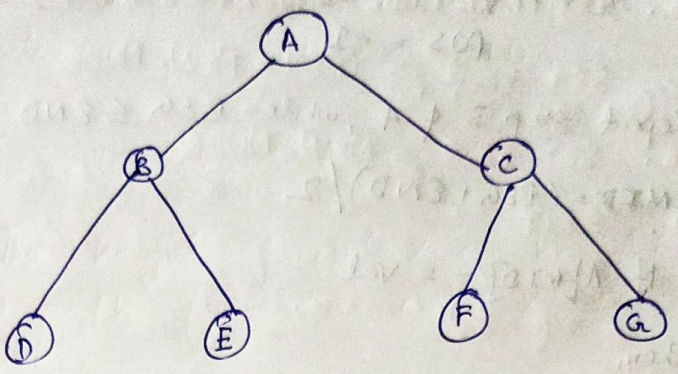
D → B → E → A → F → C → G

- **Pre-order traversal -**



A → B → D → E → C → F → G

→ Post-order traversal :-



D - E → B → F → G → C → A

- BFS -

→ Also known as Level order Tree traversal.

→ It search through a tree one level at a time.

→ It starts from root node and visit all nodes of current depth before moving to the next depth in the tree.

→ Here, we traverse the tree row by row.

(23) Write down the algorithm for binary search.

Let,

LB = lower bound

UB = Upper bound

val = value

POS = Position

A[] = array.

Step 1. [Initialize] BEG = lower bound
END = Upper bound
POS = -1

Step 2. Repeat step 3 & 4, while BEG ≤ END

Step 3. MID = (BEG + END)/2

Step 4. If A[MID] == val

then,

POS = MID + 1

PRINT POS

Goto step 6

Else if,

A[MID] > val

then,

END = MID - 1

else if,

A[MID] < val

BEG = MID + 1

[End of if]

[End of loop]

Step 5. If POS = -1

then,

PRINT ("Value is not present in the array")

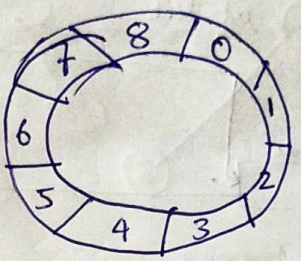
Step 6. END.

(24) Explain Circular queue with example.

A circular queue is the extended version of a regular queue where the last element is connected to the first element.

It forms a circle-like structure.

The circular queue solves the major limitations of the normal queue.



Circular queue representation.

(25) What is doubly linked list? Explain with algorithm and example.

~~explained in previous~~

~~Algorithm of doubly linked list:~~

Algorithm:

Step 1. IF Ptr = NULL
Write OVERFLOW
Go to step 9
(End of if)

Step 2. SET NEW_NODE = ptr

Step 3. SET ptr = ptr → NEXT

Step 4. SET NEW_NODE → Data = Val

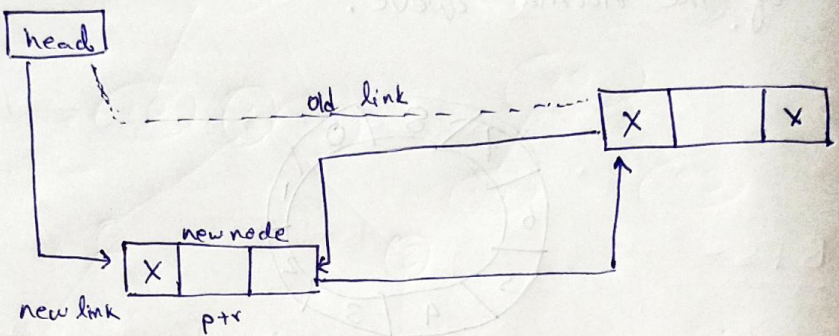
Step 5. SET NEW_NODE → PREV = NULL

Step 6. SET NEW_NODE → NEXT = START

Step 7. SET head → PREV = NEW_NODE

Step 8. SET head = NEW_NODE

Step 9. EXIT



(26) When underflow and overflow condition comes in Data Structures.

When new data is to be inserted into data structure but there is no space, that situation is called overflow.

When we want to delete data from a data structure but it is already empty, that situation is called underflow.

(22) Write algorithm for insertion and deletion of an element in queue.

Algorithm for insertion:

Step 1. IF REAR = MAX - 1
Write OVERFLOW
Go to step
[End of if]

Step 2. IF FRONT = -1 and REAR = -1
SET FRONT = REAR = 0
ELSE
SET REAR = REAR + 1
(End of if)

Step 3. Set QUEUE [REAR] = NUM

Step 4. EXIT

Algorithm for deletion :-

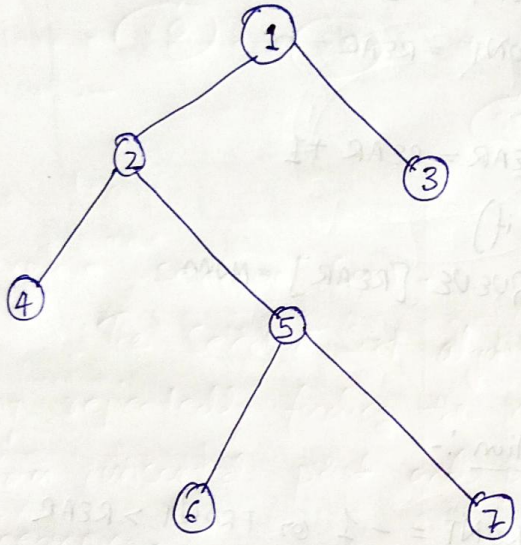
Step 1. If FRONT = -1 or FRONT > REAR
Write UNDERFLOW
ELSE
SET VAL = QUEUE [FRONT]
SET FRONT = FRONT + 1
(End of if)

Step 2. Exit.

(29) Write short note on Full Binary Trees. Extended Binary Trees.

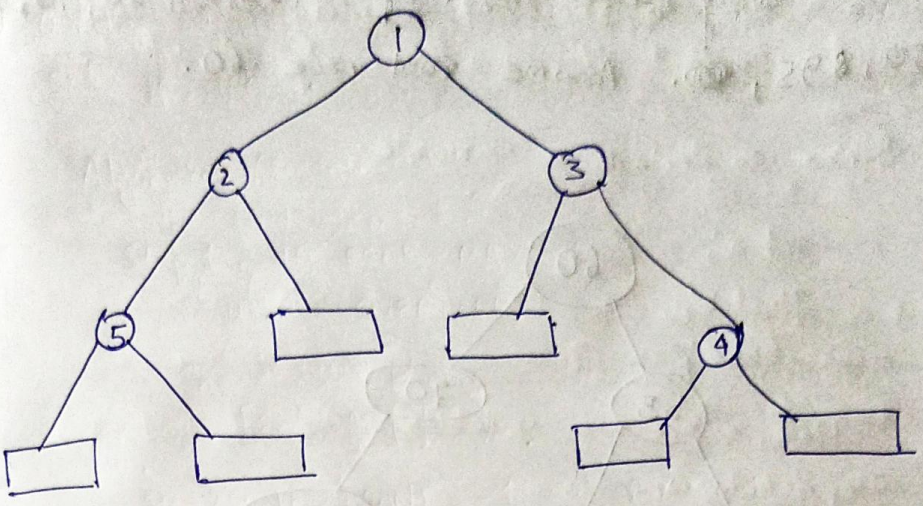
Full (Proper/Strict Binary Tree :

A full Binary Tree is a special type of binary tree in which every parent node has either two or no children.



Extended Binary Tree –

Extended binary tree is a type of binary tree in which all the null sub tree of the original tree are replaced with special nodes called external nodes, whereas other nodes are called internal nodes.



Here, Circles represents internal nodes and boxes represent external nodes.

(30) Explain terms used in Queue.

Terms used in Queue are:-

1) Enqueue() add an item to the queue.

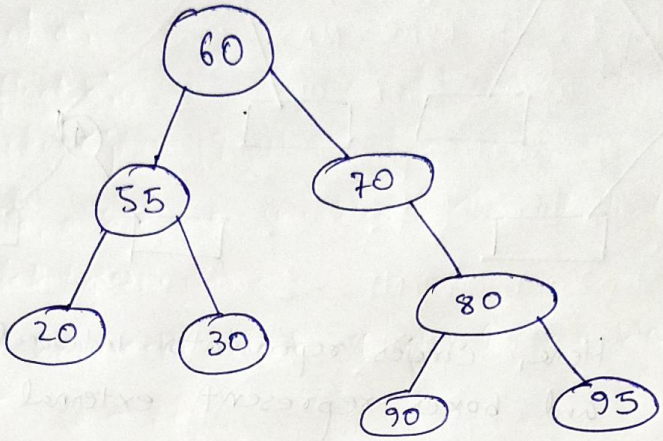
2) dequeue() remove an item from the queue.

3) peek() - gets the element in front of the queue without removing it.

4) is-full() - Checks if the queue is full

5) isempty() - Checks if the queue is empty.

(31) Construct Binary Search Tree of 20, 55, 60, 30, 70, 90, 80, 95, ... Assume root node 60.



(32) Explain selection Sort.

The Selection Sort algorithm sorts an array by repeatedly finding the minimum element from unsorted part and putting it at the beginning.

The algorithm maintains two subarrays in a given array ——

- The subarray which is already sorted
- Remaining subarray which is unsorted.

(33) Explain the various data structure operations.

The common operations performed on various data structures are —

- Searching - We can search for any element in a data structure.
- Sorting - We can sort the elements of a data structure in an ascending or descending order.
- Insertion - We can also insert the new element in a data structure.
- Updation - We can also update the element, i.e., we can replace the element with another element.
- Deletion - We can also perform the delete operations to remove the element from the data structure.
- Traversing - Traversing a data structure means to visit the element stored in it.
- Merging - It is used to combine the data items of two sorted files into single file in the sorted form.

(34) What is variable? Difference b/w local & global variable.

A variable is a name of the memory location. It is used to store data. Its ~~unused~~ value can be changed, and it can be reused many times.

It is a way to represent memory locations through symbol. So that it can be easily identified.

Syntax to declare a variable:

```
int a;
float b;
char c;
```

Here, a, b, c are variables. The int, float, char are the datatypes.

Difference between local & global variable are as follows:-

Local Variable	Global Variable.
① Variables declared inside the function.	① Variables declared outside the function.
② Scope is throughout the block.	② Scope is throughout the program.
③ Lifetime is throughout the function.	③ Lifetime is throughout the program.
④ Accessible only within the function it is declared.	④ Accessible by all the functions in the program.
⑤ Created when function starts executing and is destroyed when the execution is complete	⑤ Remains in existance for entire program.
⑥ Value cannot be changed by other functions.	⑥ Value can be changed by other functions.

(85) What is the purpose of avail list and null pointer in linked list?.

Purpose of avail list -

It is a list of free nodes in the memory. Whenever a new node is to be inserted in the linked list, a free node is taken from the AVAIL List and is inserted in the linked list. Similarly, whenever a node is deleted from the linked list, it is inserted in Avail list, so that it can be used in future.

Purpose of null pointer -

It is used to initialize O pointer variable when the pointer does not point to a valid memory address.

It is used to perform error handling with pointers before dereferencing the pointers.

It is passed as a function argument and to return from a function when we do not want to pass the actual memory address.

Section-D

(36) List various Searching Techniques. Compare them and write algorithm of anyone.

Explained in previous.

(37) What is array? What are the different operations that are performed on Array? Write algorithm of any one operation on Linear Array.

Previous paper.

Q - 14

Q - 27

(38) Convert the following expression into postfix notation using stack with algorithm.

$$(A+B)*C-(D-E)*(F+G)$$

Input Expression	Stack	Postfix Expression
(	(	
A	(	A
+	(+	A
B		AB
)		AB +
*	*	AB +
C	*	AB+C
-	*-	AB+C
(	(	AB+C
D	(	AB+CD
-	(-	AB+CD

Input Expression	Stack	Postfix Expression.
E	(-	AB+CDE
)		AB+CDE-
*	*	AB+CDE-
(	(	AB+CDE-
F	(	AB+CDE-F
+	(+	AB+CDE-F
G	(+	AB+CDE-FG
)		AB+CDE-FG+