Data Structure & Algorithms.

Part - 1

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? What is Data Structure? And it's classification.

✓ Organized collection of data in a particular format is called data structure.

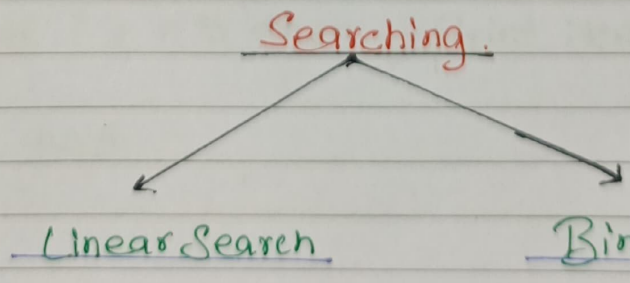
It is a technique or method of study how the data are inter-related to each other logically or mathematically.

Classification.

- Linear and non-linear.
- Homogeneous and Hetrogeneous.
- Static and Dynamic data Structure.

? Searching in Data Structure? With example & types.

✓ Searching is a method to finding an element from data structure with their appropriate location.



? What is Linear Search? Write algorithm & Program.

✓ **Linear Search :-** It is a very basic and simple algorithm. In linear search we search an element in given array by traversing the array from the starting till the desired element is found.

Algorithm :-

Step 1: Begin

Step 2: Set a[5] ← {10, 20, 30, 40, 50}
[0] [1] [2]

Step 3: Set i ← 0

Step 4: input Searching item. 30

Step 5: Repeat Step (6) & (7) while i < 5

Step 6: if a[i] = item then
print item found & location = i & exit

Step 7: i ← i+1

Step 8: if i >= 5 then, print item not found

Step 9: end

? (Q)

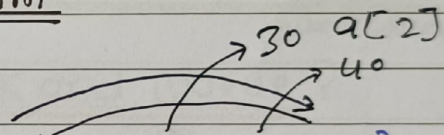
What is Binary Search? Write algorithm & Prog.

(A) It is the divide an conquer searching technique in which we have to arrange the data in particular order before searching operation. After that we find the middle element of array an compare with target element.

If item not found then we again check the target element is greater than or less than middle element, if it greater than we search right side of middle element otherwise left side of middle element.

Algorithm

Step 1: Begin



Step 2: Set a[5] ← {10, 20, 30, 40, 50}
[a]

Step 3: set lr ← 0, up ← 4, f ← 0

Step 4: input sending item x ~~30~~ 40

Step 5: Repeat Step (6) & (7) while (lr $\overset{0 \leq = 4}{<=}$ up)

Step 6: Set mid ← $\frac{lr + up}{2}$
a[2] 0 ~~80~~ 40

Step 7: if a[mid] = item then
Set f = 1 & break

Step 8: if a [mid] < item then
set lr ← mid + 1.
else
set up ← mid - 1

Step 9: if f=1 then
print item found with loc = mid
else
print not found

Step 10: exit.

? Difference between Stack and Queue ?

	Stack	Queue
①	Stack follow LIFO Operation i.e. Last in first Out.	① Queue follow FIFO Operation i.e. First in First Out.
②	Insertion and deletion takes place on one end.	② Insertion and deletion takes place on Opposite end.
③	Stack perform two operations i.e. i). PUSH, ii). POP.	③ Queue perform two Operations i.e. i). REAR ii). FRONT

	In Stack :-	In Queue :-
(iv)	(1) PUSH :- Used to insert the element in the stack. (2) POP :- Used to delete the element from the stack.	(1) REAR → Used to insert the element in the Queue. (2) FRONT → Used to delete the element from the Queue.
(v)	Stack doesn't have any type.	Queue has various type like General Queue, Circular Queue, and doubly Queue.
(vi)	In stack only one pointer is used i.e. top of the stack.	But, in Queue two different pointer are used i.e. REAR and FRONT.

? What is stack? Write Algorithm with suitable example.

✓ Stack is a collection of data item where the insertion and deletion takes place on one end called Top of the stack.

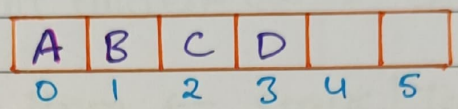
In stack we can perform two operations i.e. Push and Pop.

Push means inserting a new item into the stack.

Pop means deleting an item from the stack.

Stack always perform LIFO Operation that means Last in first Out.
A stack can represent by the help of Array and Linked List.

Example:-



Top = 3
N(Maximum stack) = 5.

? W.A.A. for PUSH Operation in Stack?

Step 1: Begin ~~3~~ 4 = 4

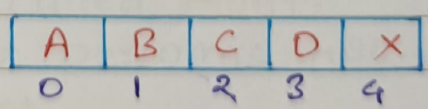
Step 2: if Top = N then, Print Overflow & exit.

Step 3: input new item.

Step 4: Top ← ~~top~~ + 1

Step 5: stack [Top] ← item

Step 6: exit



Top = ~~3~~ 4
N = 4

? W.A.A. for POP operation in stack?

✓ Step 1: Begin

$-1 = -1$

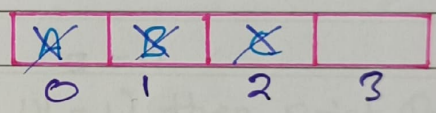
Step 2: if Top = -1 then
print underflow & exit

Step 3: set item ← Stack [Top]

Step 4: Top ← Top -1

Step 5: Print deleted item

Step 6: exit



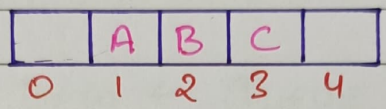
Top = 2 ✗ 0 - 1
N = 3

? What is Queue? Write Algorithm with example.

✓ Queue is a collection of data items in which insertion and deletion takes place on Opposite end. The insertion end is called rear and deletion end is called front.
In Queue we can performs two operations i.e. Rear and front.

Queue always perform FIFO operation i.e. First in First out.
A queue can be represent by the help array and Linked List.

Example :-



Front = 1
Rear = 3
N = 5

? W.A.A. for insertion of Queue?

Step 1: Begin

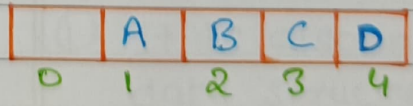
Step 2: if Rear = (N - 1) then, print Overflow & exit. (3 = 4)

Step 3: Input new item.

Step 4: Rear ← Rear + 1

Step 5: Queue[Rear] ← item

Step 6: exit.



F = 1
R = ~~3~~ 4
N = 5

? W.A.A. for delation of Queue?

Step 1: Begin
I = -1

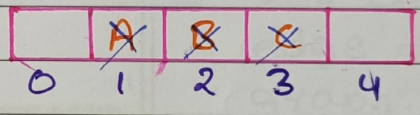
Step 2: if. F = -1 then
print Underflow & exit

Step 3: Set item ← Queue [Front]

Step 4: Front ← Front + 1

Step 5: Print deleted item

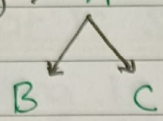
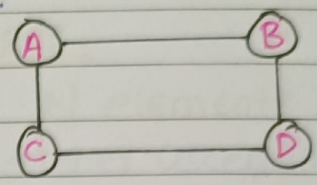
Step 6: exit.



F = ~~1~~ 2 3
R = 3
N = 5

? Difference between tree and graph?

	TREE	GRAPH
①	It is non-linear data structure.	It is also non-linear data structure.
②	It is a collection of nodes and edges. T = {node, edges}	It is a collection of vertices and edges. G = {V, E}

③ There is a unique node called root in tree e.g → A → root node.  	③ There is no unique node called root in graph. e.g → 
④ There will not be any cycle or loop.	④ A cycle can be formed.
⑤ Tree is a hierarchical model.	⑤ Graph is a network model.
⑥ It's always contain N-1 edges.	⑥ It's contain no. of edge depends upon graph.
⑦ Application – It is used to take decision for searching, deleting and inserting any element in tree.	⑦ Application – For finding shortest path in networking graph is used.