190050820001

2nd sessional
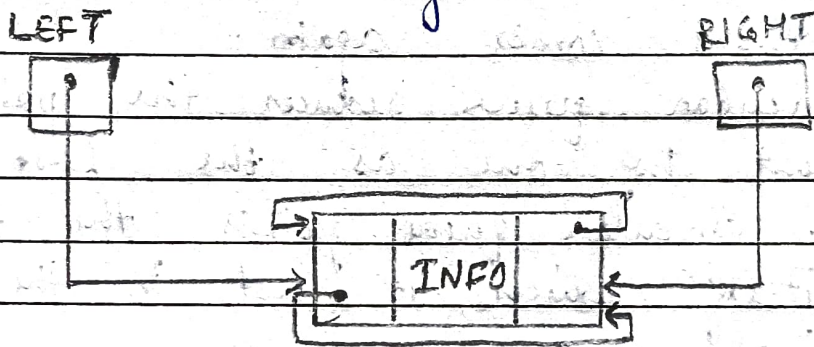4th SEM / Comp. Engg.

Subject: Data Structures using C

Section - A

Ans - 1

i) Circular Doubly Linked List -

The declaration of circular doubly linked list is just like the declaration of doubly linked list. Also the operations used in doubly linked list can be easily extended for using in circular doubly linked list.

Circular Doubly Linked List

ii) Two applications of stack are as follows -

• Tower of Hanoi -
Stack can be applied to solve the problem of tower of hanoi. By using stack we can move elements

in given conditions.

- **Algebric expressions** -

  stack can also be used to solve algebric problems such as sum, product, etc.

iii) The advantages of circular queue over linear queue are -

- Circular queue reduces the wastage of memory space more than that of linear queue.
- Circular queue is much more efficient than linear queue as in circular queue after the last element the first element comes again.
- Circular queue reduces the pointer requirement by one as the last element of circular queue points the first element itself which is not in the case of linear queue.

v) Algorithm to push an element in a stack -

Procedure Push (S, Top; X)

here

/* S is an array whose size is N */
/* Top is the top most element of stack */
/* X is the element to be pushed into stack */

steps :

1. /* Checking overflow */
   If TOP >= N then
      Print ("Stack is full. Insertion not possible")
      exit
   endif

2. /* TOP to next location */
      TOP ← TOP + 1

3. /* read and insert new element */
      Read X
      S[TOP] ← X

4. Exit
   /* End of procedure */

vi) Dequeue and Enqueue :

Dequeue - Dequeue is the function/
operation which means removal of
element from queue (or any other
data structure).

Enqueue - Enqueue is the operation of
adding an element into a data structure.
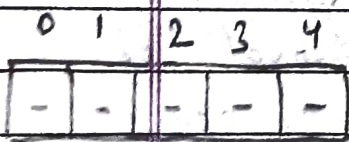(like queue)

Section - B

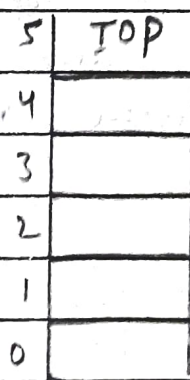**Ans - 2** Comparing Array, Stack, Linked list and queue :-

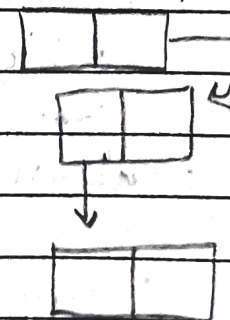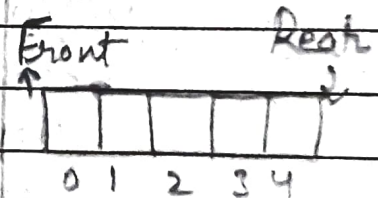| Array	Stack	Linked List	Queue
i) Array is a the collection of homoge- nous elements.	Stack is a collection of elements Stacked on top of each other. It works on LIFO (Last In first Out) principle.	Linked list is a collection of nodes. A node has two parts in which one stores INFO and other stores LINK.	Queue is a list of elements arranged in the form of one after another (queue). It works on FIFO (first In first out) principle.
ii) int a[5];	Diagram -	Diagram -	Diagram -

Array diagram (indices 0 1 2 3 4, cells empty with dashes)

Array

Stack diagram (TOP at 5, cells 5 4 3 2 1 0)

Stack

Linked List diagram (INFO LINK nodes)

Linked List

Queue diagram (Front ... Rear, indices 0 1 2 3 4)

	Array	Stack	Linked List	Queue
iii)	In Array, insertion of new elements can't be done.	In Stack, insertion takes place at the TOP.	In Linked List, insertion can be done from both ends.	In Queue, insertion is done from the rear side.
iv)	In Array, deletion can't be done as well.	In stack, deletion is also done from TOP.	In Linked List, ~~insertion~~ deletion can be done from both ends as well.	In Queue, deletion can is done from the front side.
v)	Types of Array — • One-dimensional array • Multi-dimensional array	Stack can be implemented through array or linked list.	Types of Linked List — • Singly • Doubly • Circular, etc.	Types of queue — • Circular • Doubly Ended , etc.
vi)	In this, memory space is allocated during declaration & cannot be changed later.	In this, we can put element on TOP then after that the topmost element becomes TOP.	In this, memory space can be reduced or increased as per the needs.	In this, memory space can be managed later on as well.