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Experiment no. 4

→ Aim - Queues are frequently used in computer programming and a typical ex is the creation of a job queue by an operating system. If the operating system does not use priorities, then the job are processed in the order they enter the system. Write C++ program for simulating job queue. Write functions to add job & delete job from queue.

Pre-requisite:

Basics of Queue
Different operations that can be performed on queue

Objective:

To perform addition & deletion operations on queue.

Input:

Size of & queue element in queue

Outcome:

Result of addition of job operation on queue
Result of deletion of job operation on queue

→ Theory

- Queue

Queue is an abstract data structure, similar to stacks. Unlike stacks, a queue is open at both its ends. One end is always used to insert data & the other is used to remove data. Queue follows First in First Out methodology, i.e the data item stored first will be accessed first.

As in stacks, a queue can also be implemented using Array, linked-list, Pointer & structures.

- Basic Operations

enqueue() - Add (store) an items to the queue.
dequeue() - remove (access) an items from the queue
peek() - Gets the element at the front
isfull() - Checks if the queue is full.
isempty() - Checks if the queue is empty.

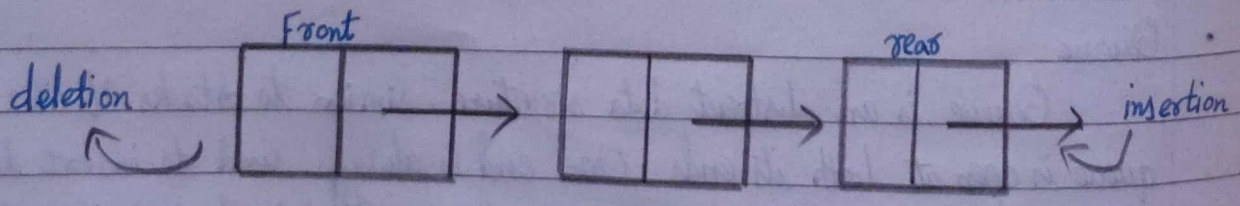
- Types of Queue

There are 4 different types of Queue

1 Simple Queue
2 Circular Queue
3 Priority Queue
4 Double Ended Queue

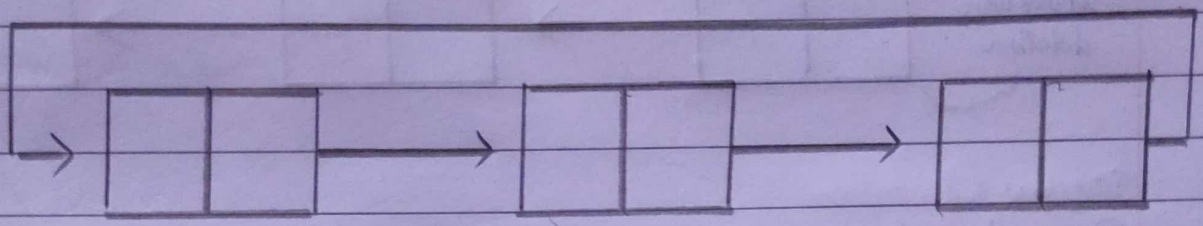
- Simple Queue

In a Simple Queue, insertion takes places at the rear & removal occurs at the front. it strictly follows FIFO rule.



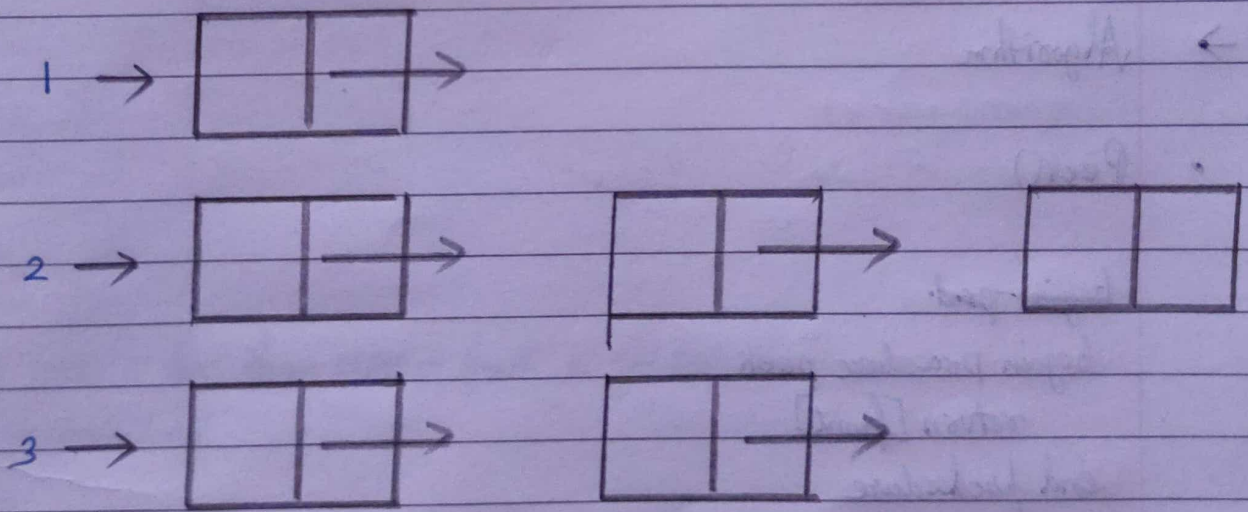
- Circular Queue

In a circular Queue, the last element points to the first element making a circular link. The main advantage of a circular queue over a simple queue is better memory utilization. If the last position is full & the first position is empty. We can insert an element in the first position



- Priority Queue

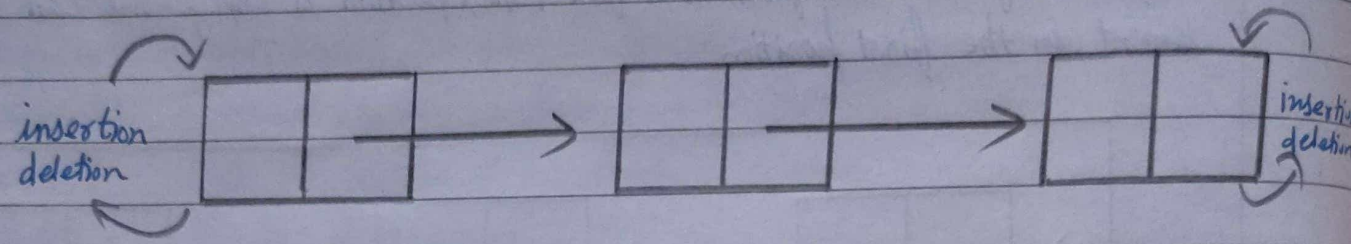
A Priority Queue is a special type of queue in which element is associated with a priority and is served according to its priority. If element with the same priority occur, they are served according to their order in the queue



Insertion occurs based on the arrival of the values and removal occurs based on priority

- Deque (Double Ended Queue)

In a double ended queue, insertion and removal of elements can be performed from either from the front or rear. Thus, it does not follow FIFO rule.



Queues have the advantages of being able to handle multiple data types & they are both flexible & flexibility & fast. Moreover, queues can be of potentially infinite length compared with the use of fixed-length arrays.

A major disadvantage of classical queue is the a new element can only be inserted when all of the element are deleted from the queue.

→ Algorithm

- Peek()

~~begin proc~~
begain procedure peek
    return [front]
end procedure

ex→
```
int peek(){
    return queue[front];
}
```

- Isfull()

```
begin produre isfull

   if rear equals to MAXSIZE
      return true
   else
      return False
   endif
end procedure
```

Ex>

```
bool isFull(){
 if (rear == MAXSIZE -1)
    return true;
 else
   return False;
}
```

- Isempty()

```
begin

  If Front is less than MIN or front is greater than rear
    return true
  else
    return False
  endif

end.
```

ex

```
bool isempty(){
 if (front<0 || Front > rear)
    return true;
 else
    return False;
}
```

- Enqueue Operation

Queues maintain two data pointers, front & rear. Therefore, its operator are comparatively difficult to implement than that of stacks

Procedure enqueue (data)

```
If queue is full
   return0;

rear = rear + 1
queue[rear] = data

return 1;
end procedure
```

- Dequeue

Produre dequeue

```
int dequeue(){

  if(isempty())
    return underflow
end if

data = queue[front];
front = front+1;
return true

end.
```