

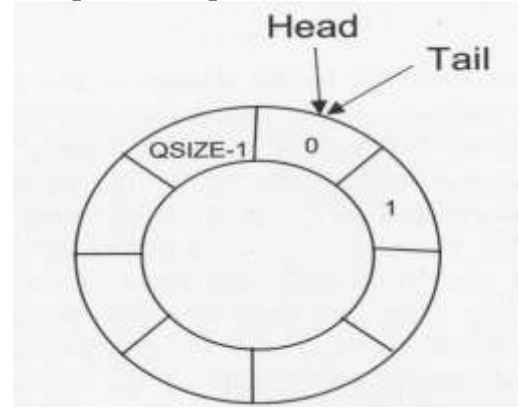
Queue ADT (FIFO = First In – First Out)



Actions allowed on a queue:

- Creating an empty queue.
- Testing if a queue is empty.
- Adding data to the tail of the queue (enqueue).
- Removing data from the head of the queue (dequeue).

An empty queue is: Head = Tail
Front = Rear



QUEUE ADT : A Queue Q stores items of some type, with First-In, First-Out (FIFO) access

Operations:

queueElementType *Q.dequeue()*

Precondition: !isEmpty()

Postcondition: Qpost = Qpre with front removed

Returns: The least-recently enqueued item (the front).

void *Q.enqueue(queueElementType x)*

Precondition: None

Postcondition: Qpost = Qpre with item x added to the rear.

queueElementType *Q.front()*

Precondition: !isEmpty()

Postcondition: None

Returns: The least-recently enqueue item (the front).

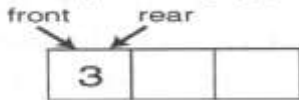
bool *Q.isEmpty()*

Returns: true if and only if Q is empty, I.e., contains no data items.

example: Identify the queue structure after execute the following enqueue operations.

enqueue(3), enqueue(6), enqueue(9), and three consecutive dequeue

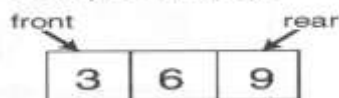
enqueue(3);



enqueue(6);



enqueue(9);



dequeue();



dequeue();



dequeue();



[1] What is the actions allowed on a queue.

[2] What is the difference between static and dynamic queues.

[3] How to implement a queue.

[4] How to detect full and empty queues with circular arrays.

[5] Write the queue ADT specification for the following operations:-

A- MakeEmpty

B- IsEmpty

C- Enqueue

D- Dequeue

[6] Write the code for static queue class (header file only)

[7] draw the structure of a dynamic queue, and write the code for it.

[8] Identify true or False and rewrite the correct version of False one.

A- A queue is a first-in-first-out (FIFO) data structure. **(true)**

B- Elements of queue ADT are added to front and removed from rear end. **(true)**

C- A dynamic queue is built on the linked list instead of an array. **(true)**

D- Computer systems use stacks while executing programs. **(true)**

E- Communication software uses queues to hold information received over networks and dial-up connections. **(true)**

[9] Indicate the suitable data structure for each of the following applications.

a) A program to evaluate arithmetic expressions according to the specific order of operators. **(stack)**

b) A bank simulation of its teller operation to see how waiting times would be affected by adding another teller,

c) A program to receive data that are to be saved and processed in the reverse order.

d) An address book to be maintained.

e) A word processor to have a PF key that causes the preceding command to be redisplayed. Every time the PF key is pressed, the program is to show the command that preceded the one currently displayed.

f) A program to keep track of patients as they check into a medical clinic, assigning patients to doctors on a first- come, first-served basis.

[10] Suppose the following operations are performed on an empty queue:

enqueue(5); enqueue(7); dequeue(); enqueue(9) ; enqueue(12); dequeue(); enqueue(10);

Draw the diagram that shows what will be stored in the static queue after operations above have executed.

Fill in the blank

1- the _____ element saved onto a queue is the first one retrieved

2- two primary queue operations are _____ and _____

3- _____ queues are implemented as arrays

4- _____ queues are implemented as linked lists

True or False

1. a static queue is built around an array
2. the size of a dynamic queue must be known in advance
3. the push operation inserts an element at the end of a queue
4. the dequeue operation retrieves an element from the top of a stack