Sunbeam Institute of Information Technology
Pune and Karad

Module – Data Structures

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Sorting Algorithm : Bubble Sort

Algorithm:

- Find the maximum element from two consecutive elements of an array A[i -> n-i-1] and place it at second location
  - where n – size of array and i – 0, 1, 2, …n-2
- Repeat the above procedure n – 1 times where n is size of array

- Repeat for n-1 times
  - Compare two consecutive elements
    - If left element > right element
      - Swap both elements

arr	33	22	66	55	44	11
	0	1	2	3	4	5

Sorting Algorithm : Insertion Sort

Algorithm:

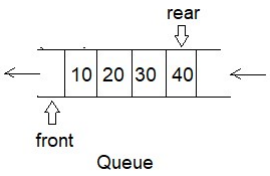
- Repeat from 1 to n-1
  - Select ith element in the array
    - Compare ith element with all its left neighbours
      - Insert at appropriate position

arr	55	44	22	66	11	33
	0	1	2	3	4	5

Queue

Queue

- Queue is First-In-First-Out structure.
- Queue Operations:
  - enqueue()
  - dequeue()
  - peek()
  - is_empty()
  - is_full()



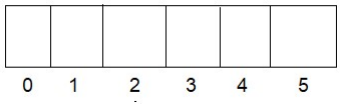
- Types of queue:
  - Linear Queue
  - Circular Queue
  - Deque
  - Priority Queue

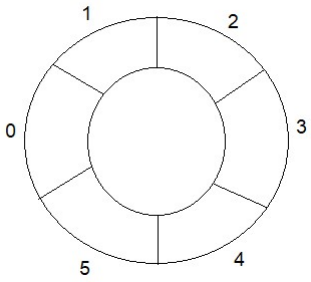
Queue

- Jobs submitted to printer
- In Network setups – file access of file server machine is given to First come First serve basis
- Calls are placed on a queue when all operators are busy
- Used in advanced data structures to give efficiency.
- Process waiting queues in OS

Circular Queue

- In linear queue (using array) when *rear* reaches last index, further elements cannot be added, even If space is available due to deletion of elements from *front*. Thus space utilization is poor.
- Circular queue allows adding elements at the start of array if rear reaches last index and space is free at the start of the array.
- Thus rear and front can be incremented in circular fashion i.e. 0, 1, 2, 3, …, n-1, 0, 1, …n-1. So they are said to be circular queue.
- However queue full and empty conditions become tricky.

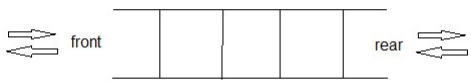




Deque and Priority Queue

Deque

- Double Ended Queue
- Insert and remove operations are possible from both end of queue.
- Operations can be performed as
  - Push front
  - Pop front
  - Push rear
  - Pop rear



Double Ended Queue

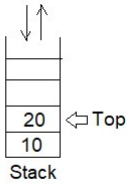
Priority Queue

- Each element is associated with priority.
- Elements are added by their priority.
- This queue is not FIFO
- Element with highest priority comes out first.

Stack

Stack

- Stack is Last-In-First-Out structure.
  - Stack Operations:
    - push()
    - pop()
    - peek()
    - is_empty()
    - is_full()



Stack

- Parenthesis balancing
- Expression conversion and evaluation
- Function calls
- Used in advanced data structures for traversing

- **Expression conversion and evaluation:**
  - Infix to postfix
  - Infix to prefix
  - Postfix evaluation
  - Prefix evaluation
  - Prefix to postfix
  - Postfix to infix

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Thank you!

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