SCC120 Week 8 workshop

Queue Abstract Data Type

1) If the elements “A”, “B”, “C” and “D” are placed into a queue and then are removed one at a time, in what order will they be removed? This is a multiple-choice question (so choose one of a, b, c, or d below).

(a) ABCD (b) DCBA (c) DCAB (d) ADBC

2) A queue is implemented with a circular buffer and a corresponding array size of 6:

0	1	2	3	4	5
	L	M	N		

The “front” variable is 1 and the “back” variable is 3.
What is the result after an ADD “P” operation?

3) In the linked list implementation of queues (with both a front pointer and a back pointer maintained), which of the following operations take linear time?

(a) Add (b) Remove (c) Remove all elements (d) Both (a) and (b)

4) A queue is implemented with a circular buffer. The size of the array is MAX_SIZE, the “front” variable is 0, and the “back” variable is (MAX_SIZE-1). Which of the following conditions indicate that the queue is full?

(a) (front== -1) && (back==-1)
(b) front==((back+1)%MAX_SIZE)
(c) back==(front+1)
(d) back==((front+1)%MAX_SIZE)

5) We described the *peek()* function for queues in the lecture slides. Write the pseudocode for this function, with the queue implemented as a linked list. What is the O() complexity of your pseudocode?

6) For the linked list implementation of queues, we described briefly a variation where we could have just the front pointer (and *not* the back pointer) and then we scan to the back of the queue when we want to add an element. What would be the O() complexity for remove() and add() in this case?

7) Again for the linked list implementation, another alternative would be to have just a back pointer (and *not* the front pointer), and for the next field of the final element (which is usually set to NULL) to point to the first element. Write the pseudocode for add() and remove() in this case. It may be helpful to draw a diagram of the linked list with an example to help you write the pseudocode. What are the O() complexities in this case?

8) For a priority queue, what are the O() complexities for add() and remove()? Explain why.

9) For a priority queue, describe a promotion method that takes O(1) time. Describe a promotion method that takes O(n) time.