Sample CS 3323 Midterm Exam 2

Total Time: 40 minutes Total Points: 45

Write your name clearly. Answer all the questions.

Reead all the questions. If you need more space, use the other side of your question sheet.

Name:_____ **Date:**_____

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Question 1. True/False **[8]**

1. The use of a queue structure ensures that the items are processed in the order they are received.
2. Item insertion and deletion in a linked list requires significant data movement.
3. A sequential search is good only for very small lists because the average search length of a sequential search is half the size of the list.
4. The linked implementation of a queue is similar to the implementation of a linked list created in a backward manner.
5. The front of the queue is accessed whenever an element is deleted from the queue.
6. The value of null pointer is zero.
7. A binary tree is a dynamic data structure.
8. If the queue is nonempty, the operation `front()` returns the first element of the queue

Question 2. Code Analysis **[7.5]**

For next set of problems, assume that `q` is a queue implemented by using circular arrays with **`QueueElement = char`** and **`capacity = 5`** and `ch` is type `char`.

Show the value of `myFront` and `myBack` and the contents of `myArray` for the Queue object q after the program segment has been executed; also indicate any errors that occur.

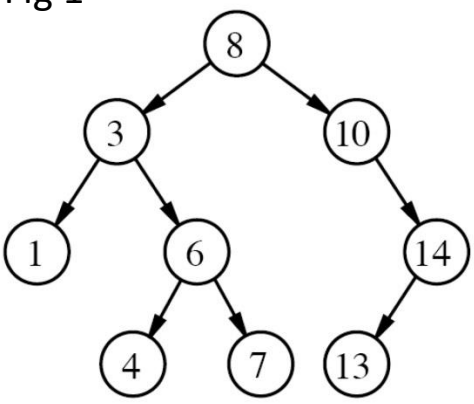
`q.enqueue('A');`
`q.enqueue('B');`
`q.enqueue('C');`
`ch= q.front();`
`q.dequeue();`
`q.enqueue(ch);`
	`myFront =` `myBack =`
	`myArray:`

q.enqueue('X');
q.enqueue('Y');
q.enqueue('Z');
while(!q.empty()){
ch = q.front();
q.dequeue();
}
	myFront = myBack =
	myArray:

ch = 'q';
for (int I =1; I <= 2; i++){
q.enqueue(ch++);
q.enqueue(ch);
}
	myFront = myBack =
	myArray:

Question 3. Draw the resulting BST, in each sequence of following operations such that resulting tree follows BST property: **[8]**

Fig 1



After:

(i). `Deleting 6`

(ii) `Deleting 8` (after i)

(iii) `inserting 8`**(after i and ii)**

(IV) **`inserting 6`** **(after i, ii and iii)**

Question 4. Give the sequence of nodes visited in following traversals on Binary search shown in Figure 1 **[6]**

(V) Pre-order

(Vi) Post-order

(V) In-order

Question 5. Consider the definition of a–Tree (the one in which each node has at most two children, `left`, `right`). Node stores a key value and height of the tree. Provide a suitable ADT (that includes data elements and methods such as constructor, destructor, post order traversals) in c++ with a suitable node structure (with a default and overloaded constructor methods) to represent this tree. **[8]**

Note: You should just provide the definition of the ADT, you do not have to provide the implementation of any methods except the constructor for the node data structure.

Question 6. Describe how would you design a queue using two stacks. In particular, how would you define you perform operation for `front`, `enque` and `dequeue` by using stack operations (such as `push, pop, top` and `empty`) on these two stacks. [1.5+3+3]

Bonus Question . Provide C++ methods to compute the following in a BST that stores integer values. Prototype of the method is given as below: [6]

(i) average Value stored in a BST

```
int avgValue (BinNode *node)
```

(ii) Maximum value stored in a BST

```
int MaxValue (BinNode *node)
```