CSC 212 Final Solution - Fall 2013

College of Computer and Information Sciences, King Saud University
Exam Duration: 3 Hours

04/01/2014

Question 1 [10 points]

Select the most appropriate answer.

1. a) 199
2. b) 9
3. d) $O(1)$
4. b) B+ tree
5. b) Slower serve but faster enqueue
6. b) Queue
7. a) Heap
8. c) External chaining
9. a) Hash
10. b) Insert

. . . . . .

Question 2 [16 points]

1.
```
public static<T> void duplicate(List<T> l){
        l.findFirst();
        while(!l.last()){
                l.insert(l.retrieve());
                l.findNext();
        }
        l.insert(l.retrieve());
}
```

2.
```
public T elncr(){
        if(head == null)
                return null;
        Node<T> p= head.next;
        T ele= head.data;
        T mel= ele;
        int cpt= 1;
        int max= 1;
        while(p != null){
                if(ele.equals(p.data)){
                        cpt++;
                        if(cpt>max){
                                max= cpt;
                                mel= ele;
                        }
                }
                else{
                        ele= p.data;
                        cpt= 1;
                }
                p= p.next;
        }
        return mel;
}
```

.....

Question 3 [16 points]

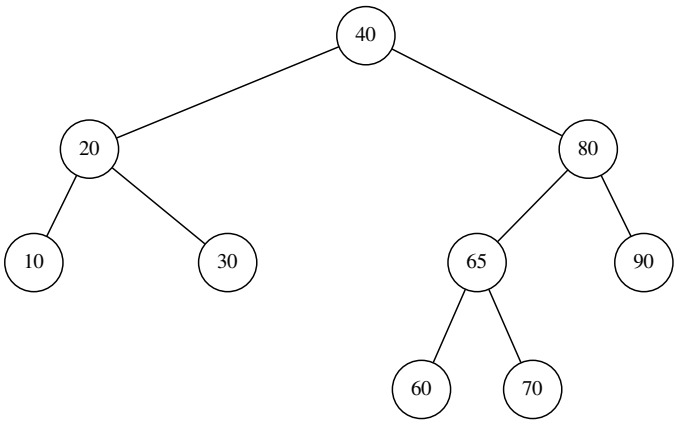
1.
```
private int nbNonLeaf(BTNode <T> t){
        if(t == null)
                return 0;
        if((t.left != null) || (t.right != null))
                return 1+ nbNonLeaf(t.left)+nbNonLeaf(t.right);
        else
                return 0;
}
```

2.
```
private int nbOneChild(BTNode <T> t){
        if(t == null)
                return 0;
        if((t.left == null) != (t.right == null))
                return 1+ nbOneChild(t.left)+nbOneChild(t.right);
        else
                return nbOneChild(t.left)+nbOneChild(t.right);
}
```

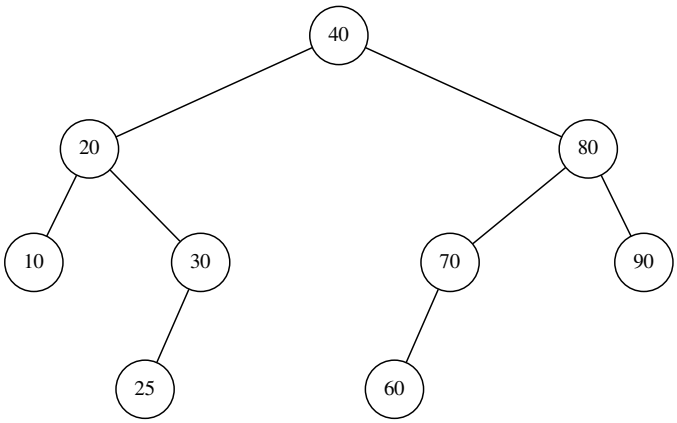
.....

Question 4 [12 points]

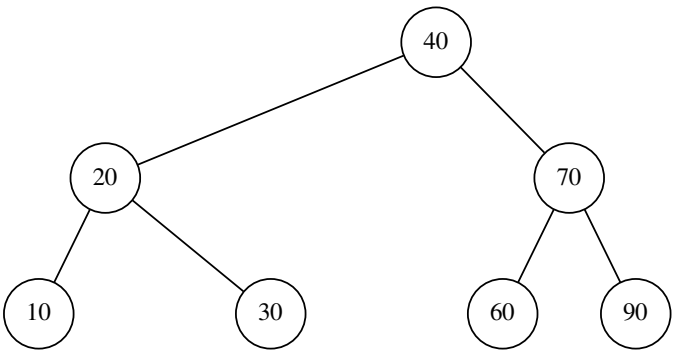
- Insert 65 (double rotation):



- Insert 25 (none):



- Delete 80 (single rotation):



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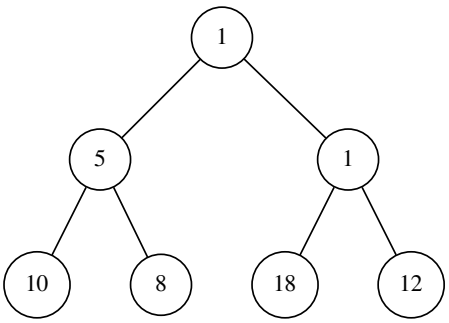
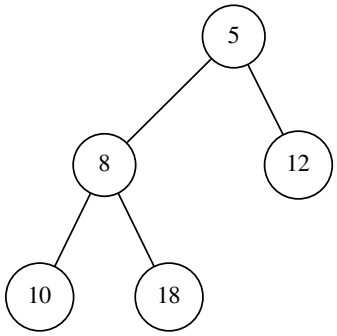
Question 5 [12 points]

1. After insert:



2. After delete:



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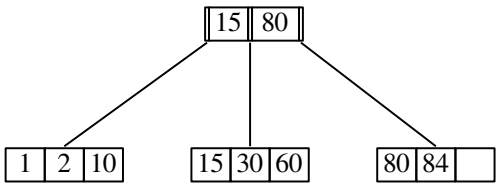
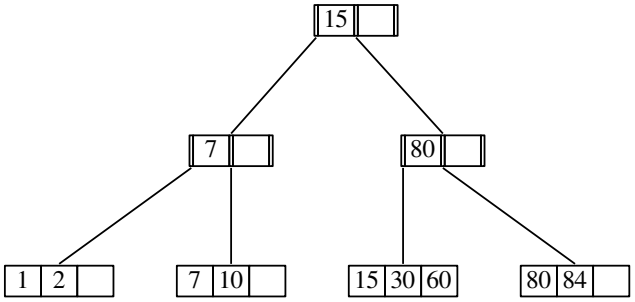
Question 6 [16 points]

1. Insert:

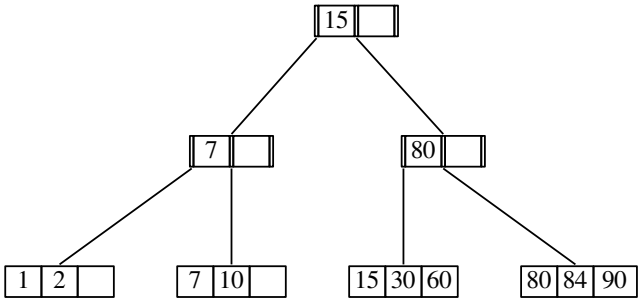
   - Insert 15:



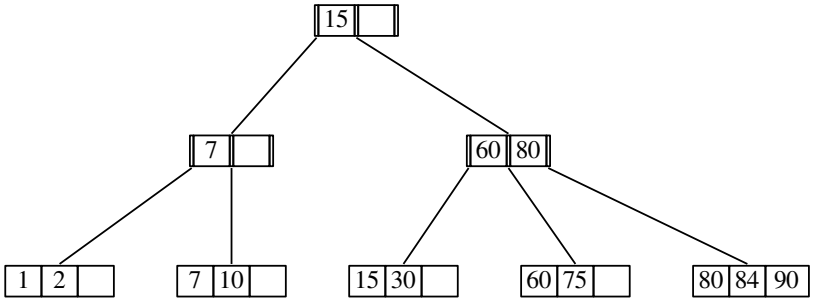
   - Insert 7:



- Insert 90:

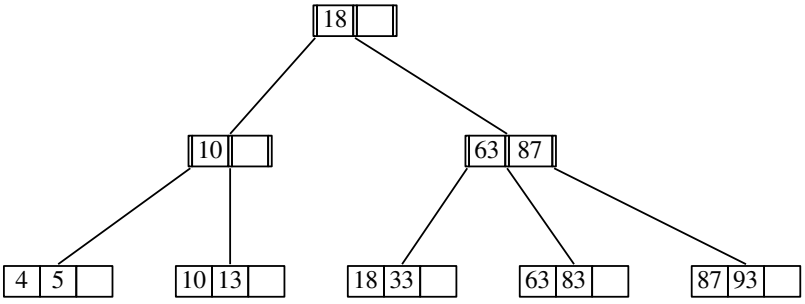


- Insert 75:

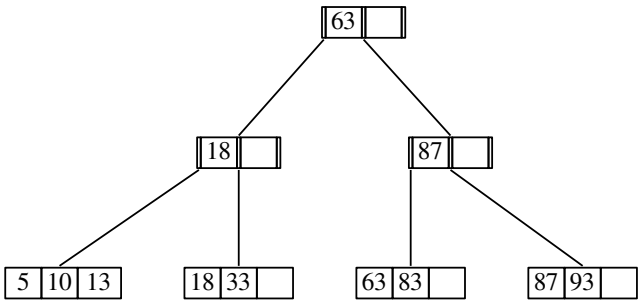


2. Delete:

- Delete 78:



- Delete 4:



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Question 7 [12 points]

1. Linear rehashing with c = 1.

0	17
1	24
2	9
3	16
4	23
5	26
6	13

2. External chaining.

0	
1	
2	$\rightarrow 9 \rightarrow 16 \rightarrow 23$
3	$\rightarrow 17 \rightarrow 24$
4	
5	$\rightarrow 26$
6	$\rightarrow 13$

3. Coalesced chaining with cellar size 3. Show clearly the links and the final position of the *epla*.

0	
1	
2	9
3	17
4	*epla*
5	26
6	13
7	24
8	23
9	16

The links are: $2 \to 9 \to 8$ and $3 \to 7$.

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Question 8 [6 points]

Adjacency matrix:

$$\begin{bmatrix} & a & b & c & d & e & f & g \\ a & 0 & 1 & 1 & 1 & 0 & 0 & 0 \\ b & 1 & 0 & 0 & 0 & 0 & 1 & 1 \\ c & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ d & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ e & 0 & 0 & 1 & 1 & 0 & 0 & 0 \\ f & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ g & 0 & 1 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

Adjacency list:

a	$\to b \to c \to d$
b	$\to a \to f \to g$
c	$\to a \to e$
d	$\to a \to e$
e	$\to c \to d$
f	$\to b$
g	$\to b$

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