Instructor: Dr. Sartaj Sahni
Fall, 2001

Advanced Data Structures
(COP 5536 /NTU AD 711R)
Exam 2

CLOSED BOOK
60 Minutes
Take One Week after Lecture 26

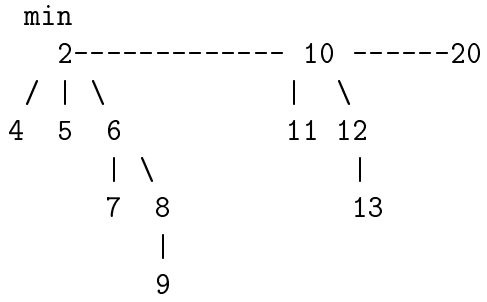
Name: _____

SSN: _____

Site Number: _____

NOTE:
1. **For all problems, use only the algorithms discussed in class/text.**
2. All answers will be graded on correctness, efficiency, clarity, elegance and other normal criteria that determine quality.
3. The points assigned to each question are provided in parentheses.

1. (10) For the following three-tree min Fibonacci heap, assume that the $ChildCut$ field of all nodes is TRUE.



   (a) (4) Perform $DecreaseKey$ operation by changing 8 to 1. (Draw the resulting $Fibonacci$ heap.)

   (b) (6) Perform Delete 10 operation on the resulting Fibobacci heap, clearly labelling ChildCut value. (Show each step)

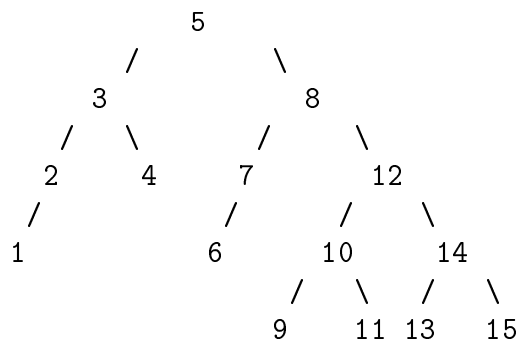
2. (10) Start with an empty two pass min pairing heap.

   (a) (3) *Insert* the following sequence of keys: 9, 6, 7, 8, 1, 2, 3, 4, and 5.

   (b) (3) Perform a *DeleteMin* operation on the resulting heap of (a), showing each step.

   (c) (4) Perform a *Delete 6* operation on the resulting heap of (b), showing each step.

3. (10) Consider the following AVL tree,

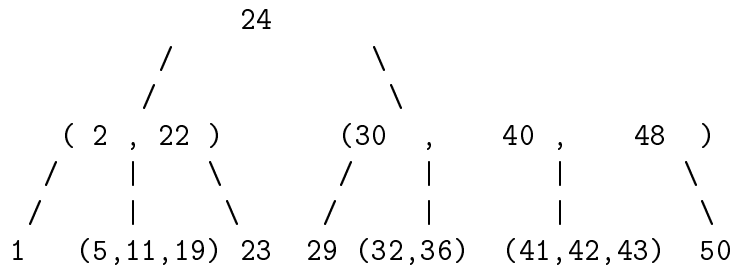


Show the modified tree under each of the following operations (Note: The two operations are independent. Each of them starts from the above tree)

(a) (5) Deletion of key 4.

(b) (5) Insertion of the key 16.

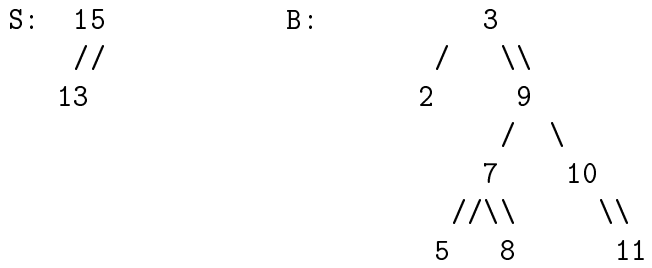
4. (8)The following tree represents a 234-tree.



(a) (4) Draw a picture of the 234-tree that results from inserting 31 into the original 234-tree.

(b) (4) Draw a picture of the 234-tree that results from deleting 24 from the original 234-tree.

5. (12) Consider the two red-black trees S and B below (single line denotes black pointer and double line red pointer).



   (a) (6) Perform $Join(S, 12, B)$ operation, showing each step.

   (b) (6) For the red-black tree B above, perform the *split* operation for key value 5, showing each step.