Instructor: Dr. Sartaj Sahni
Spring, 2004

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

CLOSED BOOK
120 Minutes

Name: _____

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. (12) For B-trees,

   (a) (6) Start with an empty B-tree of order 4 and perform insert operations using the following keys in the order. Show each step.

   $$20, 5 , 10 , 40 , 30 , 45 , 35 , 50 , 1$$

   (b) (6) *Delete* the key 30 from following the B-tree of order 6. Draw the result.

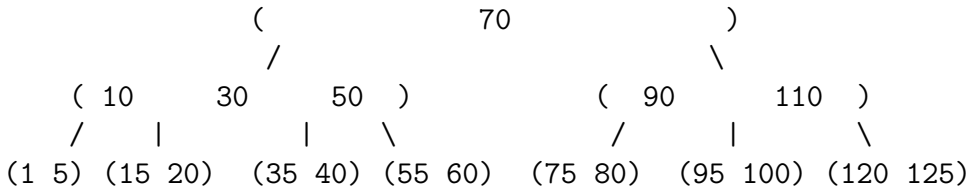

Figure 1. B-tree of order 6.

2. (12) Consider the following splay tree:

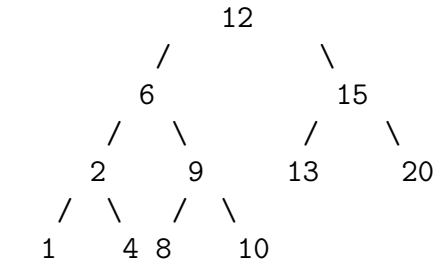

Figure 2. Splay tree

(a) (6) *Insert* for the key 7 under the assumption that this is a $top - down$ splay tree. Show each step.

(b) (6) *Delete* for the key 12 from the tree of *Figure* 2. Assume that this is a $bottom - up$ splay (show each step).

3. (10) Insert the following keys into an initially empty instance of Patricia:

01001 10010 01100 10000 10101

Draw the Patricia instance following each insertion. Then delete the key 01001, and draw the resulting instance. (show each step)

4. (6) For Suffix tree, Construct a clearly labeled suffix tree for the string babbaab.

5. (10) Explain how to find a node y that is the north neighbor of a node x in a quadtree. y should represent a region of smallest size greater than or equal to that of x.