

**Instructor: Dr. Sartaj Sahni
Summer, 2005**

**Advanced Data Structures
(COP 5536)
Final Exam**

**CLOSED BOOK
100 Minutes**

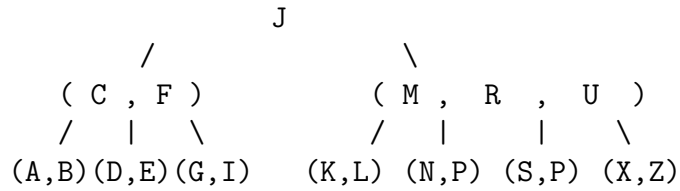
Name: _____

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. **For all problems, use only the algorithms discussed in class/text.**
2. **Write your name at the top of every exam sheet.**
3. **Write your answers directly on the exam question sheet.** You may use scrap paper (supplied by your proctor) for work, but these will not be graded.
4. All answers will be graded on correctness, efficiency, clarity, elegance and other normal criteria that determine quality.
5. The points assigned to each question are provided in parentheses.
6. You may use only a pen or a pencil. No calculators allowed.
7. Do not write on the reverse side of the exam sheet.
8. Do not write close to the margins since those areas do not always make it through when faxed.

Name: _____

1. (10) For B-trees,



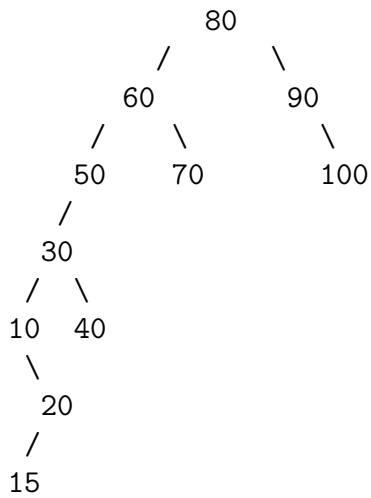
- (a) (6) Delete the key 'C' from the above B-tree of order 5. Draw the result.
- (b) (4) Suppose that n keys are inserted into an empty B-tree of order m . What is the maximum height h of the final B-tree?

Name:

Continue work here if necessary.

Name: _____

2. (10) Consider the following splay tree:



- (a) (6) Perform a delete(30) under the assumption this is a *Top-down* splay tree using two-level moves. Show the tree(s) after each step of the splay.
- (b) (4) What is the maximum height of a splay tree that is created as the result of n insertions made into an initially empty splay tree? Give an example of a sequence of inserts that results in a splay tree of this height.

Name:

Continue work here if necessary.

Name: _____

3. (10) For *Patricia*,

(a) (8) Insert the following sequence of keys into an initially empty instance of Patricia:

0101, 0010, 0011, 1011, 1000, 1101

Draw the Patricia instance following each insertion.

(b) (2) From the result tree of Part (a), delete key 1011 and draw the resulting Patricia instance.

Name:

Continue work here if necessary.

Name: _____

4. (10) For the min *radix priority search tree*(RPST) with range $[0,63)$,
- (a) (8) Perform *insert* operations into an initially empty RPST in sequence with the following keys: $(9,50)$, $(33,10)$, $(20,1)$, $(60,12)$, $(22,61)$, $(10,37)$.
Show each step. (Note: The elements x and y of a key (x,y) represents the *search* and *priority* key values, respectively.)
 - (b) (2) *Delete* key $(10,37)$ from the result RPST of Part (a).

Name:

Continue work here if necessary.

Name: _____

5. (10) Let T be a k -d tree with $k=2$.

Describe how to find all points in T that lie in rectangle $(x_{low}, x_{high}, y_{low}, y_{high})$.

Name:

Continue work here if necessary.