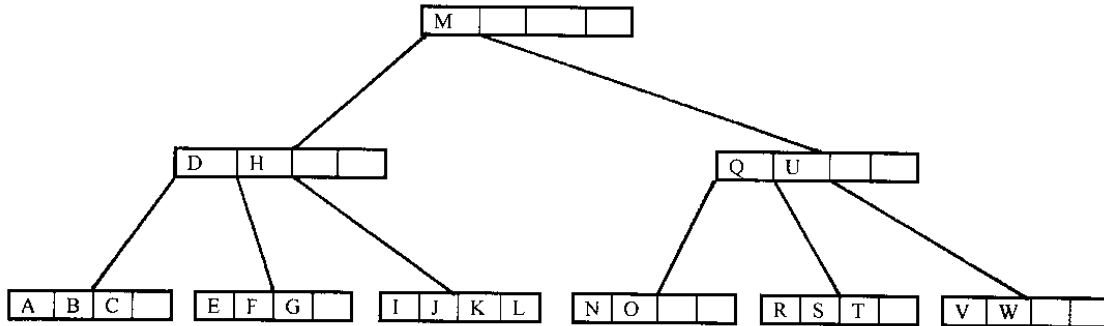


CmpE130 Homework 5

Due date: 27 Oct. 2009

1. Page 19 of the notes for Lecture 17 shows the pattern of recursive calls involved in inserting a \$ into the B-tree on page 17. Page 18 shows the B-tree resulting from the insertion (with numbered pages). Suppose that subsequent to this insertion, the character [is inserted *after* the Z. (The ASCII code for [is greater than the ASCII code for Z.) Draw a figure similar to page 19 which shows the pattern of recursive calls required to perform this insertion.
2. Given a B-tree of order 1825
 - a. What is the maximum number of descendants from a page?
 - b. What is the minimum number of descendants from a page which is not a leaf or the root?
 - c. What is the minimum number of descendants from the root?
 - d. What is the minimum number of descendants from a leaf?
 - e. How many keys are there on a non leaf page with 1509 descendants?
 - f. What is the maximum depth of the tree if it contains 85,000,000 keys?
3. A data file containing 850,000,000 records is accessed using a B-tree index. What is the minimum order m that will result in a maximum tree depth of 8?
4. Show the B-trees of order 4 that result from loading the following set of keys in order. B-trees must be drawn by hand in the style shown in question 6. Pastes from the B-tree code on the UNIX system are not acceptable.
 - a. A G I Y
 - b. A G I Y N R U O C B H K F
 - c. A G I Y N R U O C B H K F J L Q V U W S T Z
5. Repeat the previous question using redistribution on insertion.

6. Show the 4 trees that result after each of the keys E, F, Q, and U is successively deleted from the given B-tree of order 5. B-trees must be drawn by hand. Pastes from the B-tree code on the UNIX system are not acceptable.



7. Using the B-tree code given on the UNIX system
- Show the B-tree resulting from entering all the lower-case letters (except q) in alphabetical order.
 - Show the B-tree resulting from entering all the lower-case letters (except q) by going across your keyboard rows (wertyuiopas etc.).
 - Now add all the upper-case letters (including Q) to the tree in key row order. This is your original tree. Give an example of a leaf deletion that will cause
 - A redistribution from the left sibling
 - A redistribution from the right sibling
 - A concatenation
 - What keys should be deleted from the original tree to cause a redistribution from page 2 to page 16?
 - What keys should be deleted from the original tree so that the key 'i' ends up in the root page?