

2008 Paper 1 Question 11

Algorithms

- (a) What is a binary search tree *rotation*, and how are rotations useful in the creation of efficient search tree algorithms? [2 marks]
- (b) Write pseudocode for a recursive function `select(x, i)` which, given a binary search tree with root node x , executes a sequence of rotations to move the i^{th} largest node to the root of the tree and returns a pointer to the new root node. [6 marks]
- (c) Making use of `select` to deal with tricky cases, write pseudocode for a recursive function `delete(x, k)` which deletes the node containing key value k from the tree and returns a pointer to the new root node. [5 marks]
- (d) Write a more efficient version of `delete` which does not use recursion or rotation to perform its work. How does its time complexity compare with your answer to part (c)? [7 marks]