Technische Universität München
Fakultät für Informatik
Lehrstuhl für Effiziente Algorithmen
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Problem Sheet 6
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Fundamental Algorithms

Deadline: December 5, 2007

Problem 1 (10 Points)

A binary tree is $full$ if all of its vertices have either zero or two children. Let B_n denote the number of full binary trees with n vertices.

1. By drawing out all full binary trees with 3, 5, or 7 vertices, determine the exact values of B_3, B_5, and B_7. Why have we left out even numbers of vertices, like B_4?
2. For general n, derive a recurrence relation for B_n.

Problem 2 (10 Points)

Review all the sort algorithms taken in the class. Compare their strength and weakness. If possible, try to explain them with day-to-day examples.

Prove that the lower bound for sorting is $n \lg n$

Problem 3

Stacks and Queues.

1. Write pseudo code for `push(x), pop(), add(x), delete()`.
2. How can one simulate a queue with two stacks! (no counting)

What is a circular queue?

Problem 4

Design the functions `insert(x), search(x) and delete(x)` in a binary search tree – RECURSIVELY.

Compare the complexity with the iterative implementations.