

Theory of Algorithms

Solution time: 90 min.

Name:																			
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Test (5 scores)

In the below table all the **Statements** are *true* or *false*. Give your answers to the column **Answer**: **0**: false, **2**: true, **1**: you do not know the answer. Leave empty the column **Difference**. The differences between the right and your answers will be written into column **Difference**. *The empty answer means 2 differences*. The score **S** of the test is calculated: $S=5-D$, if $S<0$ then $S=0$, where **D** is the sum of the differences.

	Statements	Ans. 0..2	Diff. 0..2
1.	$o(f(n)) \cap \omega(f(n)) = \emptyset$.		
2.	It takes $\Theta(n \lg n)$ time to walk an n -node binary search tree.		
3.	The average running time of quicksort is $O(n \lg n)$.		
4.	The greedy activity selection algorithm schedules n activities in $\Theta(\lg n)$ time.		
5.	The minimum value of a binary search tree of height h can be get in $O(1)$ time.		
	Sum of the differences		

Exercises (15 scores)

1. Illustrate the operation of BUILD-MAX-HEAP with array A . Give the contents of the array as a binary tree after each step of the iteration. (3 scores)

$A = \langle 8, 2, 1, 5, 6, 9, 4, 3, 7 \rangle$

2. How tall binary search tree is built by inserting the following keys (in order) into an initially empty tree? Which level will the last key be inserted to if the root level is the first level? (3 scores)

2, 4, 5, 7, 1, 6, 3

3. Give m and s result tables that MATRIX-CHAIN-ORDER(p) computes with below given sequence of dimensions. (4 scores)

$p = (5, 2, 3, 4, 2)$

4. Working modulo $q=11$, what spurious hits does the RABIN-KARP-MATCHER encounter in the text $T=314159265$ when looking for the pattern $P=26$? (2 scores)

5. Find all solutions to the below given equations. (3 scores)

$14x \equiv 30 \pmod{100}$

Rating: 0-9:1, 10-12:2, 13-15:3, 16-18:4, 19-20:5.