

Second Midterm Exam Theory of Automata and Processes (2YT15)

23 April 2008, 9.00 –10.30

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This is a “closed book” exam. The parts add up to 50 points, the grade is obtained by dividing the total number of points by 5. *Motivate your answers!*

Assignment 1 . Given is the following context-free language:

$$L = \{a^n b^k c^n \mid k, n \geq 0\}.$$

Give a recursive specification over Sequential Algebra that generates this language. Use S for the initial variable. Give derivations for $S \succeq \mathbf{1}$, $S \succeq a.c.\mathbf{1}$ and $S \succeq a.b.c.\mathbf{1}$. (11 points)

Assignment 2 . Construct a pushdown automaton that accepts the following language:

$$L = \{w \in \{a, b\}^* \mid 2n_a(w) = n_b(w)\}$$

(w contains twice as many b 's as a 's). (13 points)

Assignment 3 . Construct a Turing machine that accepts the following language:

$$L = \{w \in \{a, b\}^* \mid 2n_a(w) = n_b(w)\}.$$

(13 points)

Assignment 4 . Show, by using the pumping lemma, that the language $\{a^i b^j c^k \mid 0 < i < j < k\}$ is not context-free. (13 points)