

First Midterm Exam Theory of Automata and Processes (2XT15)

12 March 2008, 14.00 –15.30

Faculteit Wiskunde en Informatica
Technische Universiteit Eindhoven (TU/e)

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 . Consider the language of all strings over the alphabet $\{a, b\}$ that contain at most two a 's.

- Draw an automaton that accepts this language. (6 points)
- Give a linear recursive specification for this automaton. (5 points)
- Give an iteration expression for this automaton. (6 points)

Assignment 2 . Given is the following iteration expression:

$$r = (a.1)^* \cdot (b.1)^* + (b.1)^* \cdot (a.1)^*.$$

Use the operational rules to find the automaton for this expression. In every state, give the derived iteration expression. (7 points)

Assignment 3 . In this assignment, we use alphabet $\mathcal{A} = \{a, b\}$. Given is the recursive specification

$$\begin{aligned} S &\Leftrightarrow a.T + b.U + a.1 + b.1 \\ T &\Leftrightarrow a.T + b.1 \\ U &\Leftrightarrow b.U + a.1 \end{aligned}$$

Draw a deterministic automaton that accepts the language generated by this specification. (10 points)

Assignment 4 . Show, by using the pumping lemma, that the language $\{a^n b^k \mid 0 < n < k\}$ is not regular. (16 points)