Theory of Computer Science

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Exercise Sheet 5
Due: Wednesday, April 1, 2015

Note: Submissions that are exclusively created with LaTeX will receive a bonus mark. Please submit only the resulting PDF file (or a printout of this file).

Exercise 5.1 (Regular Expressions; 2 Points)

Consider the following regular expressions over the alphabet $\Sigma = \{0, 1\}$. For each regular expression, specify two words that are in the corresponding language and two words that are not in the corresponding language.

(a) 101|100

(c) $(0\varepsilon|1(0|1))(0|1)^*$
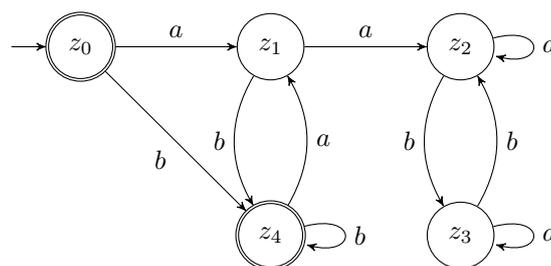
(b) $0^*(10^*10^*)^*$

(d) $1(\varepsilon|0)|0\emptyset 1$

Exercise 5.2 (DFA and NFA; 2 Points)

Specify a DFA that is equivalent to the following NFA.
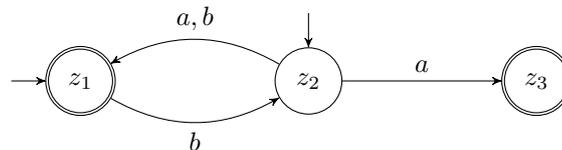
Exercise 5.3 (Minimal DFA; 2 Points)

Specify a minimal DFA which is equivalent to the following DFA:

Exercise 5.4 (Pumping Lemma for regular languages; 4 Points)

Are the following languages over $\Sigma = \{a, b, c, d\}$ regular? If so, prove it by specifying a regular expression which describes the language. If not, prove it with help of the Pumping-Lemma.

(a) $L_1 = \{a^n b^3 c^m \mid m, n \geq 0\}$

(b) $L_2 = \{a^n b c^n d^m \mid m, n \geq 0\}$

Note on marking: One of the languages is regular, the other one is not. The subtask with the regular language is worth 1 point, the other subtask 3 points.