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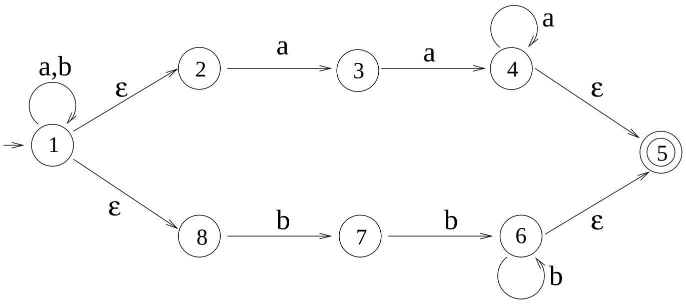
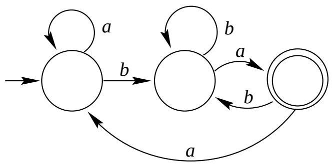
581330-2 Models for Programming and Computing

Exercise 3 (7.-11.2.2005)

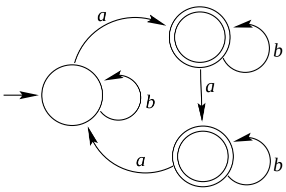
1. Construct the regular expressions for the following languages.
   (a) $\{w \in \{a,b\}^* \mid w$ contains exactly two a:s $\}$
   (b) $\{w \in \{a,b\}^* \mid w$ contains at least two a:s $\}$
   (c) $\{w \in \{a,b\}^* \mid w$ contains an even number of a:s $\}$
2. Give a regular expression for the language
   (a) $L = \{x \in \{0,1\}^* \mid x$ contains 0101 or 1010 as a substring $\}$
   (b) $L = \{x \in \{0,1\}^* \mid x$ does not contain the substring $0000\}$.
3. Construct a non-deterministic finite automaton that recognizes the same language as the following automaton with ϵ-transitions using the methods presented in HMU.



4. Construct an ϵ-automaton for the language described by $(0 \cup 1)^*$ using the methods described in HMU. Remove ϵ-transitions from the automaton, determinize the result, and finally minimize it.
5. Use the methods presented in HMU to transform the following finite automata into regular expressions.



(a)



(b)

6. Use the methods presented in HMU to transform the following finite automata into regular expressions.