

Homework 3

1. What is a regular language?
2. Assume you have an alphabet consisting of the letters a , b and c only.
(1) Find a regular expression that recognises the two strings ab and ac . (2) Find a regular expression that matches all strings *except* these two strings. Note, you can only use regular expressions of the form

$$r ::= \emptyset \mid \epsilon \mid c \mid r_1 + r_2 \mid r_1 \cdot r_2 \mid r^*$$

3. Define the function *zeroable* which takes a regular expression as argument and returns a boolean. The function should satisfy the following property:

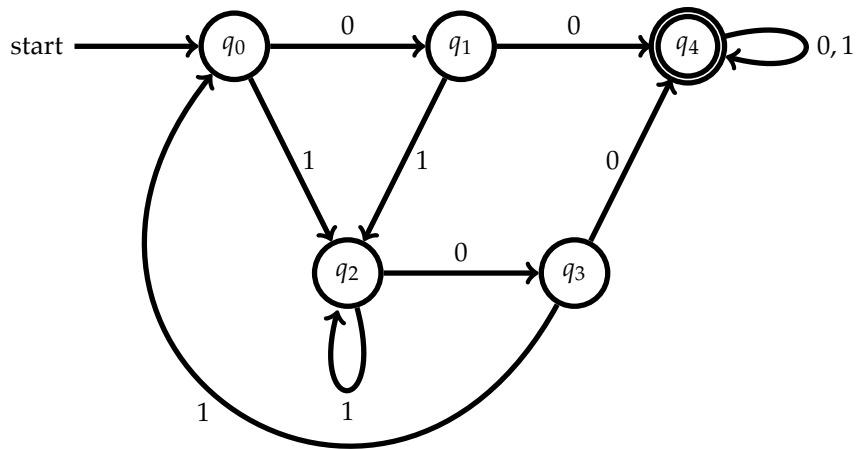
$$\text{zeroable}(r) \text{ if and only if } L(r) = \emptyset$$

4. Given the alphabet $\{a, b\}$. Draw the automaton that has two states, say q_0 and q_1 . The starting state is q_0 and the final state is q_1 . The transition function is given by

$$\begin{aligned}(q_0, a) &\rightarrow q_0 \\(q_0, b) &\rightarrow q_1 \\(q_1, b) &\rightarrow q_1\end{aligned}$$

What is the languages recognised by this automaton?

5. Give a non-deterministic finite automaton that can recognise the language $L(a \cdot (a + b)^* \cdot c)$.
6. Given the following deterministic finite automaton over the alphabet $\{0, 1\}$, find the corresponding minimal automaton. In case states can be merged, state clearly which states can be merged.



7. Define the language $L(M)$ accepted by a deterministic finite automaton M .