Formal Methods, 2012/13

Recitation 1

October 10, 2012

Problem 1
What language does the following formal system define? (The symbol $\epsilon$ is a special symbol denoting the empty string).

$\epsilon$ dashes $x$ dashes

$x$ dashes

$xt-qx$ $tqstrings$

$x$ dashes $y$ dashes $z$ dashes $xtqyqz$ $tqstrings$

$xt-yqzx$ $tqstrings$

Problem 2
Construct an automaton whose language is the set of all strings of odd length over alphabet $\Sigma = \{a, b\}$.

Problem 3
Consider again the alphabet $\Sigma = \{a, b\}$.

1. Construct an automaton whose language $L_1$ is the set of all strings that contain at least two $a$'s.

2. Construct an automaton whose language $L_2$ is the set of all strings that contain at most three $b$'s.

3. Construct an automaton whose language $L_3 = L_1 \cap L_2$.

Problem 4
Let alphabet $\Sigma$ be $\{0, 1\}$.

1. Construct a nondeterministic automaton whose language is the set of all strings that contain 010 as a substring.

2. Determinize your solution from part 1.

Problem 5 [Please ignore this exercise if you did not have a course on automata theory before.]

Let $A$ be an automaton with $n$ states. Let $B$ be an automaton with $m$ states. Let us assume that $L(A) \neq L(B)$. Find a minimal length $K$, such that a word of length $K$ exists in $(L(A) \setminus L(B)) \cup (L(B) \setminus L(A))$. 