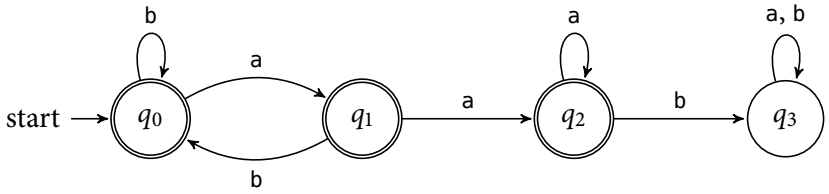
CMPU 240 · Language Theory and Computation · Spring 2019

Assignment 1

Due February 12, 4:35 p.m. Please remember that consulting outside or online materials for help with this assignment is a breach of academic integrity, which must be reported to the Academic Panel.

Problem 1

Consider the following deterministic finite automaton (DFA), M:



a. What is the start state of M?

b. What is the set of accept (final) states of M?

c. What sequence of states does M go through on input `bbaaa`?

d. Does M accept the input `babababa`? (Briefly explain why or why not.)

e. Describe the set of strings accepted by M.

Problem 2

Give state diagrams of deterministic finite automata (DFAs) recognizing the following languages over $\Sigma = \{\mathtt{a}, \mathtt{b}\}$.

a. All strings except the empty string.

b. $\{w \mid w$ starts with an `a` and has odd length, or w starts with a `b` and has even length$\}$

c. $\{w \mid w$ is any string not in $\mathtt{a}^*\mathtt{b}^*\}$

d. $\{w \mid |w| \mod 3 = 0\}$, i.e., the length of w divides evenly by 3

Problem 3

Construct nondeterministic finite automata (NFA) – with or without ε-transitions – to recognize the following languages:

a. $\{w \in \Sigma^* \mid w$ ends in `a`, `bb`, or `ccc`$\}$, where $\Sigma = \{\mathtt{a}, \mathtt{b}, \mathtt{c}\}$.

b. $\{w \in \Sigma^* \mid w$ contains at least two `b`s with exactly five characters between them$\}$, where $\Sigma = \{\mathtt{a}, \mathtt{b}\}$. E.g., `baaaaab` is in the language, as is `aabaabaaabbb`, but `bbbbb` is not, nor is `aaabab`.