Assignment 3
CSCE 4323: Formal Languages and Computability
Fall 2018

(Several of the following exercises can be found in Chapter 1 of the Sipser book, 2nd edition.) Solutions for numbers 1, 1.46, and 1.53 should be neatly typed and submitted in PDF format. Soluctions for 1.6, 1.19, and 1.21 should be provided as code for each in a text document following the format for a regular expression or NFA, as appropriate, on the web site `http://web.cs.ucdavis.edu/~doty/automata/`. A template file "CSCE4323-F18-HW-template.txt" can be found on the course site on Blackboard.

Theorem 1. Regular languages are closed under complementation.

1 Prove Theorem 1 (i.e. if L is a regular language, then $\bar{L} = \Sigma^* \setminus L$ is also regular).

1.6 Give regular expressions generating the following languages. In all parts, the alphabet is $\{0, 1\}$.

i. $\{w|$ every odd position of w is a $1\}$

j. $\{w|w$ contains at least two 0s and at most one $1\}$

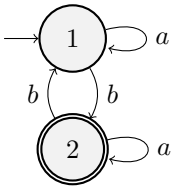
1.19 Use the procedure described in Lemma 1.55 to covert the following regular expressions to nondeterministic finite automata.

a. $(0 \cup 1)^*000(0 \cup 1)^*$

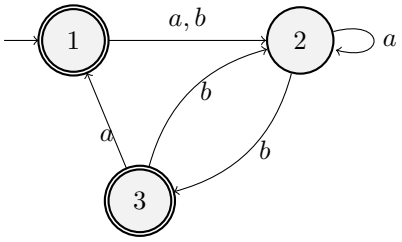
b. $(((00)^*(11)) \cup 01)^*$

1.21 Use the procedure described in Lemma 1.60 to covert the following finite automata to regular expressions.

a.



b.



1.46 Prove that the following language is not regular. You may use the pumping lemma and the closure of the class of regular languages under union, intersection, and complement.

c. $\{w|\ w \in \{0, 1\}^*$ is not a palindrome$\}$[1]

1.53 Let $\Sigma = \{0, 1, +, =\}$ and

$ADD = \{x = y + z|\ x, y, z$ are binary integers, and x is the sum of y and $z\}$.

Show that ADD is not regular.

[1] A palindrome is a string that reads the same forward and backward.