Homework 1

January 8, 2015

Exercise 1 (Ex 2.2.4, page 53)**.** *Give DFA's accepting the following languages over the alphabet* $\{0, 1\}$*.*

a) The set of all strings ending in 00.

b) The set of all strings with three consecutive 0's (not necessarily at the end).

c) The set of strings with 011 as a substring.

Exercise 2 (Ex 2.2.5, page 53-54)**.** *Give DFA's accepting the following languages over the alphabet* $\{0, 1\}$*:*

a) The set of all strings such that each block of five consecutive symbols contains at least two 0*'s.*

b) The set of all strings whose tenth symbol from the right end is 1.

c) The set of strings that either begin or end (or both) with 01.

d) The set of strings such that the number of 0*'s is divisible by five, and the number of* 1*'s is divisible by 3.*

Exercise 3 (Ex 2.3.3, page 66)**.** *Convert the following NFA to a DFA and informally describe the language it accepts.*

	0	*1*
$\to p$	$\{p, q\}$	$\{p\}$
q	$\{r, s\}$	$\{t\}$
r	$\{p, r\}$	$\{t\}$
$*s$	$\emptyset$	$\emptyset$
$*t$	$\emptyset$	$\emptyset$

Exercise 4 (Ex 2.3.4, page 66-67)**.** *Give nondeterministic finite automata to accept the following language. Try to take advantage of nondeterminism as much as possible.*

a) The set of strings over alphabet $\{0, 1, \ldots, 9\}$ *such that the final digit has appeared before.*

b) The set of strings over alphabet $\{0, 1, \ldots, 9\}$ *such that the final digit has* ***not*** *appeared before.*

c) The set of strings of 0*'s and* 1*'s such that there are two* 0*'s separated by a number of positions that is a multiple of 4. Note that 0 is an allowable multiple of 4.*

Exercises are from the book "Automata Theory, Language, and Computation", 3rd edition, by John E. Hopcroft, Rajeev Motwani, and Jeffrey D. Ullman, published by Addison-Wesley.