CSCI 510 **Models of Computation**

HW2: Spirit in the Sky

Due: Sep 22, 2010

Include your *full name*, *CS login*, and the problem number(s) on each piece of paper you hand in, and please staple your pages together before handing in.

While collaboration is encouraged in this class, please remember not to take away notes from collaboration sessions other than your scheduled lab section.

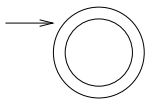
In general, if you submit a complicated, messy FSM and include no explanation of how it works, it will probably not be graded.

Problem 1

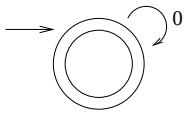
What languages to the following NFSMs recognize?

Note: A state with two circles denotes a final accept state.

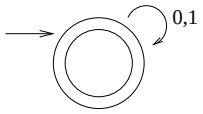
a.



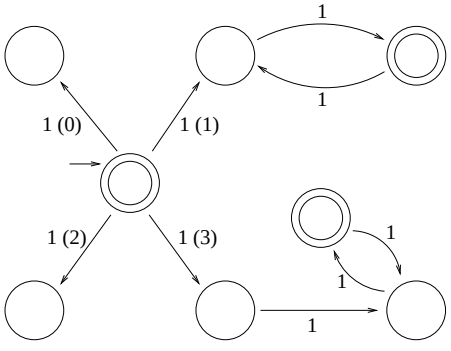
b.



c.



d.



Problem 2

Construct an NFSM over the alphabet $\Sigma = \{c, a, t\}$ that recognizes the language $L = \{w : w \text{ does not contain the substring "}cat\text{"}\}$.

Problem 3

Construct an NFSM over the alphabet $\Sigma = \{0, 1\}$ that recognizes the language of binary strings w such that w is divisible by either 3 or 5 when interpreted as a binary integer with its most significant bit first.

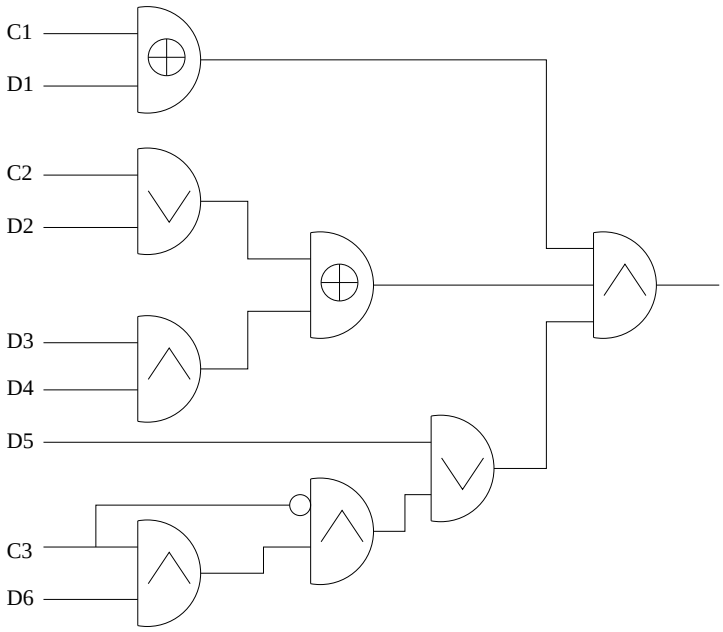
Problem 4

Construct an NFSM over the alphabet $\Sigma = \{0, 1\}$ the recognizes the language L of strings w such that w is either alternating 0s and 1s starting with a 0, or w contains three consecutive 0s.

So, for example, 0101, 01010, 11010001, and 010010001 are all in L, but 1010, 11010, and 0010 are not.

Problem 5

Consider the following nondeterministic circuit (where D_1, D_2, D_3, D_4, D_5, and D_6 are the deterministic inputs and C_1, C_2, and C_3 are the choice inputs:



a. What value must C_1 take if $D_1 = 0$, or does it not matter?

b. What value must C_2 take if $D_2 = 0, D_3 = 1, D_4 = 1$, or does it not matter?

c. What value must C_3 take if $D_5 = 0, D_6 = 1$, or does it not matter?

d. What language does this nondeterministic circuit recognize?

There are no lab problems and there will be no labs this week.