CS 334 - Homework 1 (Regular Languages) ←[0-indexed!]
Due 2/23/2016

Let $M = (Q, \Sigma, \delta, q_1, F)$, where:

$Q := \{q_1, q_2, q_3, q_4\}$,

$\Sigma := \{0, 1\}$,

$\delta :=$

	0	1
q_1	q_2	q_3
q_2	q_4	q_3
q_3	q_2	q_4
q_4	q_4	q_4

and $F := \{q_1, q_2, q_3\}$.

1. Draw an automaton diagram equivalent to the formal description of the DFA given above.
2. State whether each of the following strings belongs to L(*M*).
    a. 0110
    b. 10101
    c. 01010
    d. 0
    e. 1
    f. 101
    g. 1011
    h. ε
3. Describe L(*M*), the language accepted by *M*.

Let $N = (P, \Sigma, \gamma, p_1, G)$, where:

$P := \{p_1, p_2, p_3, p_4, p_5, p_6\}$,

$\Sigma := \{0, 1\}$,

$\gamma :=$

	0	1
p_1	p_2	p_4
p_2	p_3	p_4
p_3	p_6	p_4
p_4	p_2	p_5

p_5	p_2	p_6
p_6	p_6	p_6

and F:= $\{q_1, q_2, q_3, q_4, q_5\}$.

1. Draw an NFA diagram which accepts L(*M*) ∩ L(*N*). Describe the language accepted by this automaton.
2. Draw an NFA diagram which accepts L(*M*) ⧵ L(*N*). Describe the language accepted by this automaton.
3. Draw an NFA diagram which accepts L(*M*) U L(*N*). Describe the language accepted by this automaton.
   Note: This diagram should be a "proper" NFA - it should not be a deterministic automaton.

4. Convert the NFA provided in (3) into a DFA.
5. Provide a regular expression which accepts the language L(*M*) U L(*N*).

Given the alphabet Σ:= {0, 1}, provide a DFA which accepts the language given by the regular expression "(0*1)U(01*0)".

Use the Pumping Lemma for Regular Languages to demonstrate that $\{ww^{-1} \mid w \in \Sigma\}$, where Σ := {0,1} and $^{-1}$ indicates string-reversal, is not a regular language.