COT 4210 Homework #2: Sections 1.2, 1.3, 1.4
Assigned: 8/29/2024
Due Date/Time: On Webcourses

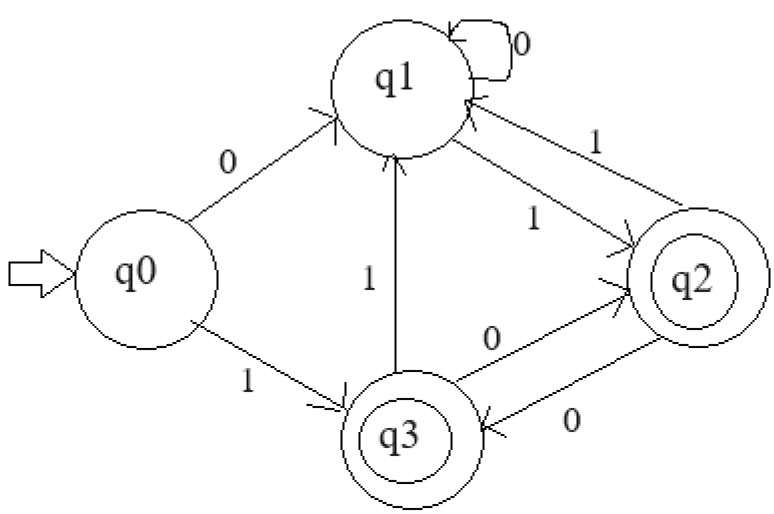
1) The following below is a formal description of an NFA. Use the algorithm shown in class to cover this NFA to an equivalent DFA. Please use the naming convention from class for the names of the states in the DFA such as q_{023}, where the subscript lists each state in the subset of NFA states it represents.

$\{Q, \Sigma, \delta, q_0, F\}$ where

$Q = \{q_0, q_1, q_2, q_3\}$
$\Sigma = \{0, 1\}$
Start state = q_0
$F = \{q_2, q_3\}$
δ =

	ε	0	1
q_0	$\{q_3\}$	$\{q_1\}$	∅
q_1	∅	∅	$\{q_2, q_3\}$
q_2	$\{q_1\}$	$\{q_2\}$	$\{q_2, q_3\}$
q_3	∅	$\{q_2\}$	$\{q_0\}$

2) The DFA D is represented by the drawing below. Use the algorithm shown in class to convert a DFA to a regular expression **<u>via ripping the states in the GNFA out in this order: q0, q1, q3, q2</u>**. This problem will be tedious but will be good practice for the first exam which will have a shorter related question.



3) Use the algorithm shown in class to convert the regular expression below (over the alphabet {0,1}) into an equivalent NFA. You may omit "forced epsilon transitions" between states in a chain when doing so obviously doesn't change the language accepted by the NFA.

$$(0 \cup 1)^* 10 \cup 10(101 \cup 00)^*$$

4) Via the pumping lemma for regular languages, show that the following language is NOT regular:

$$\left\{0^{n^3} \middle| n \in N\right\}$$

Note: For the purposes of this class, the set N is the set of non-negative integers while the set Z^+ is the set of positive integers.

5) Via the pumping lemma for regular languages, show that the following language over the alphabet {0, 1} is NOT regular:

$$\{w | w\ is\ a\ palindrome\}$$

Note: A palindrome is a string that reads the same forwards and backwards.

6) Define w^R to be the reverse of the string w. For any language L, define $L^R = \{w^R | w \in L\}$. Prove that if L is a regular language, then L^R is also regular.