CSCI 400 – Programming Language Concepts – Spring 2019
HW 09 – Regular Expressions and DFAs (60 points)

This assignment is to be turned in through Blackboard.

1. (5 points) Let L be the language with alphabet $\Sigma = \{0, 1\}$ consisting of all strings of even length. (Since 0 is even, $\varepsilon \in L$.) Give a regular expression corresponding to L.

2. (5 points) Find a regular expression for the language with alphabet $\Sigma = \{0, 1\}$ consisting of all strings containing exactly two 0's.

3. (5 points) Find a regular expression for the language with alphabet $\Sigma = \{0, 1\}$ consisting of all strings containing at least two 0's.

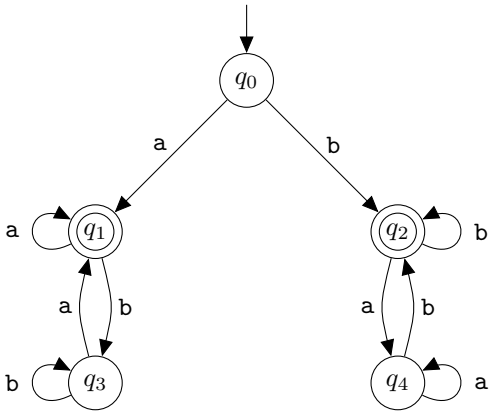
4. (5 points) Find a regular expression for the language with alphabet $\Sigma = \{0, 1\}$ consisting of all strings in which every 0 is followed immediately by 11.

5. (5 points) Draw a state diagram for a DFA that recognizes the language defined in Question 2.

6. (5 points) Draw a state diagram for a DFA that recognizes the language defined in Question 3.

7. (5 points) Draw a state diagram for a DFA that recognizes the language defined in Question 4.

8. (5 points) Consider the state diagram for a DFA M_1 shown below. Describe in your own words the language $L(M_1)$.



9. (5 points) Write the formal definition for the DFA M_1 given in Question 8.

10. (5 points) Draw a state diagram for the DFA M_2 given below.
    $M_2 = (Q, \Sigma, \delta, q_0, F)$
    Where
    1. $Q = \{q_0, q_1, q_2, q_3\}$
    2. $\Sigma = \{0, 1\}$
    3. δ is described as

	0	1
q_0	q_2	q_1
q_1	q_3	q_0
q_2	q_0	q_3
q_3	q_1	q_2

    4. $F = \{q_0\}$

11. (5 points) Describe in your own words the language recognized by DFA M_2 from Question 10.

12. (5 points) Find a regular expression for the language with alphabet $\Sigma = \{0, 1\}$ consisting of all strings containing no two consecutive 0's.