Prepare a document with answers to the following questions. Your work should be legible, neat, and well labeled.

On the first page, be sure to include all team members names on your submission as well as your honor code statement and collaboration statement.

1. (5 points) Give at least two different examples of languages. For each language, use a different alphabet (Σ) and give the first few strings in Σ^*. Then give a language, L_1 which is a finite subset of Σ^*.

2. For each of the following languages described, write 5 strings that belong to it, including the shortest string. Then use words to informally describe it. For each language, the alphabet is $\Sigma = \{a, b, c\}$.

   (a) (7 points) $L(a(b^*|c^*))$

   (b) (7 points) $L((a(b|c))^*)$

3. Consider the following formal definition of a finite automata:

 $$M = \{\{Q1, Q2, Q3\}, \{a, b\}, \delta, Q1, \{Q3\}\}$$

   with δ described by the transition table:

	a	b
Q1	Q2	Q1
Q2	Q3	Q1
Q3	Q3	Q1

   (a) (5 points) Draw the finite state diagram for this automata.

   (b) State whether the DFA will accept or reject the following strings:
       i. (2 points) bbbaaab _____
       ii. (2 points) ababaaa _____
       iii. (2 points) bbaabaa _____
       iv. (2 points) baba _____

   (c) (5 points) In your own words, describe the set of strings the DFA accepts.

   (d) (5 points) Write a regular expression that defines the language.

4. For each of the following automata, informally describe the language accepted by it. Then give a formal definition (5-tuple) for the automata.
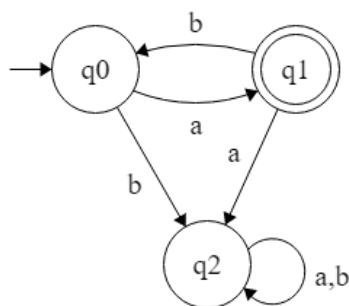
   (a) (10 points)

(b) (10 points)
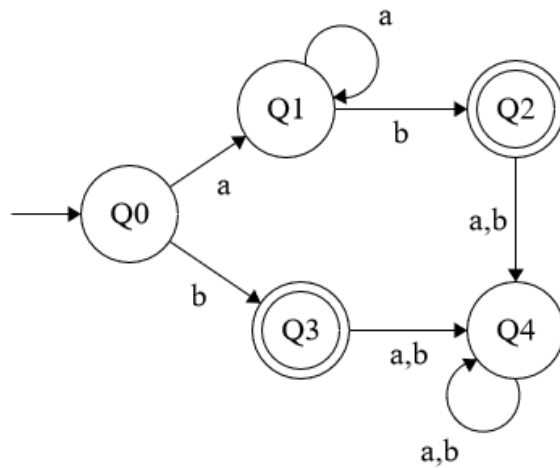
5. For each of the following descriptions, design a DFA which accepts the given set of strings. Then write a regular expression which defines the language of the DFA. For all of these, assume $\Sigma = \{0, 1\}$.

   (a) (10 points) All strings that start with 01 or 10

   (b) (10 points) All strings that start with 101

   (c) (10 points) All strings that start with 0 and contain exactly one 1

   (d) (10 points) All strings with at least three 1s.

   (e) (10 points) All strings in which every 1 is immediately followed by a 0. *Hint: Is the empty string or the string 000 in this language?*