

Names: _____

*On my honor, I/we have not given, nor received,
nor witnessed any unauthorized assistance on this work.*

Signature: _____

Signature: _____

Signature: _____

Signature: _____

Signature: _____

List any resources your team used in completing this problem set:

Question:	1	2	3	4	5	Total
Points:	5	14	23	20	50	112
Score:						

GRADE: _____

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

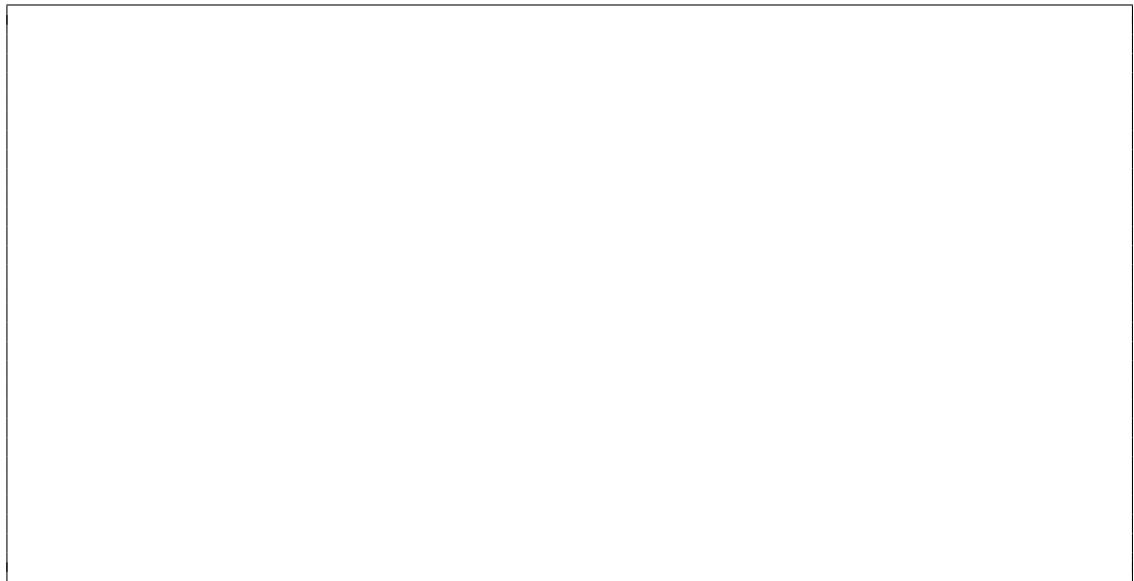
3. Consider the following formal definition of a finite automata:

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

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 _____

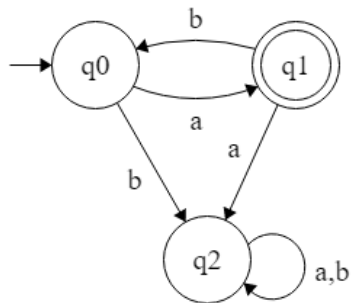
- (c) (5 points) In your own words, describe the set of strings the DFA accepts.



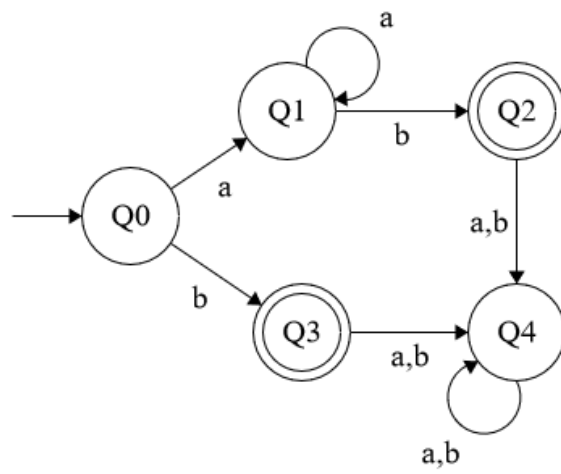
- (d) (5 points) Write a regular expression that defines the language.

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?*