COMP-4200

Formal Languages

FROM:	Midas Oden
TO:	Dr. Anh Nguyen
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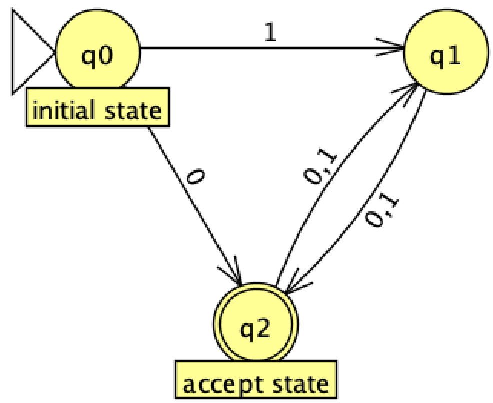
LAB SECTION:	001

Homework #2

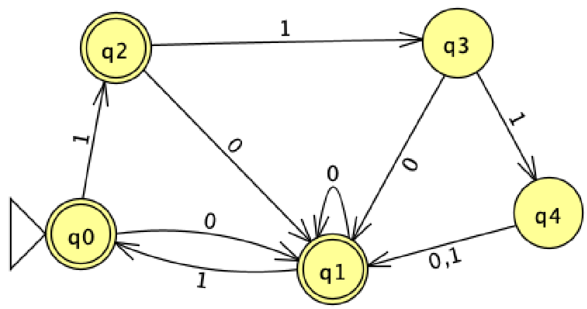
Problem 1

Draw the state diagram of DFAs recognizing the following languages. Alphabet $\Sigma = \{0, 1\}$.

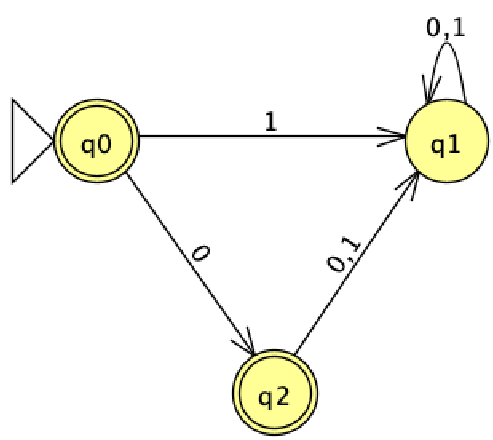
a. A = {w|w starts with 0 and has odd length, or starts with 1 and has even length}



b. B = {w|w is any string except 11 and 111}



c. $C = \{\epsilon, 0\}$



Problem 2

Example of set difference: A = {0,01}, and B = {0,11}. Then, A — B = {01}.

Prove that regular languages are closed under the set *difference* operation. That is, if A and B are regular languages, then, A — B is also a regular language.

Hint: One can prove the statement above by either (1) contradiction or (2) construction. For the proof, you may make use of the theorems that regular languages are closed under *union*, *intersection*, and *complement*

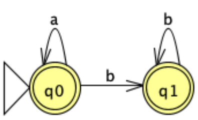
ANSWER:

→ We know that A — B = The intersection of A and B complement. Also we know that regular languages are closed under union and under complement. That is ... $A^C = \Sigma^* - A$

→ A — B denotes the elements which exists in A but not in B

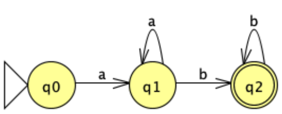
L(A):

A = {empty, a, b, aa, ab, bb, ...}



L(B):

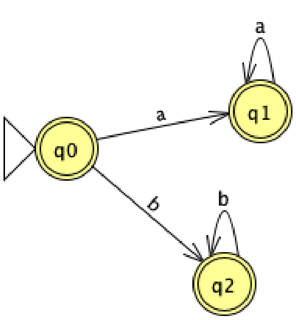
B = {ab, aab, abb, aabb, ...}



→ We can prove A — B is regular by applying proof by contradiction by assuming A — B is not regular and by taking all elements which belong in A and removing elements within B.

L(A — B):

A — B = {empty, a, b, aa, bbb, ...}



→ Since, A — B has an automata, L(A — B) is regular, hence proved.