

COMP 4200: Assignment 2

Due on February 05, 2024

Professor Kwon 001

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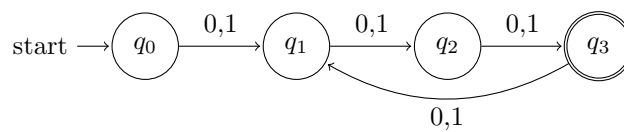
Problem 1

Draw the state diagram of DFAs recognizing the following languages.

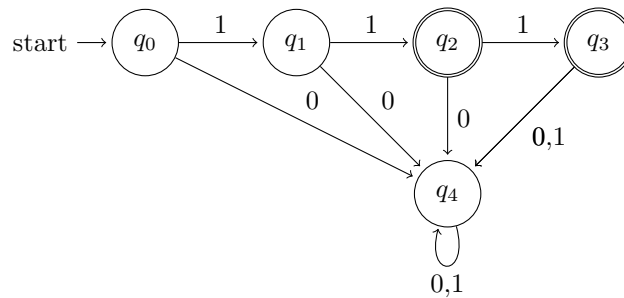
1. $A = \{w \mid |w| \text{ is a multiple of } 3\}$
2. $B = \{11, 111\}$
3. $C = \{w \mid w \text{ contains an even number of 0's and two 1's}\}$
4. $D = \{w \mid w \text{ begins with 0 and every } w \text{ is preceded by 1}\}$

Solution

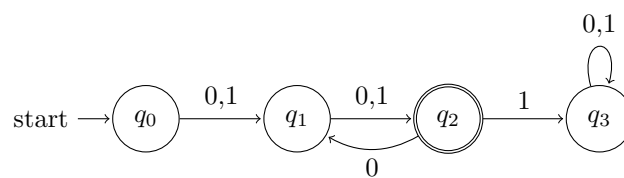
Part One



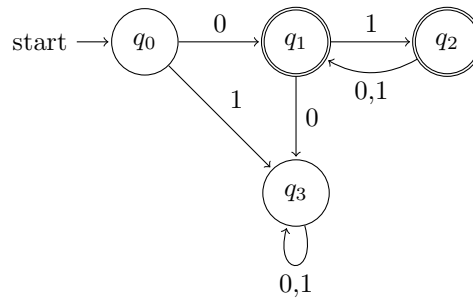
Part Two



Part Three



Part Four



Problem 2

Prove that regular languages are closed under set difference.

Solution

We will prove by construction, showing that $A - B$ is closed by creating it from other set operations.

We think of $A - B$ as *everything that is in A that is also not in B* .

$$A - B = A \cap \overline{B}$$

Using the following properties of regular languages A and B ,

1. $A \cap B$ is regular
2. \overline{A} is regular

Given A, B are regular languages,

\overline{B} is regular

$A \cap \overline{B}$ is regular

$A - B$ is regular

□