

# COMP 4200: Assignment 2

Due on February 05, 2024

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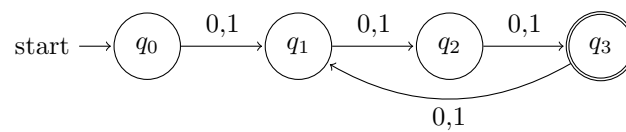
## Problem 1

Draw the state diagram of DFAs recognizing the following languages.

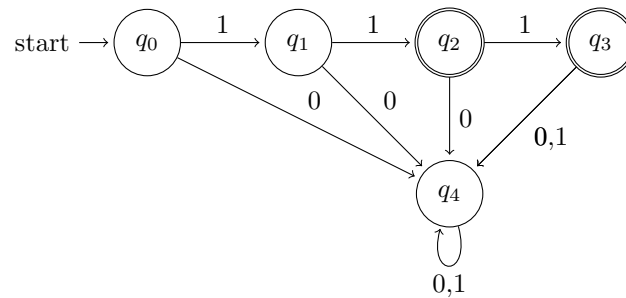
1.  $A = \{w \mid |w| \text{ is a multiple of } 3\}$
2.  $B = \{11, 111\}$
3.  $C = \{w \mid w \text{ contains an even number of 0's and two 1's}\}$
4.  $D = \{w \mid w \text{ begins with 0 and every } w \text{ is preceded by 1}\}$

### Solution

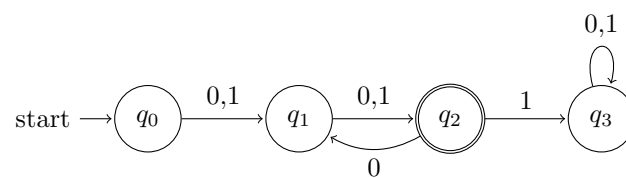
#### Part One



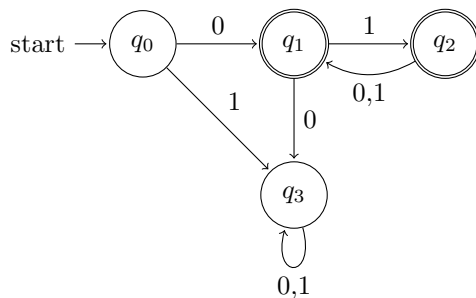
#### Part Two



#### 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

□