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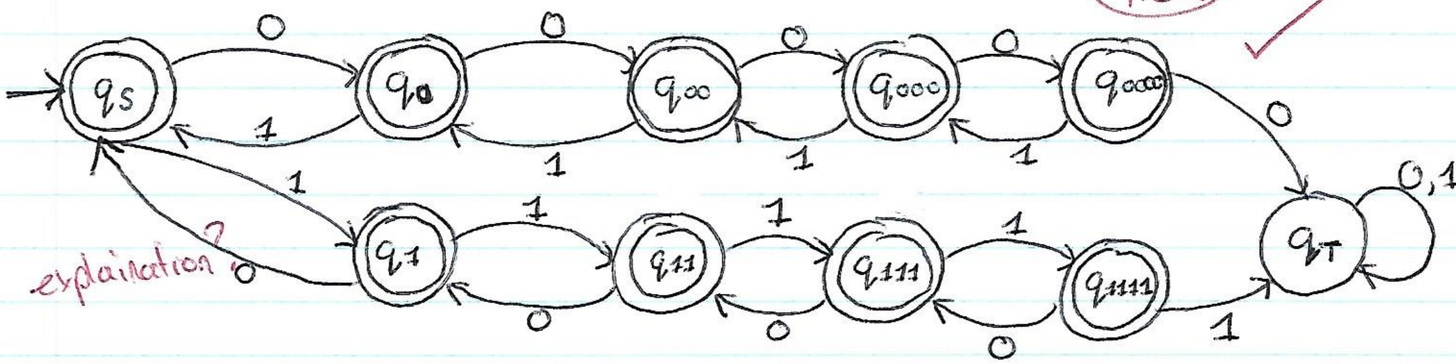
CPSC 313 Assignment 2

Exercise 1

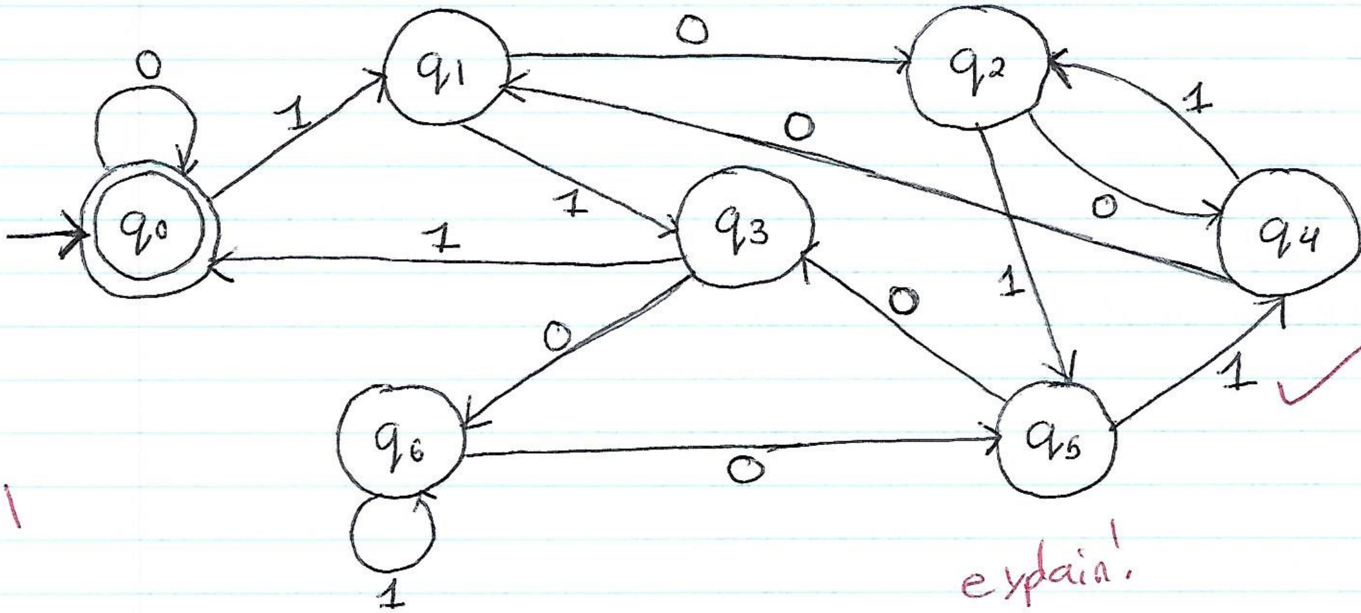
a) A DFA that accepts strings such that in every prefix the number of 0s and the number of 1s differ by at most 4, over $\Sigma = \{0, 1\}^*$

1.05



explaination?

b) A DFA that accepts strings which interpretted as a number (with most significant bit on the left) are divisible by 7, over $\Sigma = \{0, 1\}^*$.



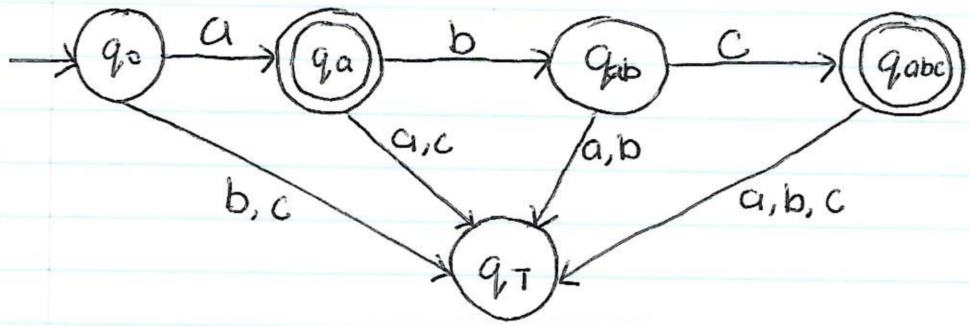
explain!

1

Exercise 2

Argue why any DFA accepting the language $L = \{a, abc\}$ must contain at least five states. $\Sigma = \{a, b, c\}$

A DFA that accepts $L = \{a, abc\}$ would look like the following:



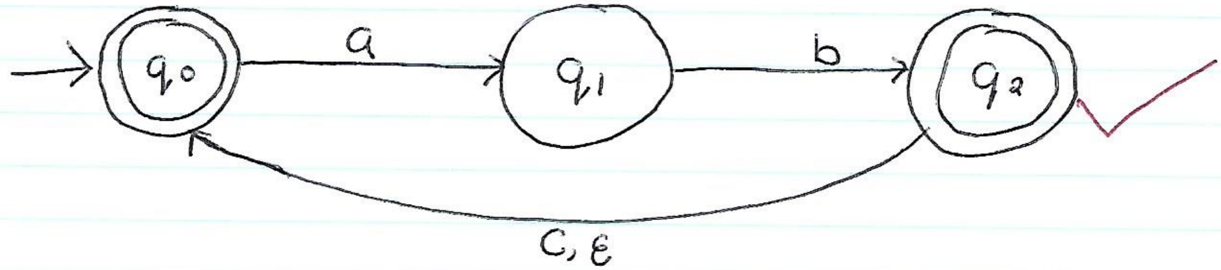
A DFA accepting $L = \{a, abc\}$ would need at least 5 states because, when reading the longest string of L, we need a start state, a second state to transition to when we read 'a', so we can remember that 'a' has been read, a third state to transition to when 'b' is read, so that we know we have read 'ab' so far, and a fourth state to transition to when 'c' is read, so we know that 'abc' has been read. The states q_a and q_{abc} being accepting states. These 4 states allow us to read and accept the strings of our language. However, we need a non-accepting trap state to transition to from any of the 4 states when an invalid symbol of Σ is read. This ensures that ONLY strings in our Language are accepted. If we were to transition to one of the 4 states rather than q_T, we would be accepting invalid strings. These 5 states are required so that we only accept what strings are in our language, and trap all invalid ones.

1.5

Awesome!

Exercise 3

Give an NFA with 3 states that accepts the language $L = \{ab, abc\}^*$ over the alphabet $\Sigma = \{a, b, c\}$



Nice! Good job!