

CSC240 Winter 2024 Quiz 9

due April 5, 2024

Consider the DFA $M = (\{q_0, q_1, q_2\}, \{0, 1, 2\}, \delta, q_0, \{q_0\})$, where

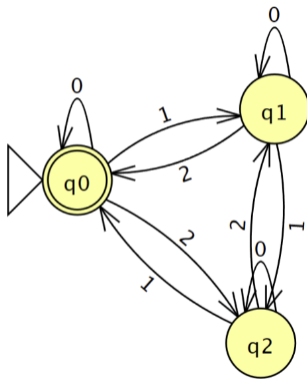
$\delta(q_i, 0) = q_i$ for all $i \in \{0, 1, 2\}$,

$\delta(q_i, 1) = q_{i+1}$ for all $i \in \{0, 1\}$,

$\delta(q_2, 1) = q_0$,

$\delta(q_0, 2) = q_2$, and

$\delta(q_i, 2) = q_{i-1}$ for all $i \in \{1, 2\}$.



1. Describe the language $L(M) = \{x \in \{0, 1, 2\}^* \mid \dots\}$ by replacing the \dots with at most 15 words. Do not mention δ .

Here \dots is equivalent to “the sum of the letters in x is divisible by 3.”

2. Construct a regular expression r such that $L(r) = L(M)$.

Construct

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r=(
  0
  + (2(0)*1)
  + (1(0)*2)
  + ((1 + 2(0)*2) (0 + 1(0)*2)* (2 + 1(0)*1) (0 + 2(0)*1)*)
)*
  
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Or in 1 line: $r = (0 + (20^*1) + (10^*2) + ((1 + 20^*2)(0 + 10^*2)^*(2 + 10^*1)(0 + 20^*1)^*))^*$

Then we can claim that $L(r) = L(M)$.