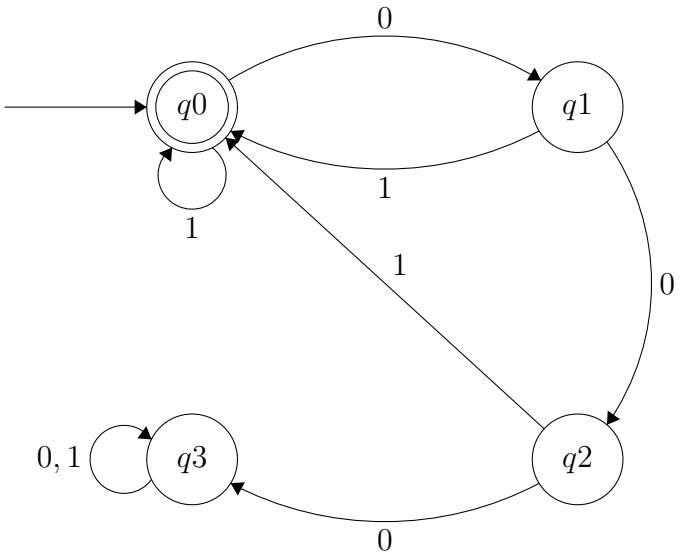
Vladimir Hugec

Question 1:

$$L_1 = \{w | w \text{ does not contain the substring } 000\}$$

1.1 Construct a DFA



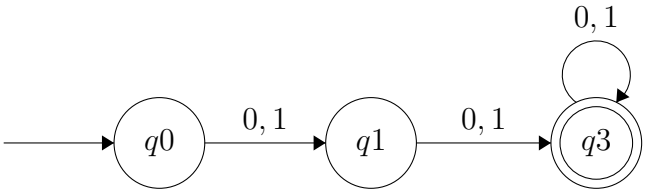
1.2 Full Formal Specifications of the Machine

$Q = \{q_0, q_1, q_2, q_3\}$
$\Sigma = \{0, 1\}$
$\delta : Q \text{ x } \Sigma \rightarrow Q$
$\delta(q_0, 1) = q_0$
$\delta(q_0, 0) = q_1$
$\delta(q_1, 1) = q_0$
$\delta(q_1, 0) = q_2$
$\delta(q_2, 1) = q_0$
$\delta(q_2, 0) = q_3$
$\delta(q_3, 0) = q_3$
$\delta(q_3, 1) = q_3$
$q_0 \in Q$ is initial state
$F = q_0$

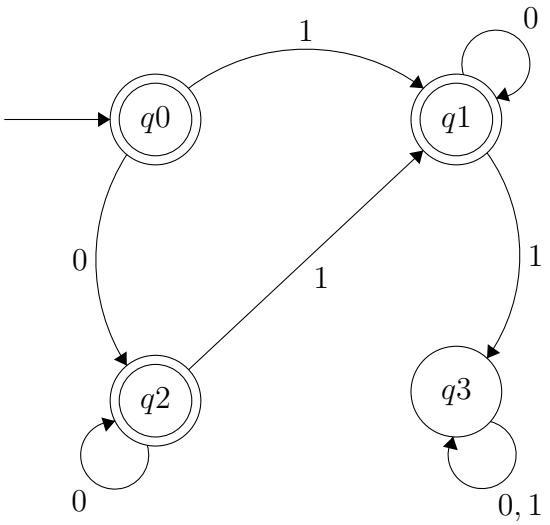
Question 2:

$L_2 = \{w|\ |w| \geq 2$, but w contains less than two 1's$\}$

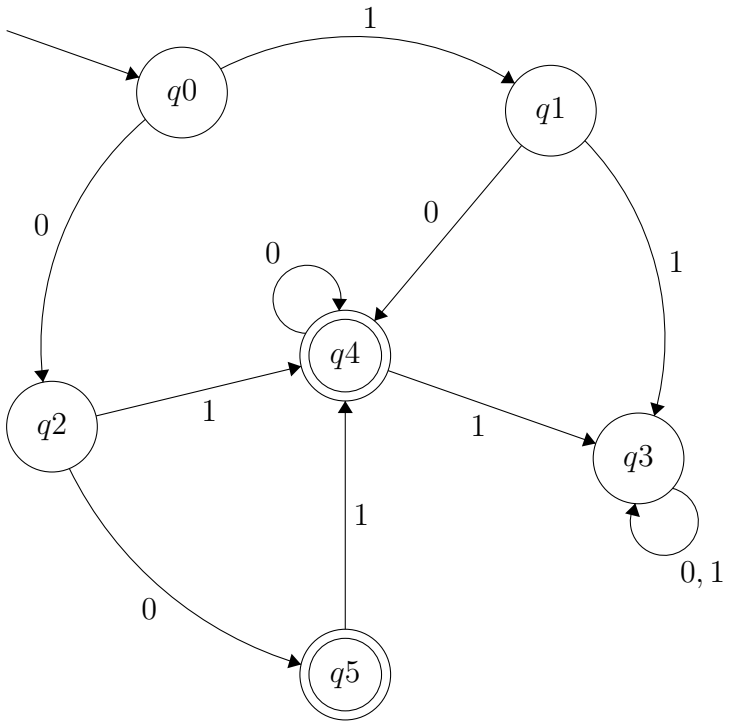
2.1 DFA for $L_2 = \{w|\ |w| \geq 2\}$



2.2 DFA for $L_2 = \{w|$ w contains less than two 1's$\}$



2.3 DFA for combination of both other DFA's

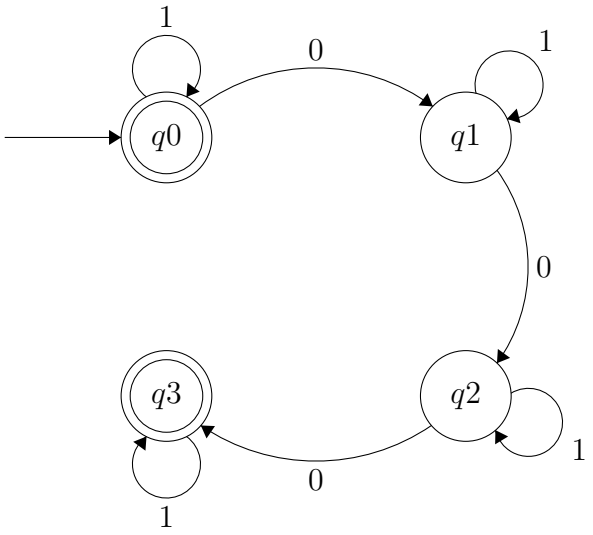


Question 3:

Prove that the following language is regular:

$L_3 = \{w|$ if w contains any 0's, then it contains at least three of them$\}$

Proof. A language is regular if one can construct a DFA which can recognize it. The following DFA can recognize L_3 :



□

3.1 Full Formal Specifications of the Machine

$Q = \{q_0, q_1, q_2, q_3\}$
$\Sigma = \{0, 1\}$
$\delta : Q \text{ x } \Sigma \rightarrow Q$
$\delta(q_0, 1) = q_0$
$\delta(q_0, 0) = q_1$
$\delta(q_1, 1) = q_1$
$\delta(q_1, 0) = q_2$
$\delta(q_2, 1) = q_2$
$\delta(q_2, 0) = q_3$
$\delta(q_3, 1) = q_3$
$q_0 \in Q$ is initial state
$F = \{q_0, q_3\}$