Subject: Theory of computation
Topic: DFA

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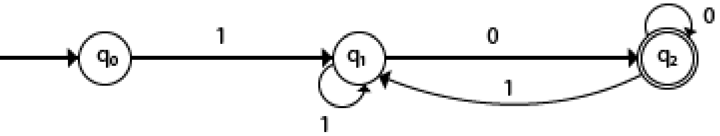
Design a FA with $\Sigma = \{0, 1\}$ accepts those string which starts with 1 and ends with 0.

Solution:

The FA will have a start state q0 from which only the edge with input 1 will go to the next state.



In state q1, if we read 1, we will be in state q1, but if we read 0 at state q1, we will reach to state q2 which is the final state. In state q2, if we read either 0 or 1, we will go to q2 state or c

Example 2:

Design a FA with Σ = {0, 1} accepts the only input 101.

Solution:

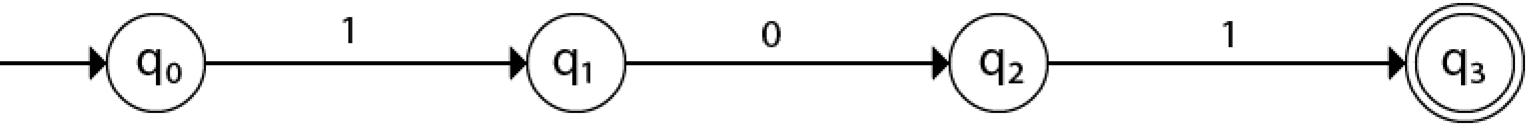


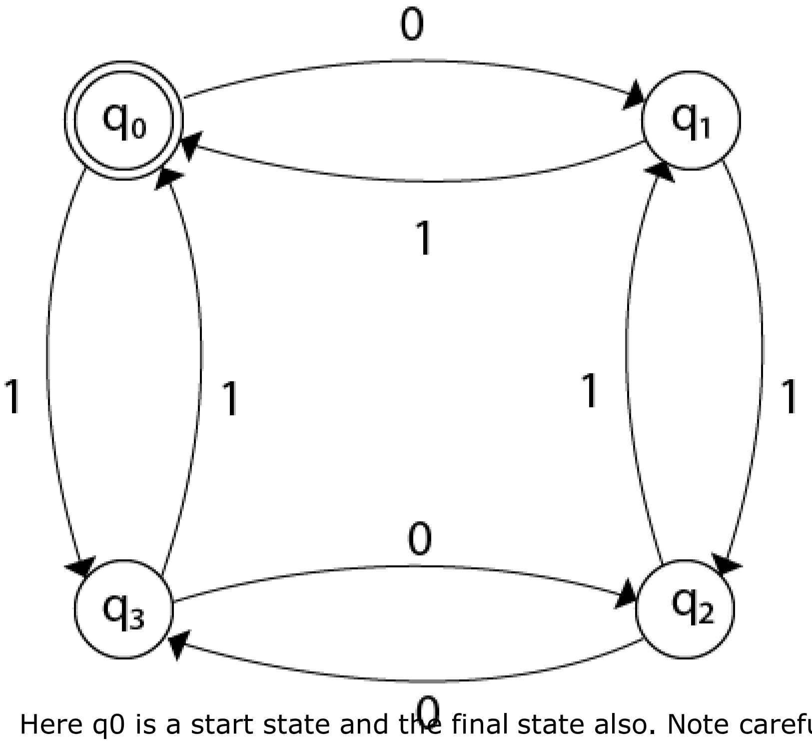
Fig: FA

In the given solution, we can see that only input 101 will be accepted. Hence, for input 101, there is no other path shown for other input.

Design FA with ∑ = {0, 1} accepts even number of 0's and even number of 1's.

Solution:

This FA will consider four different stages for input 0 and input 1. The stages could be:



Here q0 is a start state and the final state also. Note carefully that a symmetry of 0's and 1's is maintained. We can associate meanings to each state as:

q0: state of even number of 0's and even number of 1's.

q1: state of odd number of 0's and even number of 1's.

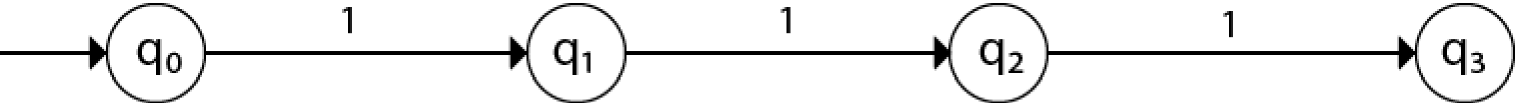
q2: state of odd number of 0's and odd number of 1's.

q3: state of even number of 0's and odd number of 1's.

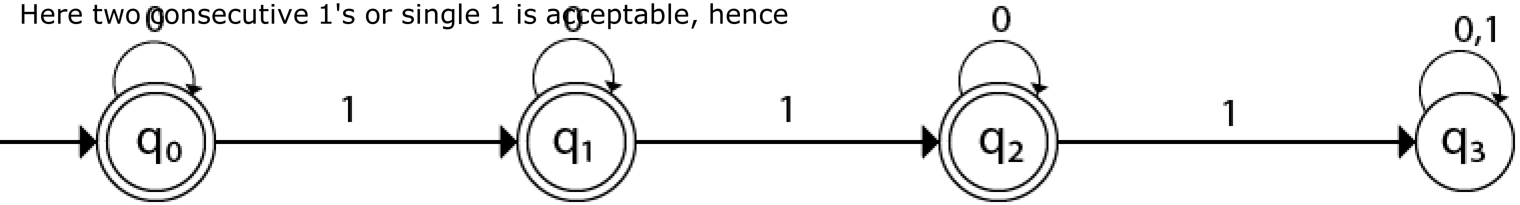
Design a DFA L(M) = {w | w ε {0, 1}*} and W is a string that does not contain consecutive 1's.

Solution:

When three consecutive 1's occur the DFA will be:



Here two consecutive 1's or single 1 is acceptable, hence



The stages q0, q1, q2 are the final states. The DFA will generate the strings that do not contain consecutive 1's like 10, 110, 101,..... etc.

Design a FA with $\Sigma = \{0, 1\}$ accepts the strings with an even number of 0's followed by single 1.

Solution:

The DFA can be shown by a transition diagram as: