Project 2

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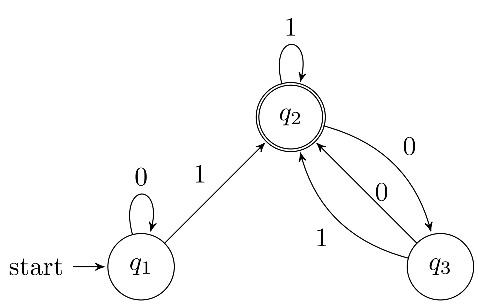
Let an FSA, M be defined as follows:
$Q = \{q_1, q_2, q_3\}$
$\Sigma = 0, 1$
$F = q_2$
$q_s = q_1$

$$\delta = \begin{array}{|c|c|c|} & 0 & 1 \\ \hline q_1 & q_1 & q_2 \\ q_2 & q_3 & q_2 \\ q_3 & q_2 & q_2 \end{array}$$

1 Draw M using nodes and arcs.



2 Characterize $L(M)$ in words, the more formal the better.

The language $L(M)$ can be characterized as any string built from the characters $\{0, 1\}$ containing at least one 1, and ending with either a 1 or an even number of 0s.
$L(M)\{s$ ends with a 1 or 00$\}$

The formal description of a DFA M_1 is:
$Q = \{q_1, q_2, q_3, q_4, q_5\}$
$\Sigma = \{u, d\}$
δ: is described in the table below
$q_s = q_3$
$F = \{q_3\}$

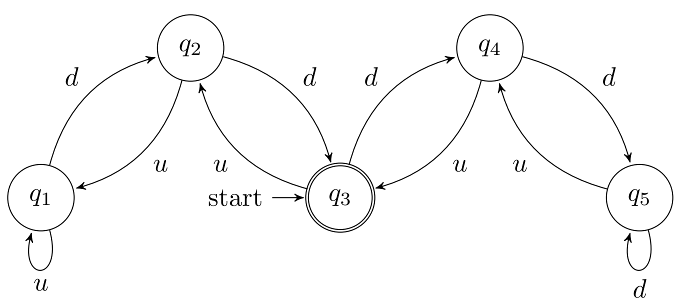
Here is δ:

	u	d
q_1	q_1	q_2
q_2	q_1	q_3
q_3	q_2	q_4
q_4	q_3	q_5
q_5	q_4	q_5

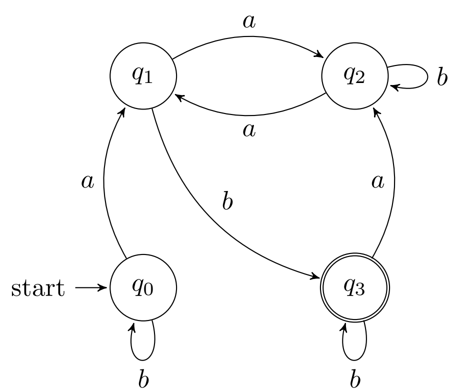
3 Why is F a set, whereas q_s is not?

F is a set because it is all the accept states where as q_s is the start state and in an FSA there is only one start stat but there can be multiple accept states.

4 Give the state diagram of M_1



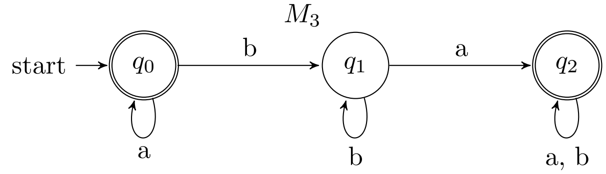
5 Suppose we have a machine, M_2, an DFA, whose alphabet is $\{a, b\}$. Suppose further that $L(M_2) = \{w|w$ has an odd number of the symbol a and ends with the symbol b$\}$. Give the state diagram of M_2



6 Suppose we have a machine, M_3, a DFA, whose alphabet is $\{a, b\}$. Suppose further that $L(M_3) = \{w|w$ is not in $a^*b^*\}$. $L(M_3)$ is the complement of a simpler language. Construct the DFA for the simpler language, then use it to give the state diagram of $L(M_3)$.

$M_3 : \Sigma = a, b$
$L(M_3) = \{w|w \text{ is not in } a^*b^*\}$
$L(M_{3_0}) = \{w|w \text{ is in } a^*b^*\} \rightarrow \{a, b, ab, abb, aabb, ...\}$

M_3



7 Suppose we have a machine, M_4, a DFA, whose alphabet is $\{0, 1\}$. Suppose further that $L(M_4) = \{w|w$ contains an even number of 0s or contains exactly two 1s$\}$. Give the state diagram for M_4

$M_4 : \Sigma = \{0, 1\}$
$L(M_4) = \{w|w$ contains even # of 0s of exactly 2 1s $\}$
$\{w|w$ contains even # of 0s of exactly 2 1s $\} = \{00, 11, 00011, 0110, 11001, ...\}$