CS 4384 — Automata Theory, Homework 1

https://iniyanjoseph.com | iniyanijoseph@gmail.com

Prove that $\forall_{n\geq 3} 2^n \geq n + 5$

Proof. *Proof by induction:*

Basis:
For $n = 3$, $2^3 = 3 + 5 = 8$

Inductive Hypothesis:
Assume for n, $2^n \geq n + 5$.

Inductive Step:
Show that

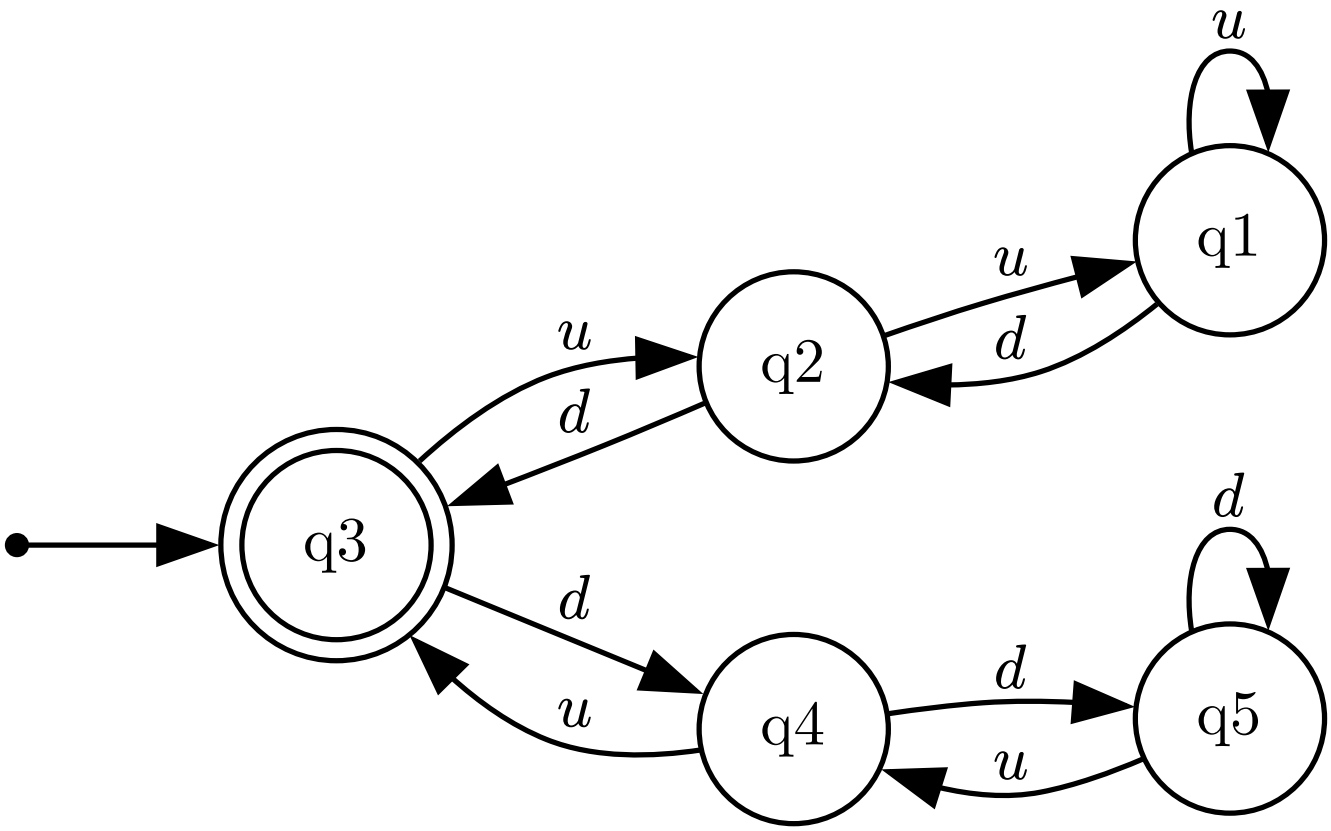
$$2^{n+1} \geq n + 1 + 5$$
$$2^n \times 2 \geq n + 1 + 5$$

By the inductive hypothesis

$$2^n \times 2 \geq 2^{n-1} + 1 \geq n + 5 + 1$$

where the inequality holds for $n \geq 2$

Consider the DFA in the Exercise 1.3 on page 83 from the textbook. Draw the DFA and determine its result for each of the following inputs?



udududd
Not accepted (ends on q4)

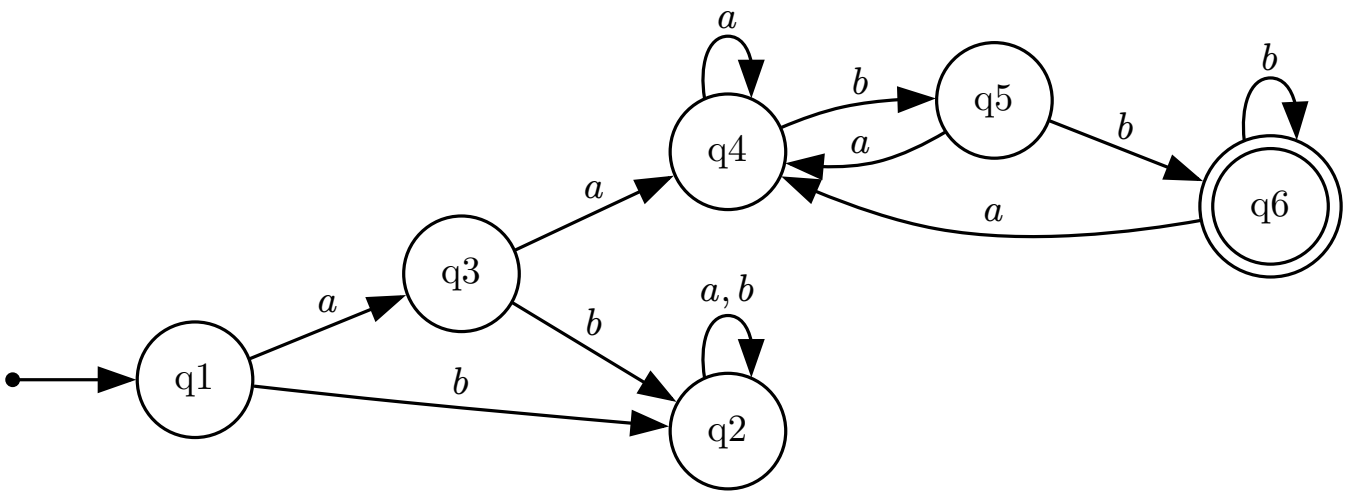
01110

Accepted (ends on q3)

uuduuu

Not accepted (ends on q1)

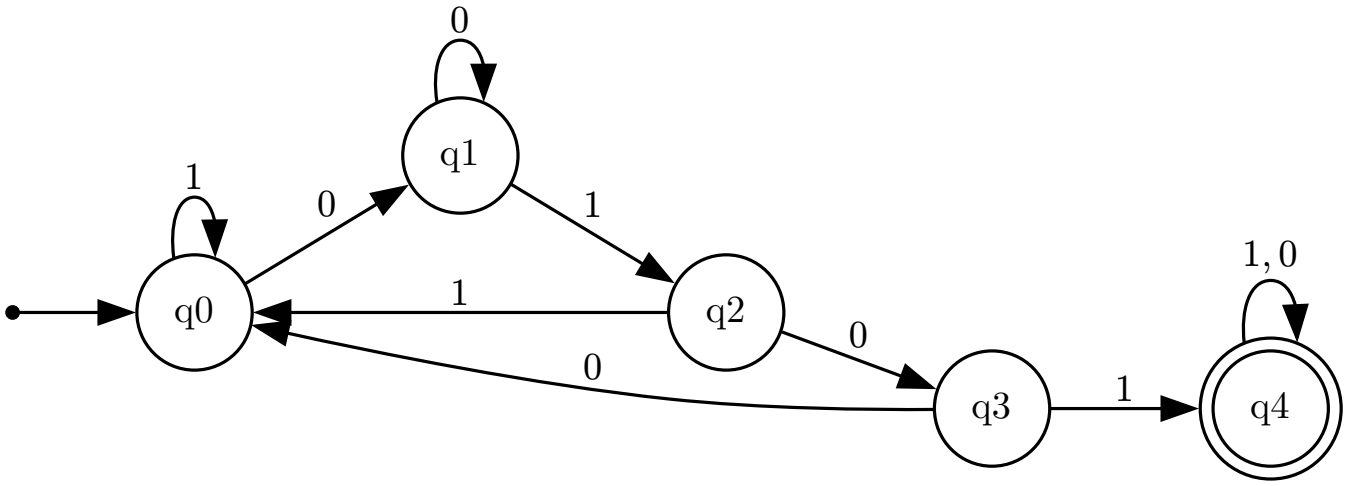
Let $\Sigma = \{a, b\}$ be an alphabet. Design an FA that recognizes all the strings which start with *aa* and end with *bb*



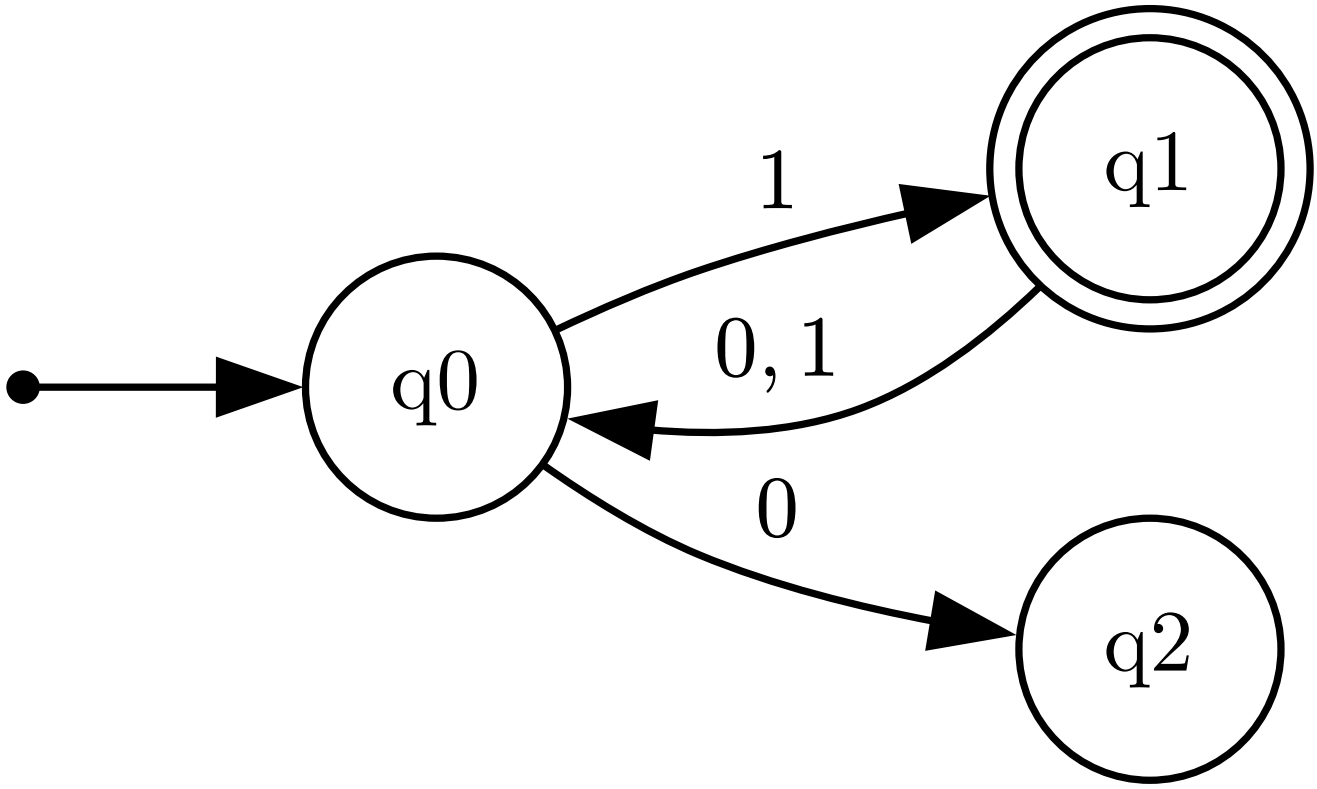
Solve the Exercise 1.6 (parts (c), (i) and (k) only) on page 84 of the textbook

Construct a DFA for each part.

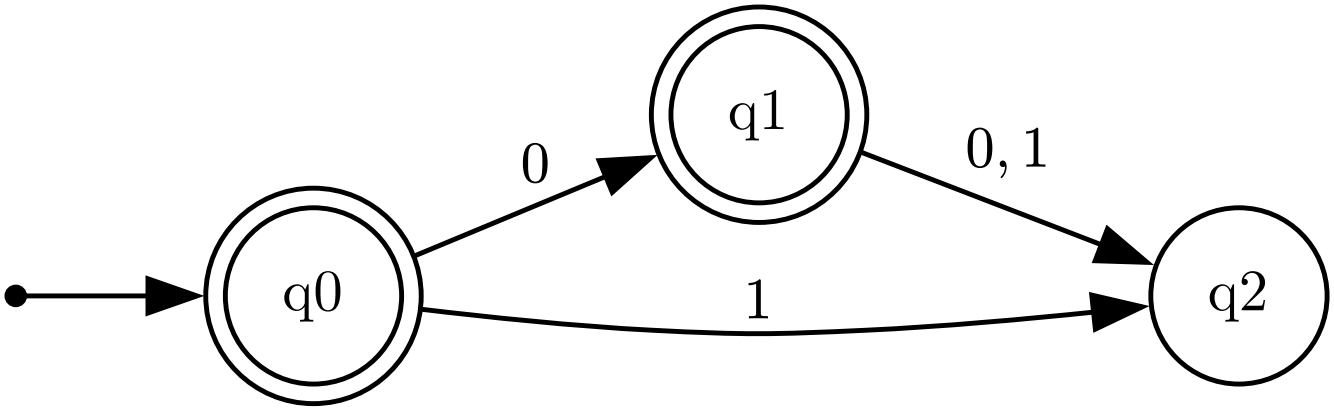
.c



.i

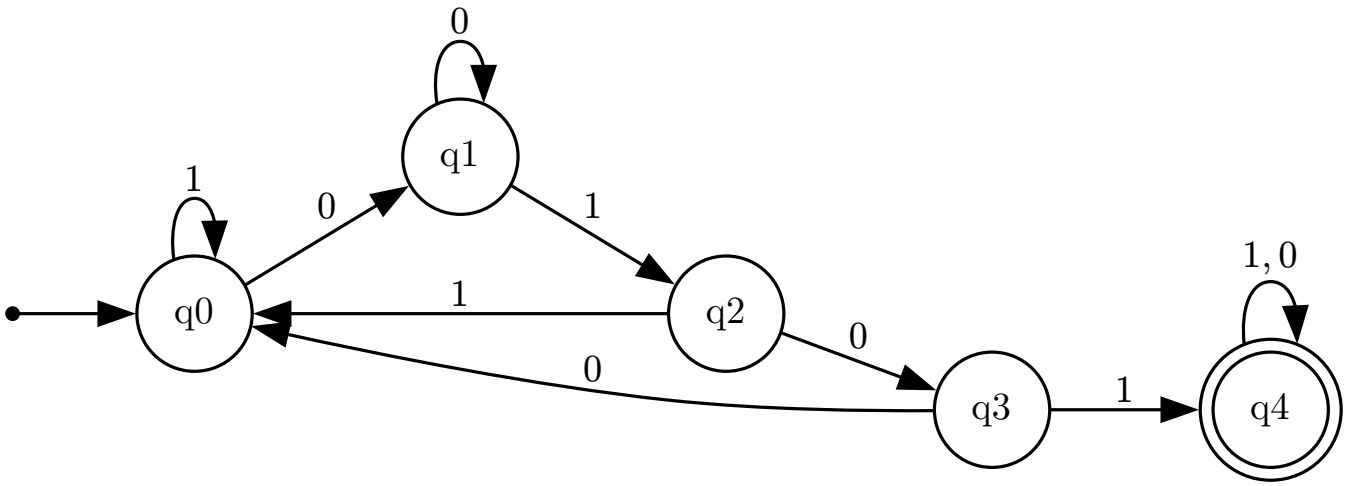


.k $\{\varepsilon, 0\}$

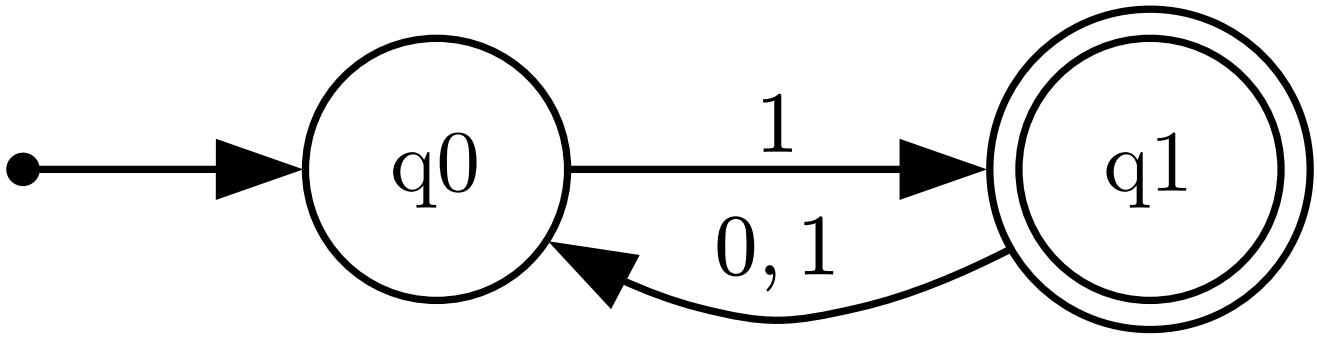


Construct a NFA for each part.

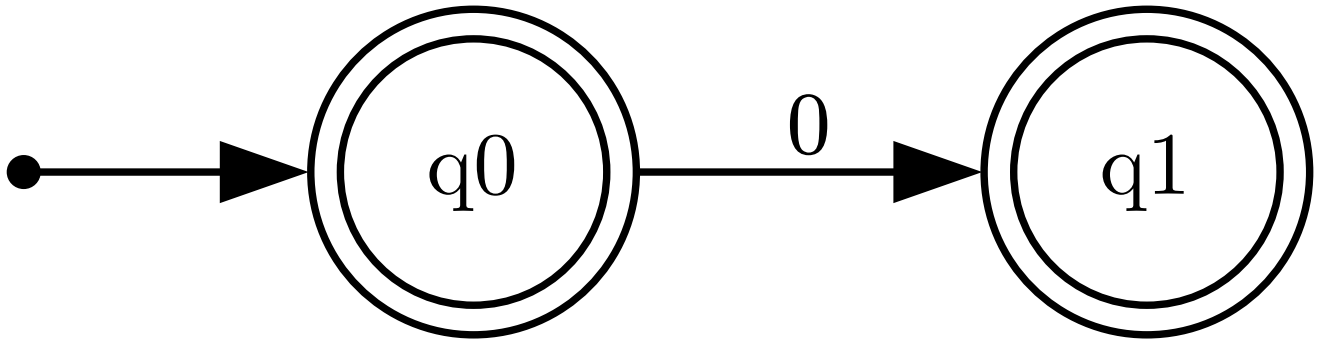
.c



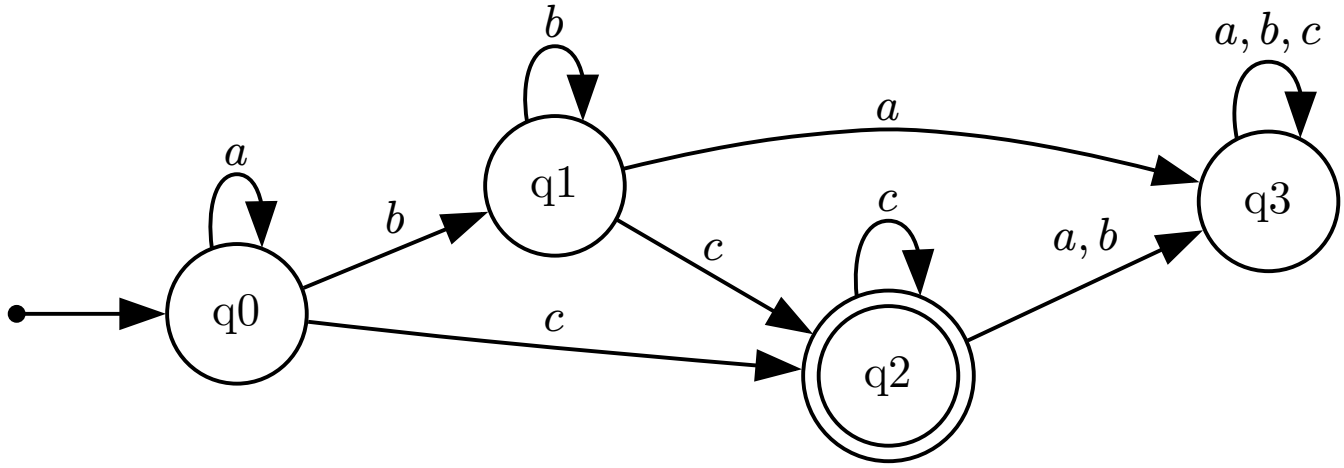
.i



.k $\{\varepsilon, 0\}$

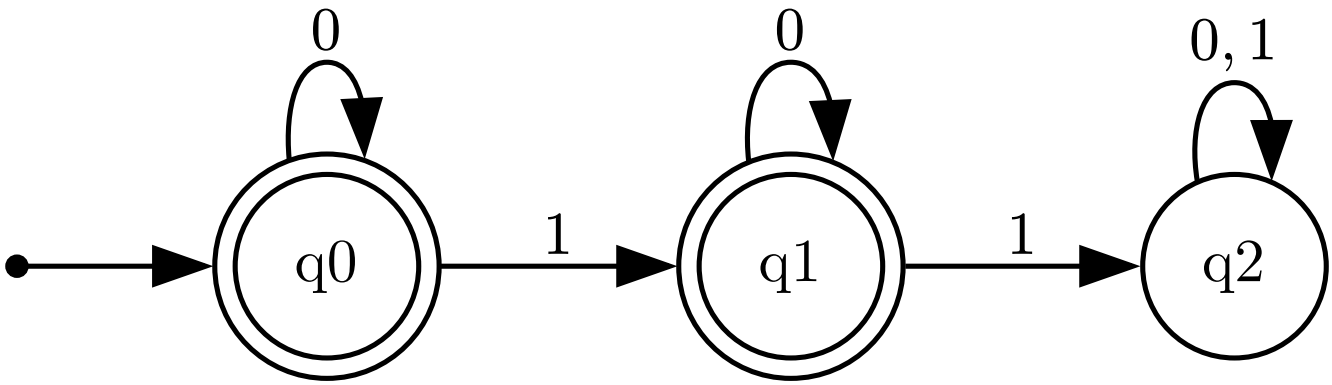


Design a DFA to accept the language $\{a^n b^m c^k \mid n \geq 0, m \geq 0, k \geq 1\}$

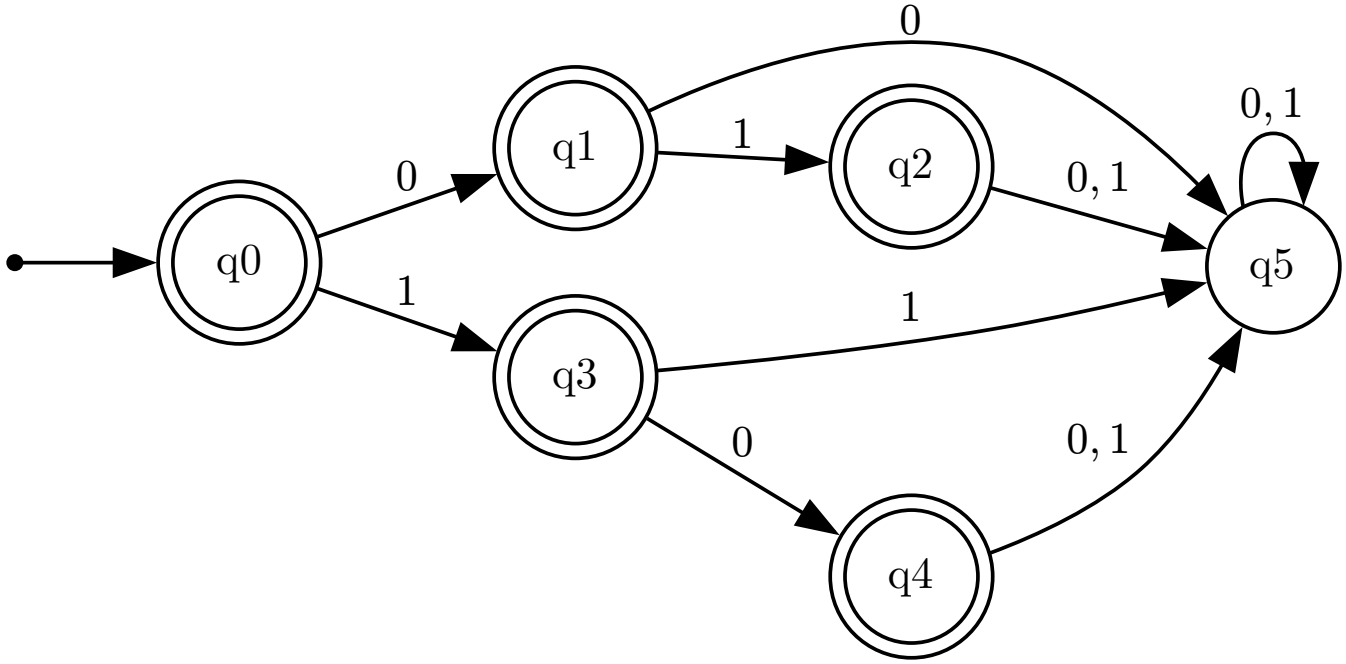


Let $\Sigma = \{0, 1\}$ be an alphabet. Design a DFA for each language

$L_1 = \{w \in \Sigma^* \mid |w|_1 \leq 1\}$



The set of all of strings in which no two characters are the same



The same thing is redrawn (using a different format) for clarity.

