CISS362: Introduction to Automata Theory, Languages, and Computation
Assignment a05

Name: _____

Objectives

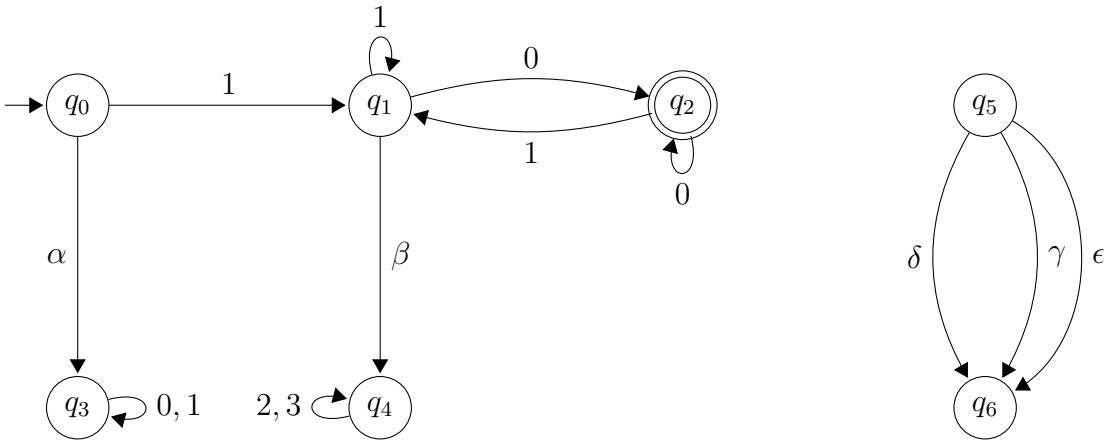
- Design DFAs
- Design NFAs.

As before modify the files `q01.tex` for Q1, `q02.tex` for Q2, etc.

- Sipser 1.8: Q1.
- Sipser 1.9: Q2.
- Sipser 1.10: Q3.
- Sipser 1.11: DIY and then check the solution in the Sipser book.
- Sipser 1.12: Skip.
- Sipser 1.13: Q4.
- Sipser 1.14: Q5.
- Sipser 1.15: Q6.
- Sipser 1.16: Q7.

How to draw a state diagram

Here's an example showing you how to draw the elements of a state diagram. Also, look at the solution to 1.3 below.

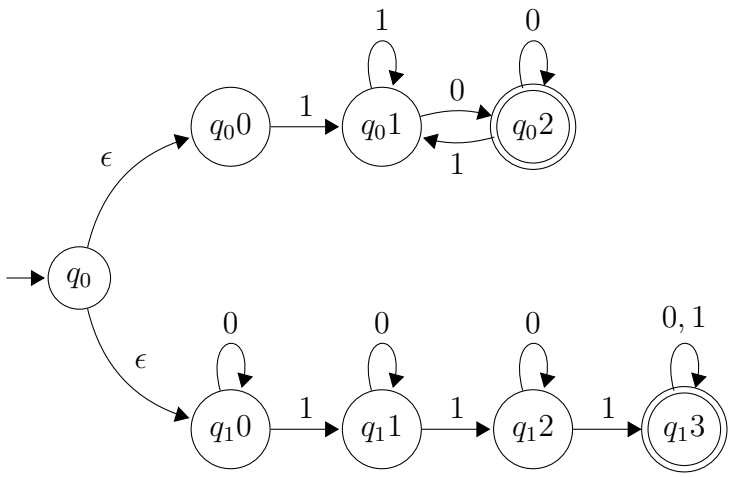


For more information on drawing state diagrams go to my website and look for `latex-automata.pdf`. Let me know if you have any questions about drawing state diagram.

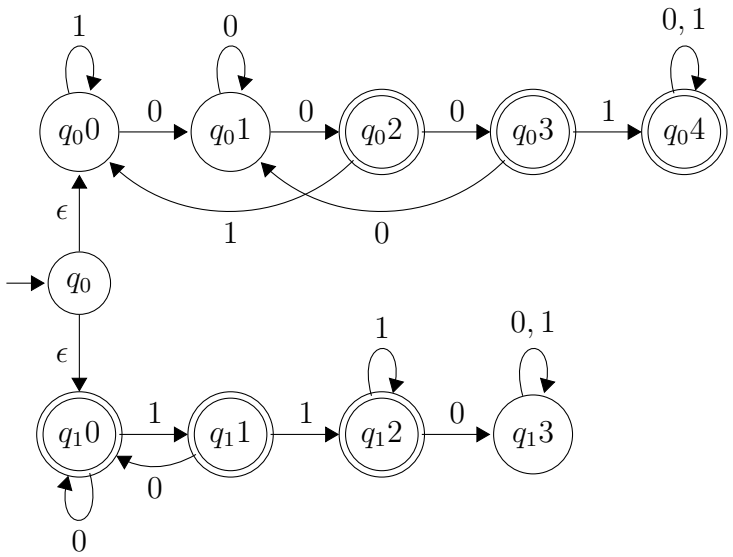
Q1. Sipser 1.8.

Solution.

(a.)



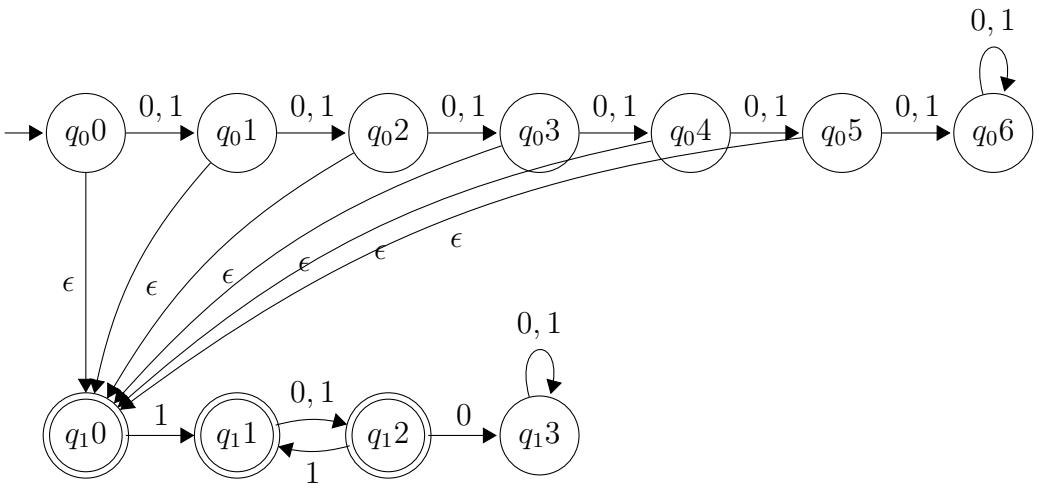
(b.)



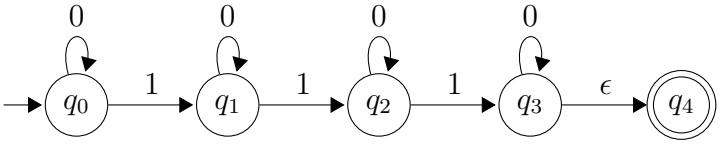
Q2. Sipser 1.9.

Solution.

(a.)



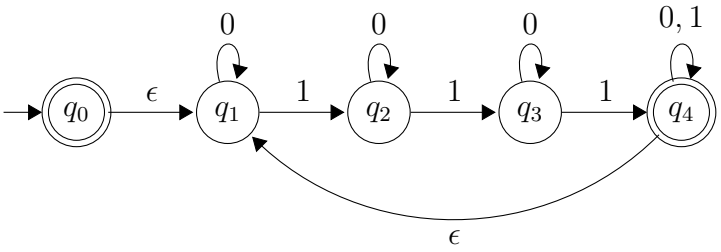
(b.)



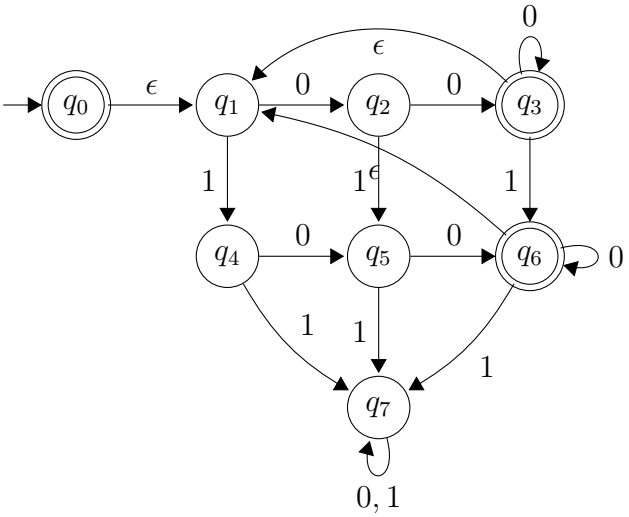
Q3. Sipser 1.10.

Solution.

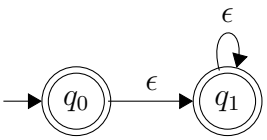
(a.)



(b.)



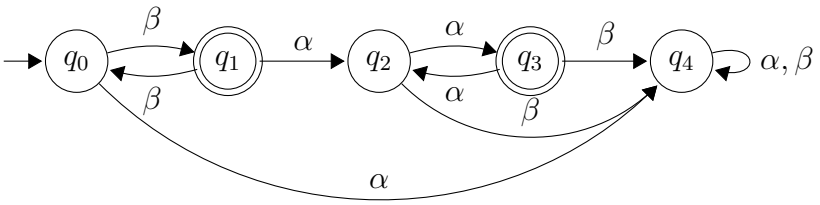
(c.)



Q4. Sipser 1.12.

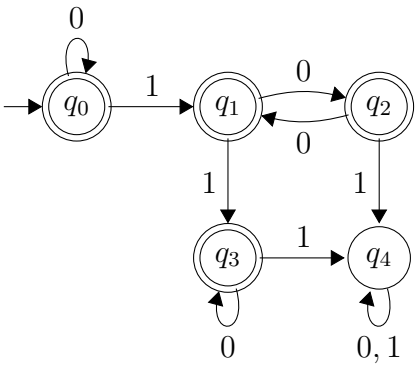
Solution.

Regular Expression: $D = \{\beta(\beta\beta)^*(\alpha\alpha)^*\}$



Q5. Sipser 1.13.

Solution.



Q6. Sipser 1.14.

For (b) make sure you example is the simplest.

Solution.

(a) Let $M = (\Sigma, Q, q_0, F, \delta)$. Define $\overline{M}$ to be the DFA

$$\overline{M} = (\Sigma, Q, q_0, Q - F, \delta)$$

We will show that

$$L(\overline{M}) = \overline{L(M)}$$

Let $w \in \Sigma^*$.

$$\begin{aligned} w \in L(\overline{M}) &\iff ? \\ &\iff ? \\ &\iff w \in \overline{L(M)} \end{aligned}$$

(Recall that $w \in L(M)$ iff $\delta^*(q_0, w) \in F$.)

(b)