Indian Institute of Technology Dharwad

CS 202: Tutorial 1 (24 December 2021)

1. Given $\Sigma = \{0, 1\}$, What is the cardinality of Σ^*? Prove/disprove that $| \Sigma^* | < | \mathcal{P}(\Sigma^*) |$, where $\mathcal{P}(\Sigma^*)$ is the powerset of Σ^*.

2. Consider $\Sigma = \{0, 1\}$:

   (a) Which of the following languages over Σ are NOT recognized by deterministic finite automata with *three* states?

      i. words which do not have 11 as a contiguous subword
      ii. words that end in 11
      iii. words which do not have 101 as a contiguous subword

   (b) Construct a DFA for the above languages.

3. Give the formal description of DFAs that accept the following languages defined over $\Sigma = \{a, b\}$:

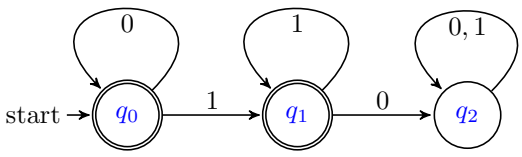
   (a) all strings starting with the subword *aba*

   (b) all strings ending with the subword *aba*

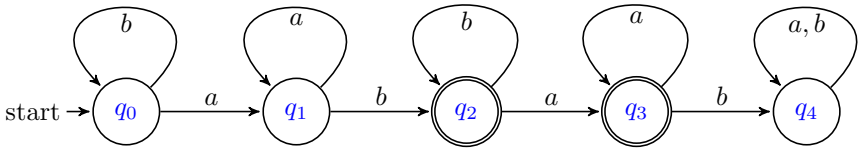
   (c) all strings containing *aba*

4. Describe the language accepted by the following finite state machines.

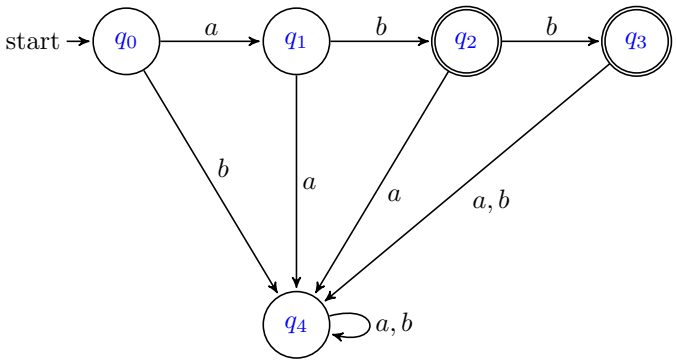
(a)



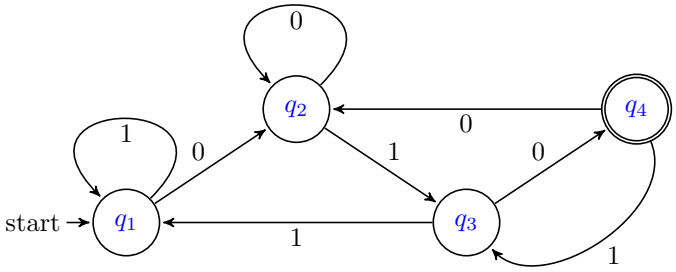
(b)



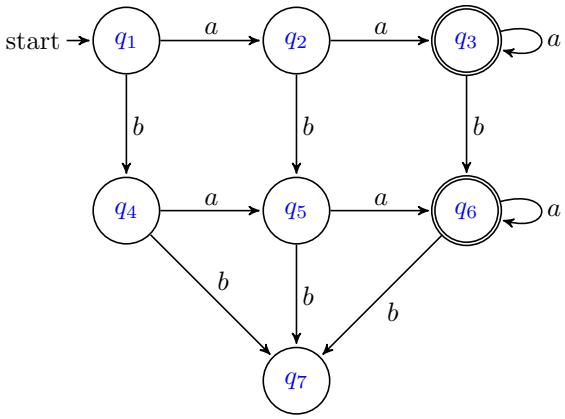
(c)


start
q_0
q_1
q_2
q_3
q_4
a
b
b
b
a
a
a, b
a, b

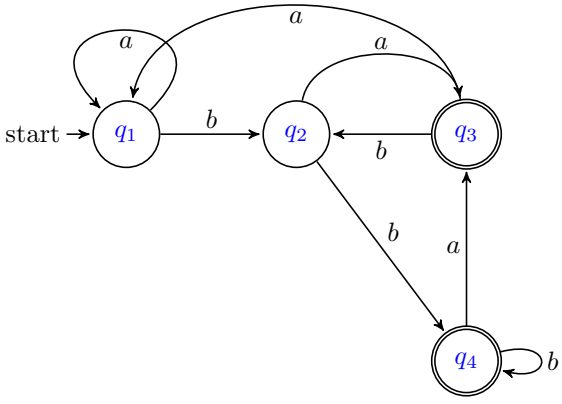
(d)


start
q_1
q_2
q_3
q_4
0
1
0
1
0
0
1
1

(e)


start
q_1
q_2
q_3
q_4
q_5
q_6
q_7
a
a
a
a
a
a
b
b
b
b
b
b

(f)


start
q_1
q_2
q_3
q_4
a
a
a
b
b
b
b
a
b

(g)