ECS 120: Theory of Computation

Homework 3 Solution

Due: 4/19/06

Problem 1.

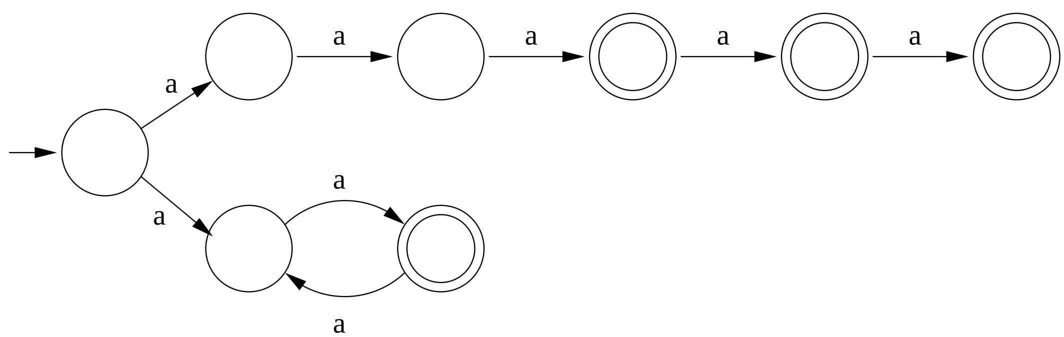
[Linz, Section 2.2, Exercise 4).]

$\delta^*(q_0, 1011) = \{q_2\}$
$\delta^*(q_1, 01) = \{q_1\}$

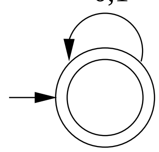
[Linz, Section 2.2, Exercise 12.]

01001 and 000.

[Linz, Section 2.2, Exercise 14.]



[Linz, Section 2.3, Exercise 3.]



[Linz, Section 2.3, Exercise 5.]

True.

Prove that $\overline{L(M)} = \{w \in \Sigma^* : \delta^*(q_0, w) \cap F = \emptyset\}$.

If $x \in \overline{L(M)}$, then $\delta^*(q_0, x) \cap F = \emptyset$ (by definition 2.6).
If $x \in \{w \in \Sigma^* : \delta^*(q_0, w) \cap F = \emptyset\}$, then M rejects x and $x \in \overline{L(M)}$.
Thus, $x \in \overline{L(M)} \leftrightarrow x \in \{w \in \Sigma^* : \delta^*(q_0, w) \cap F = \emptyset\}$.

[Linz, Section 2.3, Exercise 6.]

False.

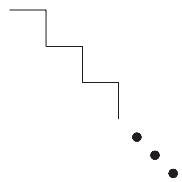
Given that $M = (Q, \Sigma, \delta, q_0, F)$. $\overline{L(M)} = \Sigma^* - L(M)$. However, if $x \notin L(M)$, then $\delta^*(q_0, x) \subseteq (Q - F)$ or $\delta^*(q_0, x) = \emptyset$. If $\delta^*(q_0, x) = \emptyset$, then $\emptyset \cap (Q - F) = \emptyset$.

[Linz, Section 3.1, Exercise 11.]

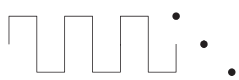
$abbbb^*(a + b)^+$

[Linz, Section 3.1, Exercise 24.]

[a.]



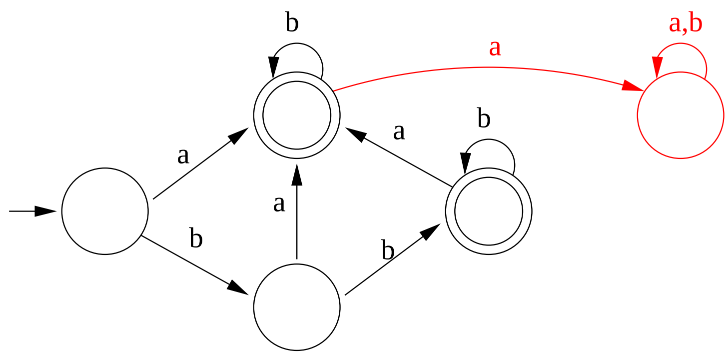
[b.]



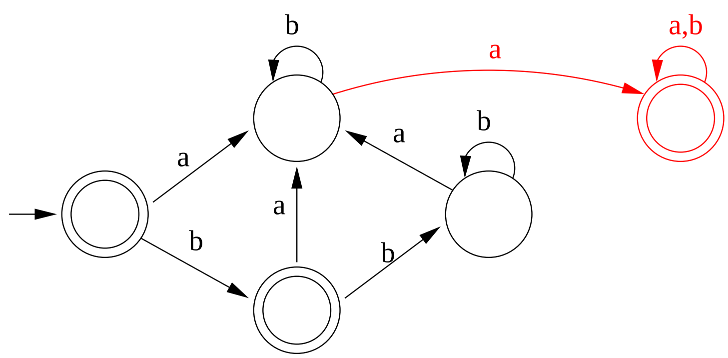
[c.]

Problem 2

[a.]



[b.]



[c.]

$b^*(a + ab + bb)b^*$