Bradley White
HW #3
CSCI 338
2-21-2016

1. 2.4, p.155

C: $S \to 0R \mid 1R$
$R \to 0S \mid 1S \mid \varepsilon$

F: $S \to S$

2. 2.6, p.155

B:

$L = \{a^n b^m : n > m\} \cup \{a^n b^m : n < m\} \cup \{(a \cup b)^* b (a \cup b)^* a (a \cup b)^*\}$ is the complement of $\{a^n b^n : n \geq 0\}$.

The CFG that generates $\{a^n b^m : n > m\}$ is:

$S_1 \to aS_1 b \mid aS_1 \mid a$

Similarly the CFG that generates $\{a^n b^m : n < m\}$ is:

$S_2 \to aS_2 b \mid S_2 b \mid b$

The CFG that generates $\{(a \cup b)^* b (a \cup b)^* a (a \cup b)^*\}$ is:

$S_3 \to XbXaX$
$X \to aX \mid bX \mid \varepsilon$

So, the CFG that generates L is:

$S \to S_1 \mid S_2 \mid S_3$
$S_1 \to aS_1 b \mid aS_1 \mid a$
$S_2 \to aS_2 b \mid S_2 b \mid b$
$S_3 \to XbXaX$
$X \to aX \mid bX \mid \varepsilon$

3. 2.14, p.156

Step 1:

$S \to A$
$A \to BAB \mid B \mid \varepsilon$
$B \to 00 \mid \varepsilon$

Step 2:

$S \to A$
$A \to BAB \mid B \mid BA \mid A \mid AB \mid BB$
$B \to 00$

Step 3:

$S \to BAB \mid BA \mid AB \mid BB \mid 00 \mid \varepsilon$
$A \to BAB \mid BA \mid AB \mid BB \mid 00$
$B \to 00$

Step 4:

$S \to BU \mid BA \mid AB \mid BB \mid CC \mid \varepsilon$
$A \to BU \mid BA \mid AB \mid BB \mid CC$
$B \to CC$
$U \to AB$
$C \to 0$

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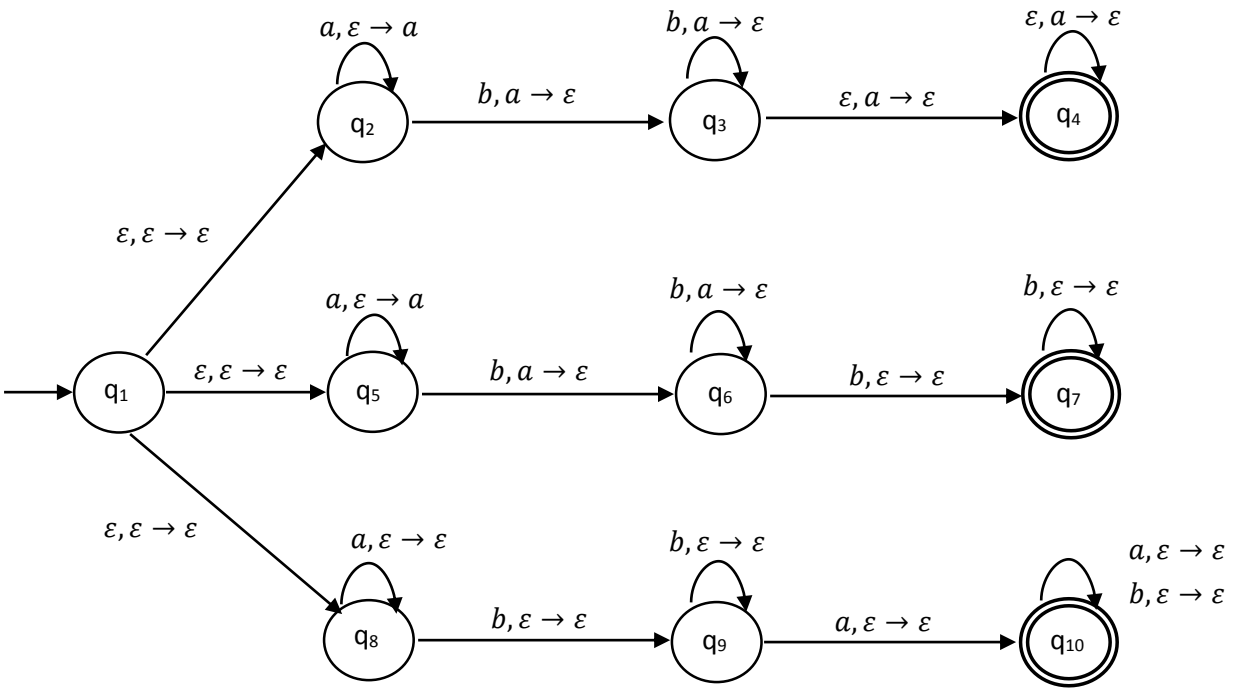
4.



5.

$$Q = \{q_1, q_2, \ldots, q_{10}\}$$
$$\Sigma = \{a, b\}$$
$$\Gamma = \{a\}$$
$$q_0 = q_1$$
$$F = \{q_4, q_7, q_{10}\}$$

6.