a) $\Sigma = [a, b]$

$Q = [1, 2, 3, 4, 5, 6]$

$q_0 = 1$

$F = 6$

$V = |A, B, C, D, E, F|$

$A \to bB$

$B \to aC$

$B \to bB$

$C \to aC$

$C \to bD$

$D \to aE$

$D \to bB$

$E \to aE$

$E \to bF$

$F \to aE$

$F \to bF$

$S \to A$

$F \to ?$

$\delta(1, b) = 2$

$\delta(2, a) = 3$

$\delta(2, b) = 2$

$\delta(3, a) = 3$

$\delta(3, b) = 4$

$\delta(4, a) = 5$

$\delta(4, b) = 2$

$\delta(5, a) = 5$

$\delta(5, b) = 6$

$\delta(6, a) = 5$

$\delta(6, b) = 6$

$S \to A$

$A \to bB$

$B \to aC \mid bB$

$C \to aC \mid bD$

$D \to aE \mid bB$

$E \to aE \mid bF$

$F \to aE \mid bF \mid ?$

B) $\Sigma: |a, b, c|$

$Q: |1, 2, 3, 4, 5, 6, 7|$

$q_0: 1$

$F: 7$

$V: |A, B, C, D, E, F, G|$

$A \to aB$
$A \to bA$
$A \to cA$
$B \to aC$
$B \to bA$
$B \to cA$
$C \to cC$
$C \to bD$
$C \to cC$
$D \to aC$
$D \to bE$
$D \to cC$
$E \to aE$
$E \to bE$
$E \to cF$
$F \to aE$
$F \to cG$
$G \to aG$
$G \to bG$
$G \to cG$
$G \to 7$
$S \to A$

$\delta: |1, a| = 2$
$\delta: |1, b| = 1$
$\delta: |1, c| = 1$
$\delta: |2, a| = 3$
$\delta: |3, a| = 3$
$\delta: |3, b| = 4$
$\delta: |3, c| = 3$
$\delta: |4, a| = 3$
$\delta: |4, b| = 5$
$\delta: |4, c| = 3$
$\delta: |5, a| = 5$
$\delta: |5, b| = 5$
$\delta: |5, c| = 6$
$\delta: |6, a| = 5$
$\delta: |6, c| = 7$
$\delta: |7, a| = 7$
$\delta: |7, b| = 7$
$\delta: |7, c| = 7$

$S \to A$
$A \to ab \mid bA \mid cA$
$B \to aC \mid bA \mid cA$
$C \to aC \mid bD \mid cC$
$D \to aC \mid bE \mid cC$
$E \to aE \mid bE \mid cF$
$F \to cF \mid aE \mid cG$
$G \to aG \mid bG \mid cG \mid 7$

tilibra

c) $\Sigma = \{0, 1\}$

$Q = \{a, b, c, d\}$

$q_0 = a$

$F = \{d\}$

$V = \{A, B, C, D\}$

$\delta(a, 0) = a$

$\delta(a, 1) = b$

$\delta(b, 0) = b$

$\delta(b, 1) = c$

$\delta(c, 0) = c$

$\delta(c, 1) = d$

$\delta(b, 0) = d$

$A \to 0A$

$A \to 1B$

$B \to 0B$

$B \to 1C$

$C \to 0C$

$C \to 1D$

$D \to 0D$

$D \to ?$

$S \to A$

$S \to A \mid B$

$A \to 0A \mid 1B$

$B \to 0B \mid 1C$

$C \to 0C \mid 1D$

$D \to 0D \mid ?$

a) $\Sigma = \{0, 1\}$

$Q = \{a, b, c, d\}$

$q_0 = a$

$F = D$

$\delta(a, 0) = a$

$\delta(a, 1) = b$

$\delta(b, 0) = b$

$\delta(b, 1) = c$

$\delta(c, 0) = c$

$\delta(c, 1) = d$

$\delta(a, 0) = a$

$\delta(d, 1) = b$

$V = \{A, B, C, D\}$

$A \to 0A$

$A \to 1B$

$B \to 0B$

$B \to 1C$

$C \to 0C$

$C \to 1D$

$D \to 0D$

$D \to 1B$

$D \to ?$

$S \to A$

$S \to A$

$A \to 0A \mid 1B$

$B \to 0B \mid 1C$

$C \to 0C \mid 1D$

$D \to 0D \mid 1B \mid ?$

b) 2) $\Sigma = \{0, 1\}$

$Q = \{a, b, c, d\}$

$q_0 = a$

$F = d$

$\delta(a, 0) = b$

$\delta(a, 1) = b$

$\delta(b, 0) = c$

$\delta(b, 1) = c$

$\delta(c, 0) = D$

$\delta(c, 1) = D$

$\delta(D, 0) = b$

$\delta(D, 1) = b$

$Q = \{A, B, C, D\}$

$A \to aB$

$A \to bB$

$B \to aC$

$B \to bC$

$C \to aD$

$C \to bD$

$D \to aB$

$D \to bB$

$D \to ?$

$S \to A$

$A \to 0B \mid 1B$

$B \to 0C \mid 1C$

$C \to 0D \mid 1D$

$C \to 0B \mid 1B \mid ?$

b) $\Sigma = \{0, 1\}$
$Q = \{a, b, c\}$
$Q_0 = \{a\}$
$F = C$

$\delta = \{a, 0\} = b$
$\delta = \{b, 0\} = C$
$\delta = \{b, 1\} = D$
$\delta = \{c, 0\} = b$
$\delta = \{c, 1\} = b$

$V = \{A, B, C\}$

$A \to 0B$
$B \to 0C$
$B \to 1C$
$C \to 0B$
$C \to 1B$
$C \to ?$
$S \to A$

$A \to 0B$
$B \to 0C \mid 1C$
$C \to 0B \mid 1B \mid ?$

g) $\Sigma = \{0, 1\}$

$Q = \{a, b, c, d\}$

$q_0 = \{a\}$

$F = \{d\}$

$\delta = \{(a, 0) = b$

$\delta = (b, 0) = c$

$\delta = (b, 1) = c$

$\delta = (c, 0) = d$

$\delta = (c, 1) = d$

$\delta = (d, 0) = c$

$\delta = (d, 1) = c$

$V = \{A, B, C, D, E\}$

$A \to 0B$

$B \to 0C$

$B \to 1C$

$B \to ?$

$C \to 0D$

$C \to 1D$

$D \to 0D$

$D \to 1D$

$D \to ?$

$S \to A$

$A \to 0B$

$B \to 0C \mid 1C \mid ?$

$C \to 0D \mid 1D$

$D \to 0C \mid 1C \mid ?$