2.4(c) $S \rightarrow XSX \mid X$

$X \rightarrow$ [illegible] $0 \mid 1$

(f) $S \rightarrow S$

2.6 (b)

$S \to bW \mid aWbaW \mid N$

$W \to aW \mid bW \mid \epsilon$ $\quad \{a,b\}^*$

$N \to aNb \mid A \mid B$ $\quad a^i b^j \quad i \neq j$

$A \to aA \mid a$ $\quad a^k \quad k \geq 1$

$B \to bB \mid b$ $\quad b^k \quad k \geq 1$

2.14

add S_0

$S_0 \rightarrow A$

$A \rightarrow BAB \mid B \mid \epsilon$

$B \rightarrow 00 \mid \epsilon$

eliminate $B \rightarrow \epsilon$

$S_0 \rightarrow A$

$A \rightarrow BAB \mid B \mid \epsilon \mid AB \mid BA \mid A$

$B \rightarrow 00$

can eliminate since $A \rightarrow A$ does nothing

2.14

Eliminate $A \to \epsilon$ (new)

$S_0 \to A \mid \epsilon$

$A \to BAB \mid B \mid AB \mid BA \mid BB$ (new) $\mid \epsilon$

$B \to 00$

Remove $A \to B$

$S_0 \to A \mid \epsilon$

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

$B \to 00$

Remove $S_0 \to A$

$S_0 \to \epsilon \mid BAB \mid AB \mid BA \mid BB \mid 00$

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

$B \to 00$

Convert remaining rules

$S_0 \to \epsilon \mid BC \mid AB \mid BA \mid BB \mid ZZ$

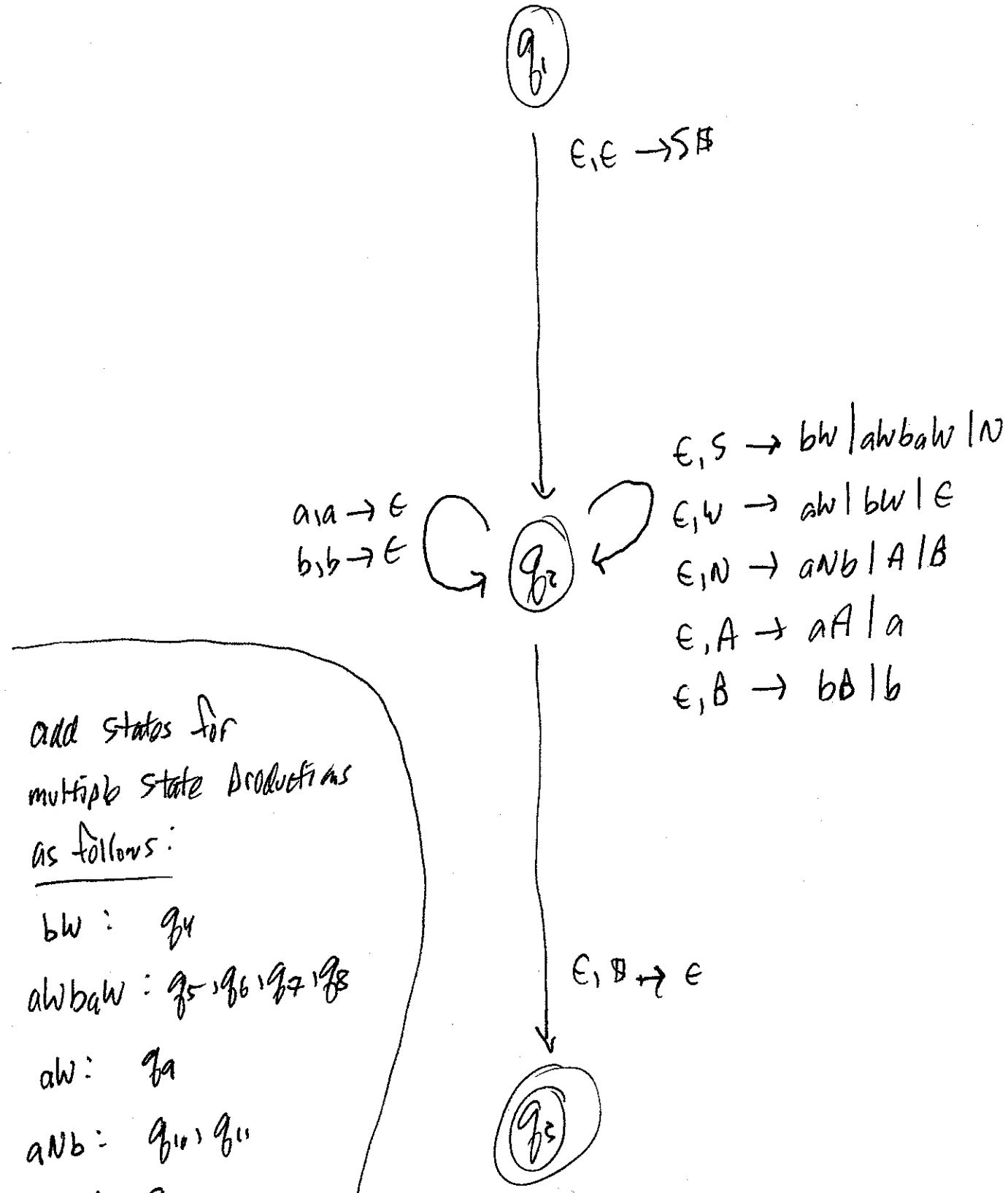
$A \to BC \mid AB \mid BA \mid BB \mid ZZ$

$B \to ZZ$

$C \to AB$

$Z \to 0$

#4



add states for multiple state productions as follows:

bW : q_4

aWbaW : q_5, q_6, q_7, q_8

aW : q_9

aNb : q_{10}, q_{11}

aA : q_{12}

bB : q_{13}

S$: q_{14}

see #6 for example

#5

$$Q = \{q_1, \dots q_{14}\}$$

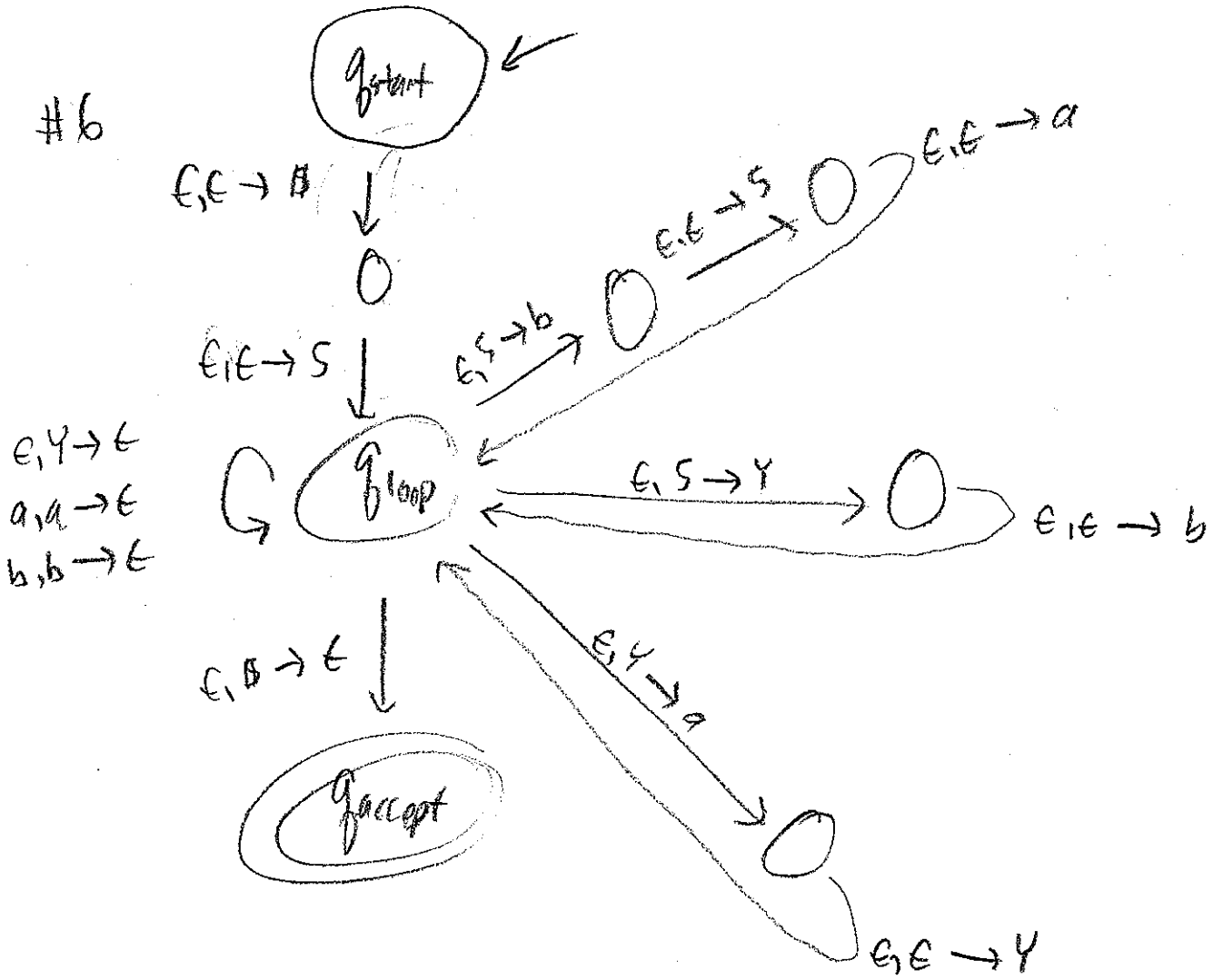
$$\Sigma = \{a, b\}$$

$$\Gamma = \{a, b, \$, S, W, N, A, B\}$$

$$q_0 = q_1$$

$$F = \{q_3\}$$

#6


q_{start}
$\epsilon, \epsilon \to B$
$\epsilon, \epsilon \to S$
q_{loop}
$\epsilon, Y \to \epsilon$
$a, a \to \epsilon$
$b, b \to \epsilon$
$\epsilon, B \to \epsilon$
q_{accept}
$\epsilon, S \to b$
$\epsilon, \epsilon \to S$
$\epsilon, \epsilon \to a$
$\epsilon, S \to Y$
$\epsilon, \epsilon \to b$
$\epsilon, Y \to a$
$\epsilon, \epsilon \to Y$