Q1

I pledge my honor that I have neither given nor received aid on this exam.

Aaron Steig

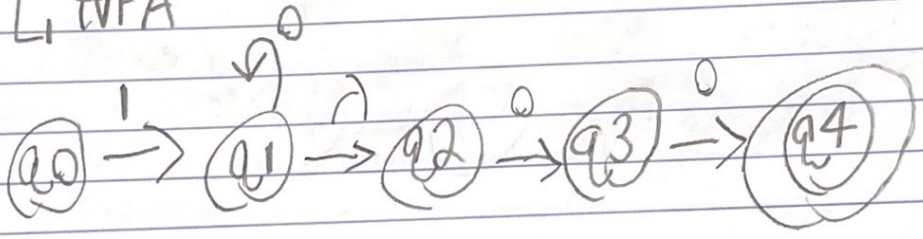
Q2

$L = 1(0^*)00 \cup (00)^*$

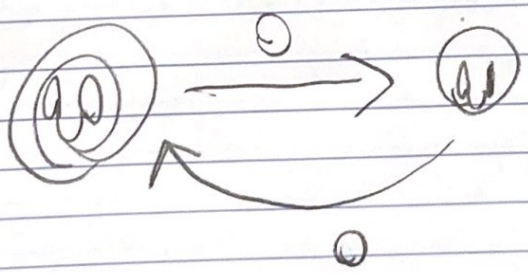
$L_1 = 1(0^*)00$

$L_2 = (11)^*$

L_1 NFA



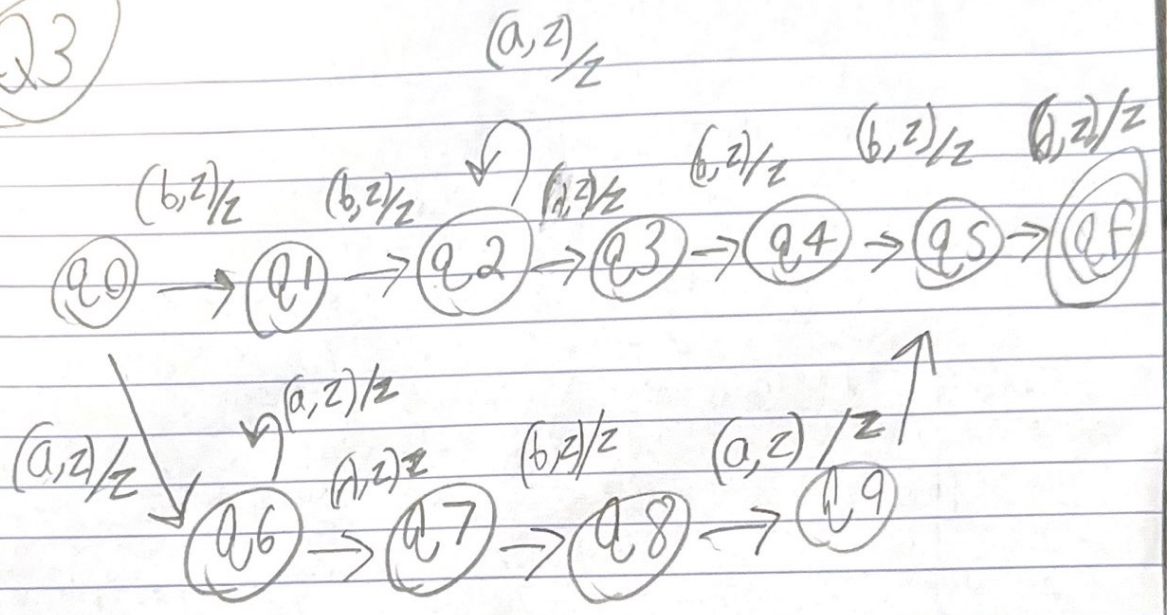
L_2 NFA



Since we were able to create NFA's for both languages of L_1 and L_2, they are both regular. confirmed by theorem 2.2 as closed under union operation

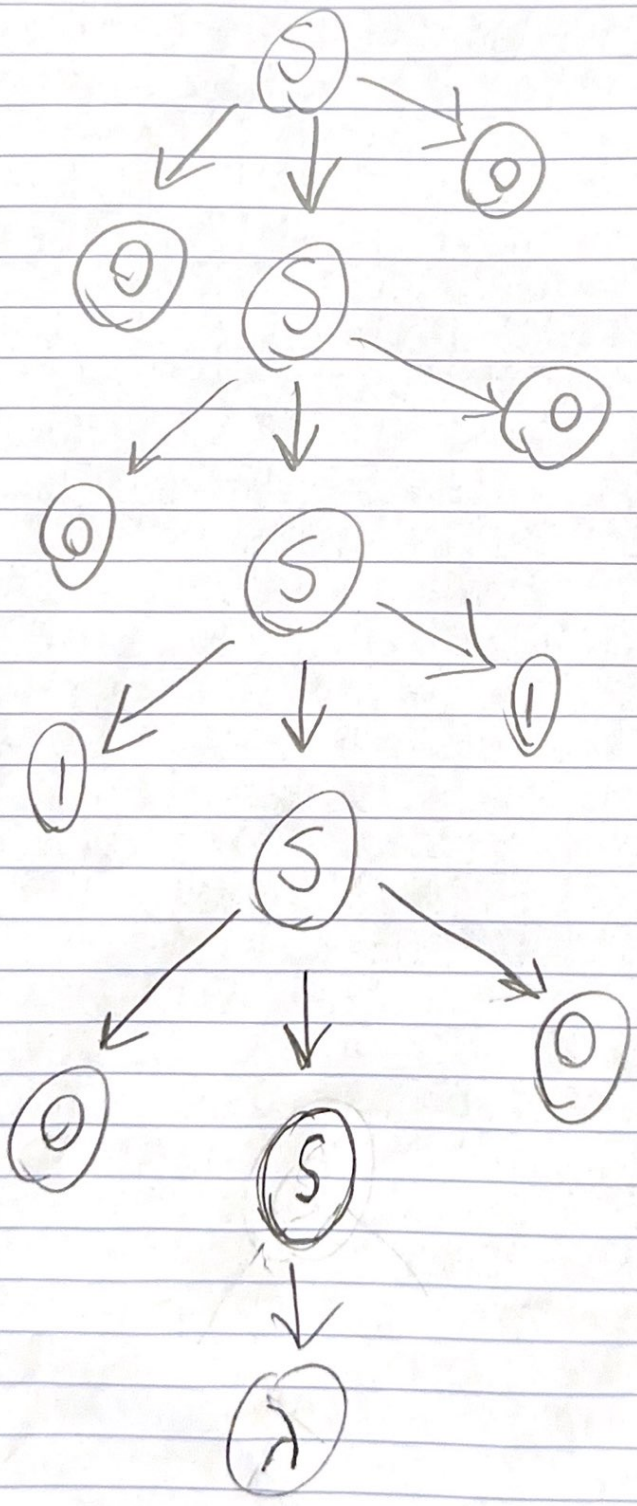
$L = L_1 \cup L_2$

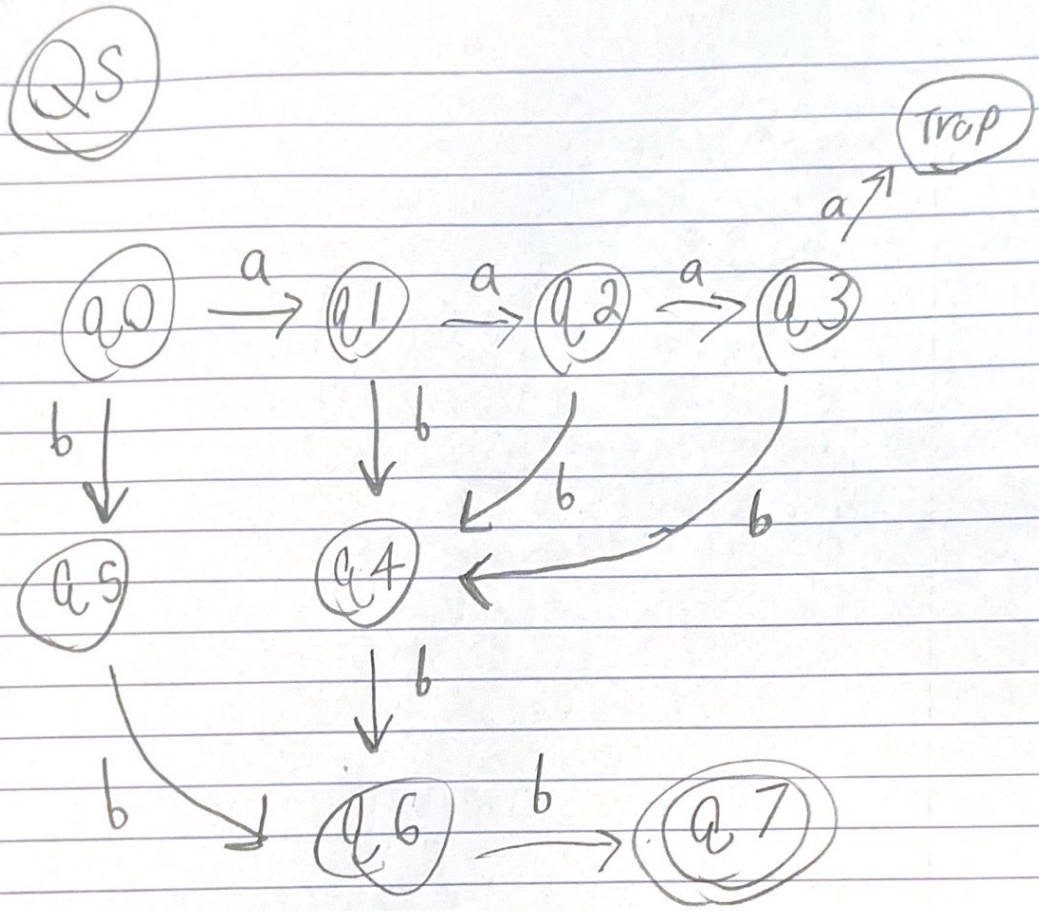
Q3


(a,z)/z
(b,z)/z
(b,z)/z
(a,z)/z
(b,z)/z
(b,z)/z
(b,z)/z
q0
q1
q2
q3
q4
q5
qf
(a,z)/z
(a,z)/z
(a,z)/z
(b,z)/z
(a,z)/z
q6
q7
q8
q9

Q4

00100100




Qs
Trap
a
q0
a
q1
a
q2
a
q3
b
b
b
b
q5
q4
b
b
q6
b
q7

Q6

① eliminate Start Symbol from RHS

$S0 \rightarrow S$
$S \rightarrow AB \mid aB$
$A \rightarrow aaab \mid \lambda$
$B \rightarrow aaaA$

② eliminate λ production

$S0 \rightarrow S$
$S \rightarrow AB \mid aB \mid B$
$A \rightarrow aaab$
$B \rightarrow aaaA$

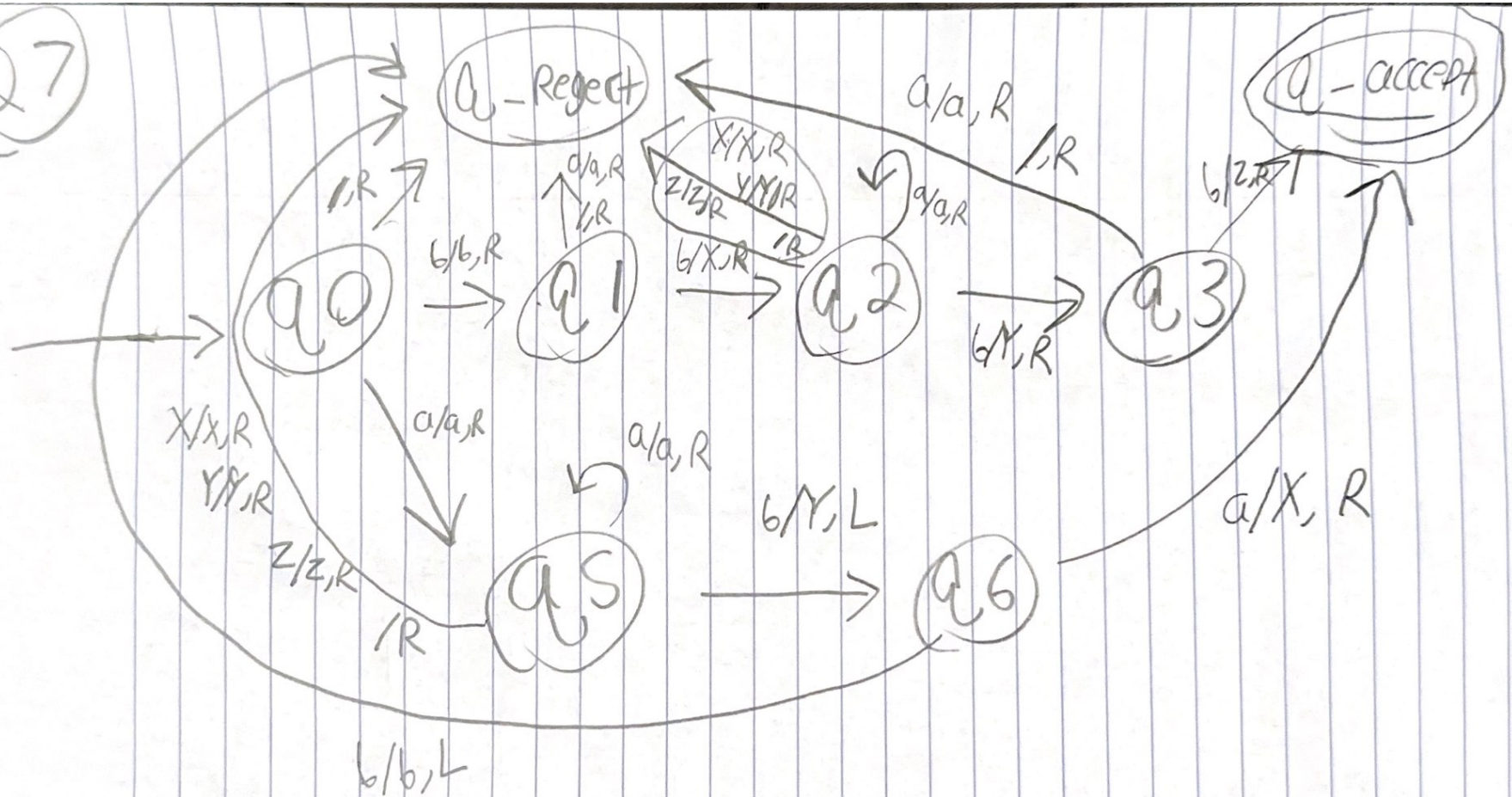
③ eliminate unit production

$S0 \rightarrow AB \mid aB \mid B$
$S \rightarrow AB \mid aB$
$A \rightarrow aaab$
$B \rightarrow aaaA$

let $U \rightarrow a$, $V \rightarrow aU$, $W \rightarrow aV$

$S0 \rightarrow AB \mid UB \mid B$
$S \rightarrow AB \mid UB$
$A \rightarrow WYU$
$B \rightarrow WUA$
$U \rightarrow a$
$V \rightarrow aU$
$W \rightarrow aV$

Q7


q_Reject
q_accept
q0
q1
q2
q3
q5
q6
a/a,R
1/R
X/X,R
Y/Y,R
Z/Z,R
b/b,R
b/X,R
b/Y,R
b/Z,R
a/X,R
b/Y,L
b/b,L