Q4-(a)

TOA Assignment

Q4.

(a) $S \rightarrow abS \mid a$

strings: a, abS, ababS, ababaS, abababa

$L = (ab)^* a$

(b) $S \rightarrow aSb \mid \lambda$

strings: ab, aSb, aaSbb, ...

$L = a^n b^n$

(c) $x = 2y$, $a^x b^y$

strings → aab , aaaabb

aaaaaabbb

$S \rightarrow aaSb \mid \lambda$

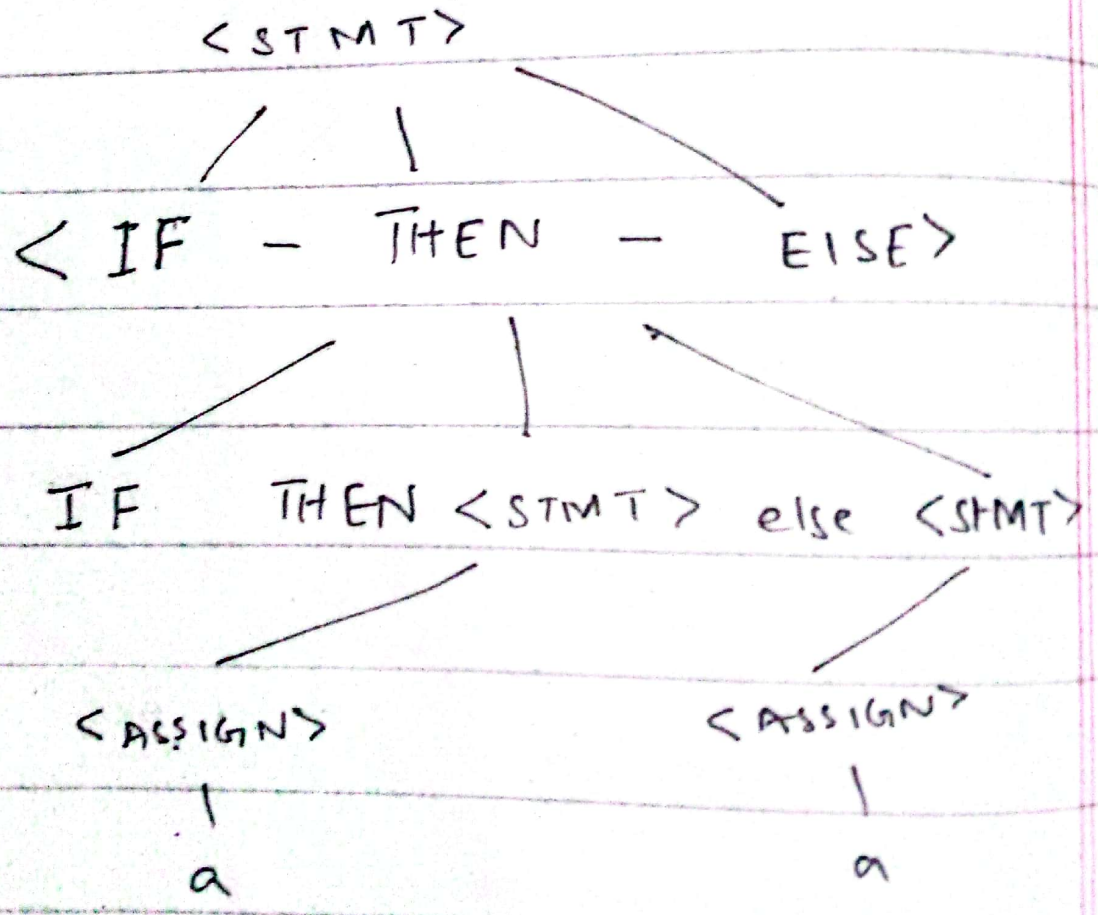
(d) $a^x b^y a^z$, $z = x + 2y$

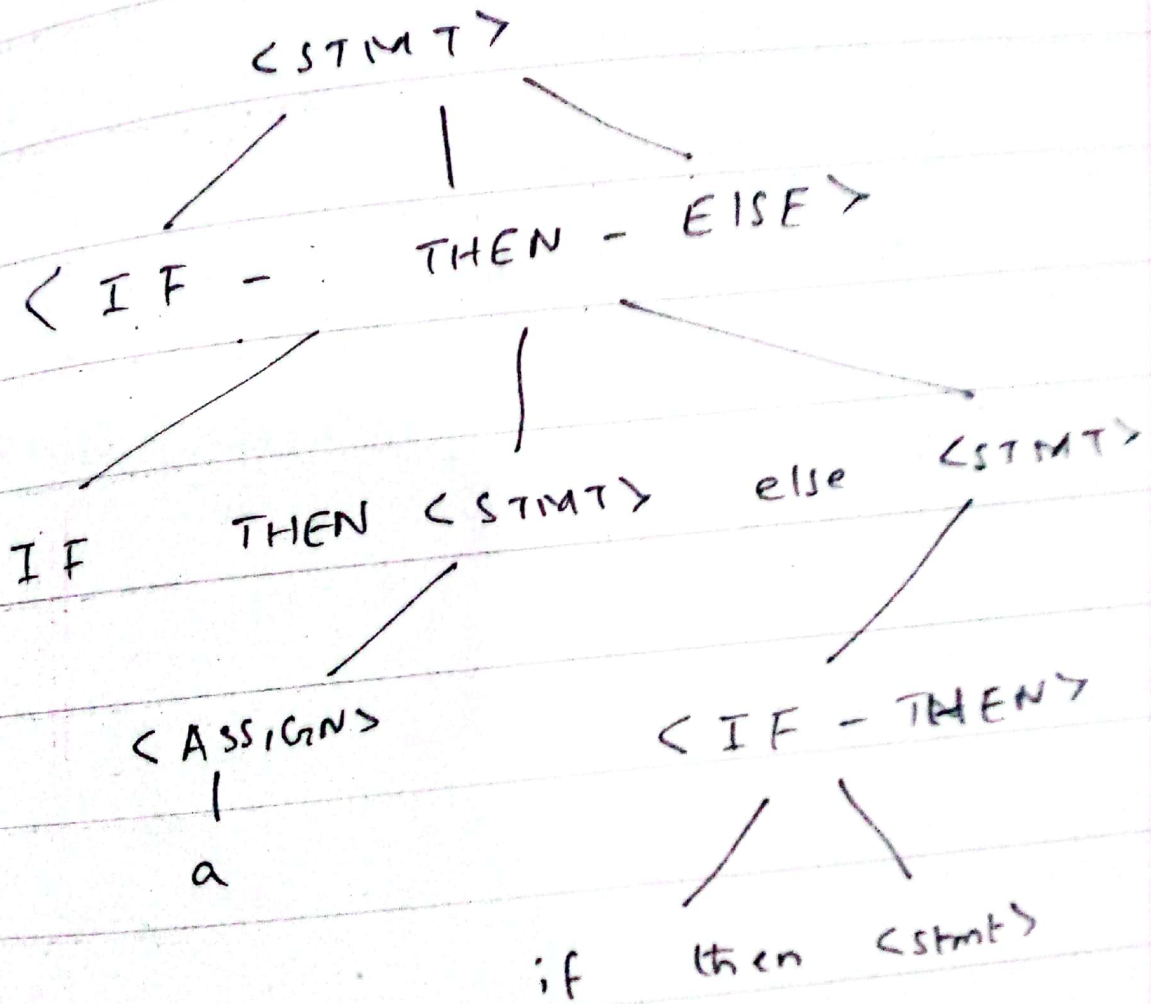
strings → abaaa ,

abbaaaaa → $x=1, y=2$ $z=5$

$S \rightarrow a \mid bbS \mid aSb$

Q1.





→ Two derivation of same tree

so, G is ambiguous ~~ambigoes~~.

Q2. CFG → CNF

(a) A → BAB | B | λ

B → 00 | λ

Simplify →

→ A → BAB | B | λ | A

B → 00

→ A → ~~BAB~~ | ~~B~~ | λ | ~~A~~ | 00A00 | 00

A → 00 | 00A00 | λ

→ A → 00A00 | 00 | 0000

TO CNF

→ $A \rightarrow T_a T_a A\ T_a T_a \mid T_a T_a \mid T_a T_a T_a T_a$

$T_a \rightarrow 0$

$A \rightarrow T_a V_a \mid T_a T_a \mid T_a V_b$

$V_a \rightarrow T_a A\ T_a T_a$

$V_b \rightarrow T_a T_a\ T_a$

$T_a \rightarrow 0$

$A \rightarrow T_a V_a \mid T_a T_a \mid T_a V_b$

$V_a \rightarrow T_a V_c$

$V_b \rightarrow T_a V_{d1}$

$T_a \rightarrow 0$

$V_c \rightarrow A$ [redacted] V_d

$V_{d1} \rightarrow T_a T_a$

(b) $S \rightarrow Xa$

$B \rightarrow aX \mid bX \mid \lambda$

→ B is a useless production

$S \rightarrow Xa$

→ X is undefined

$S \rightarrow a$

(c) $S \rightarrow aSa \mid bSb \mid b \mid a \mid aa \mid bb$

$S \rightarrow T_aST_a \mid T_bST_b \mid \overset{b}{T_b} \mid \overset{a}{T_a} \mid T_aT_a \mid T_bT_b$

$T_a \rightarrow a$

$T_b \rightarrow b$

$S \rightarrow T_aV_a \mid T_bV_b \mid b \mid a \mid T_aT_a \mid T_bT_b$

$V_a \rightarrow ST_a$

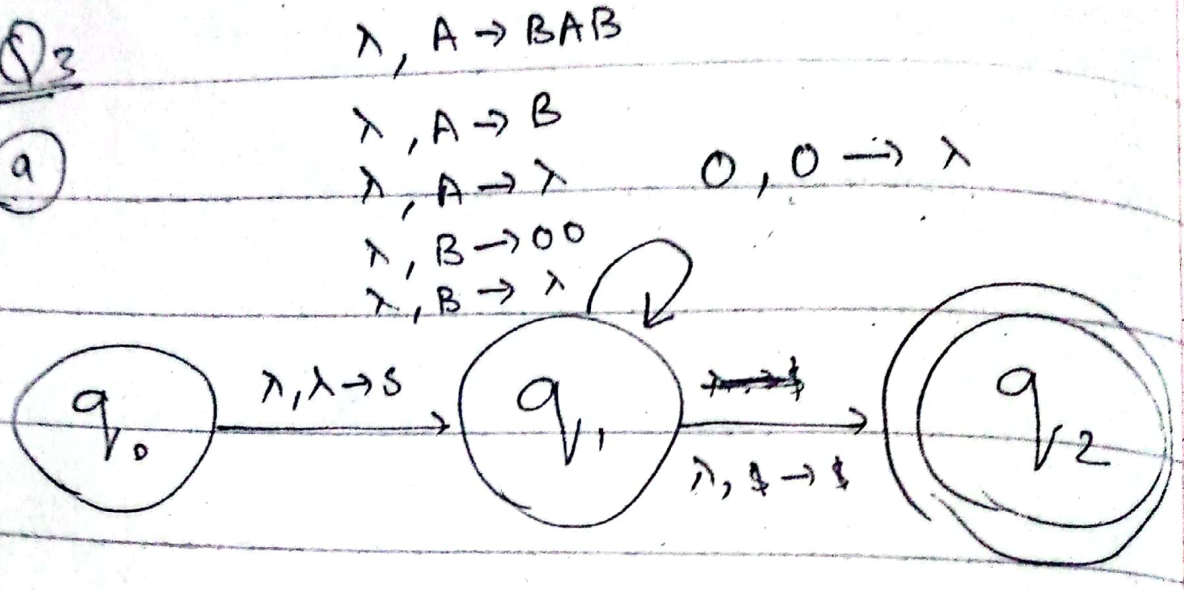
$V_b \rightarrow ST_b$

$T_a \rightarrow a$

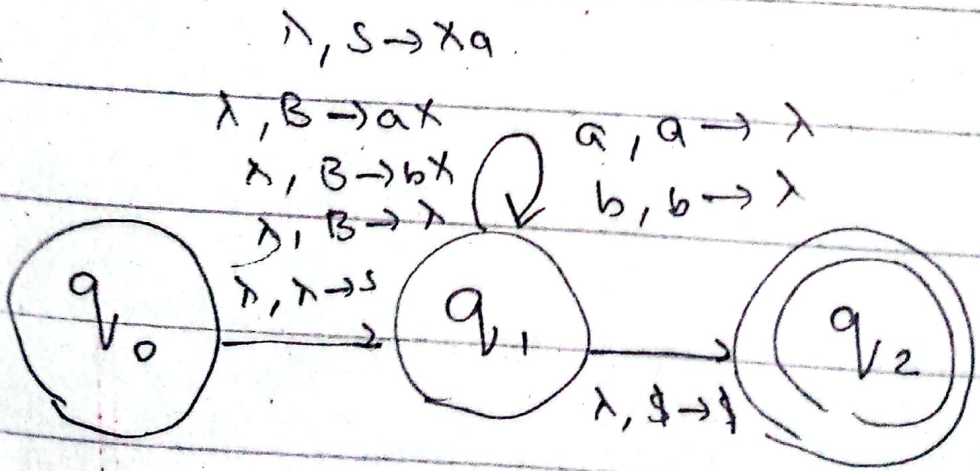
$T_b \rightarrow b$

Q3

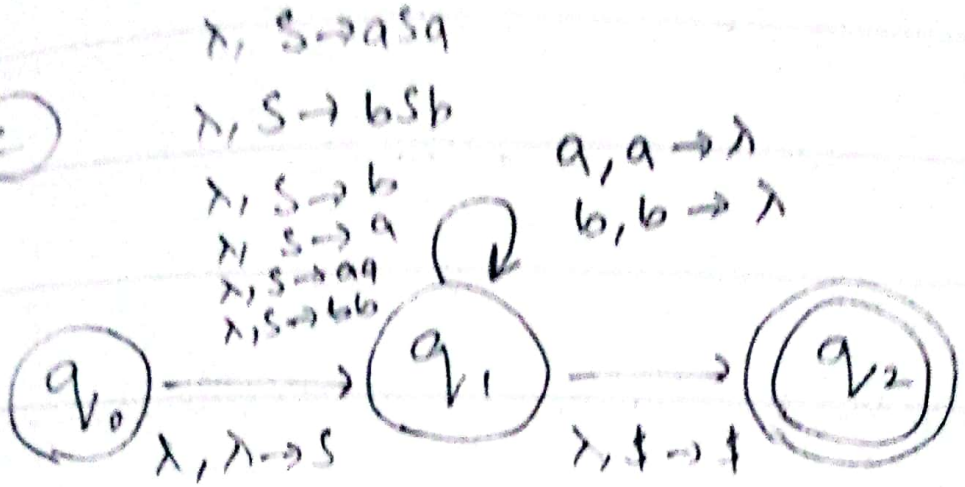
(a)


λ, A → BAB
λ, A → B
λ, A → λ
λ, B → 00
λ, B → λ
0, 0 → λ
λ, λ → S
λ, $ → $
q0
q1
q2

(b)


λ, S → Xa
λ, B → aX
λ, B → bX
λ, B → λ
a, a → λ
b, b → λ
λ, λ → S
λ, $ → $
q0
q1
q2

(c)



Qs $A = \{ w : w \in \{a, b\}^*, \ w \leq 3a's \}$

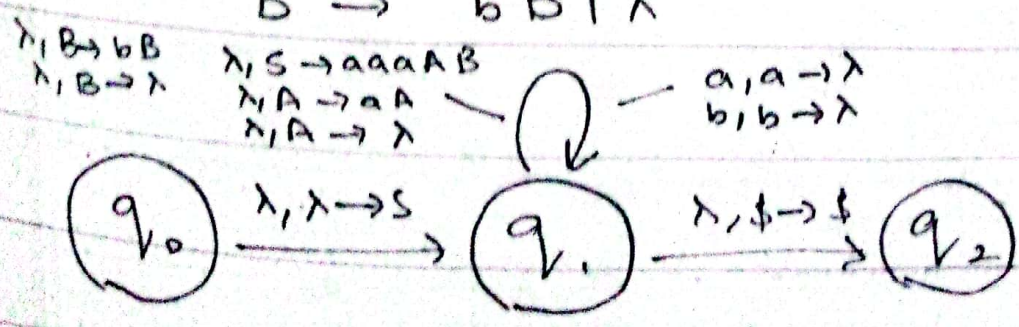
Strings → aaa, aaaab, aaaabb

$L = aaaa^n b^m$

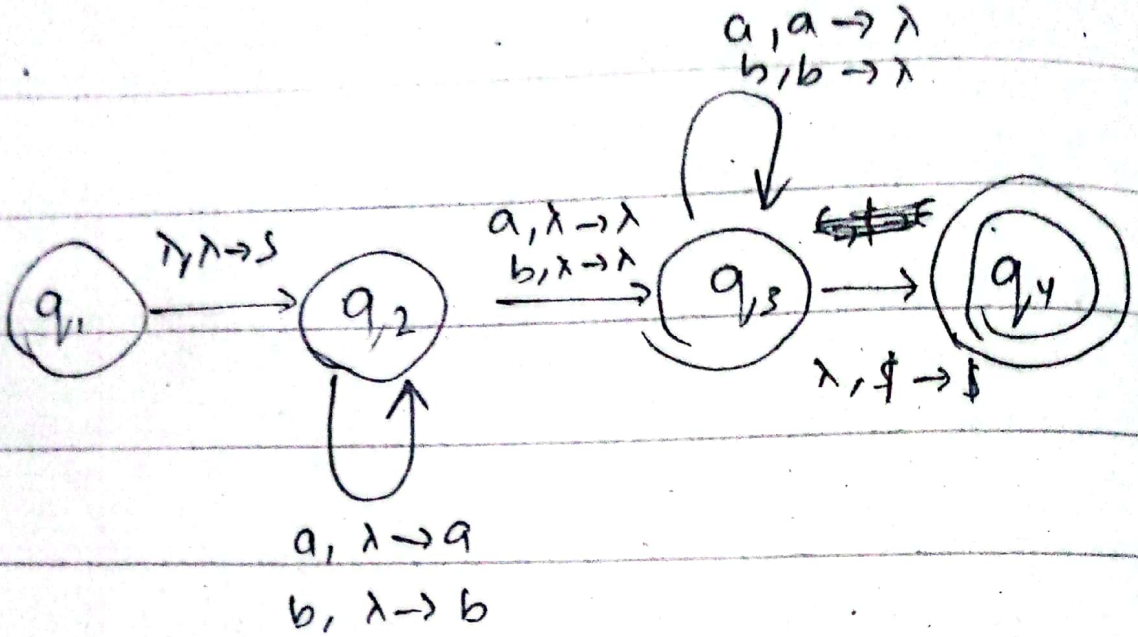
$S \rightarrow aaaAB$

$A \rightarrow aA \mid \lambda$

$B \rightarrow bB \mid \lambda$

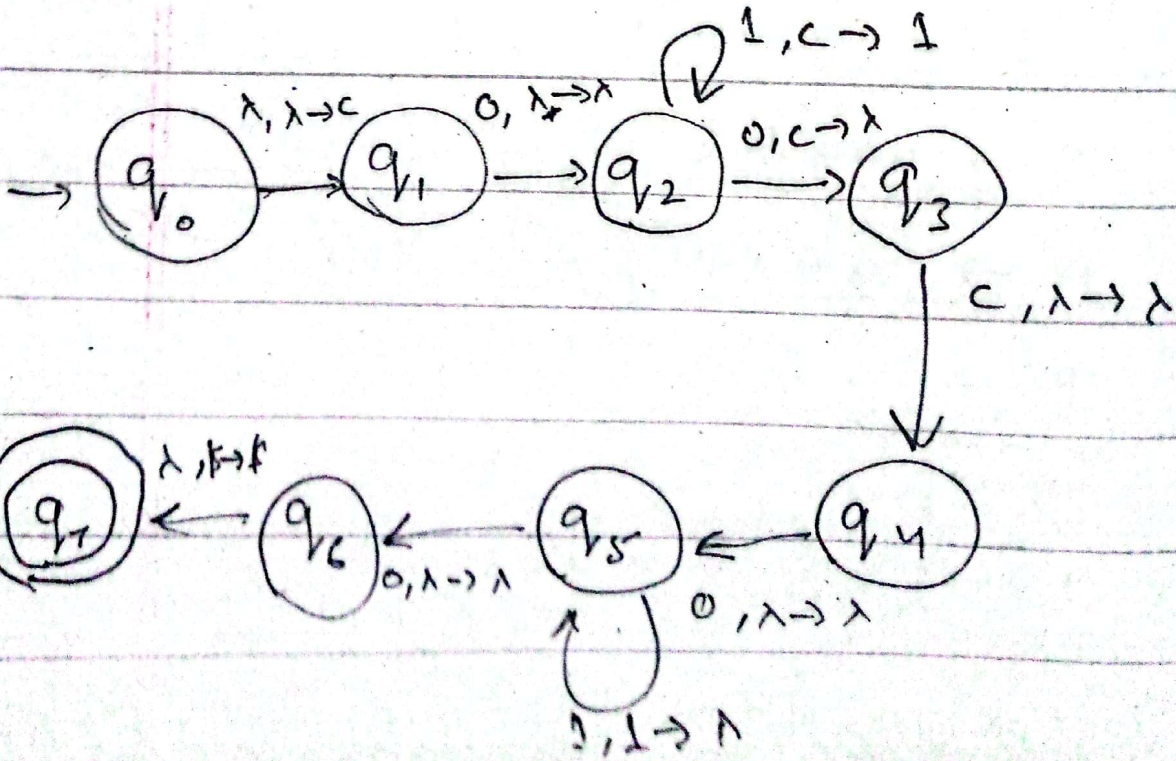


Q6.



Q7

$$L = \{ 0 1^n 0 c 0 1^m 0 \} \quad c \geq 0$$

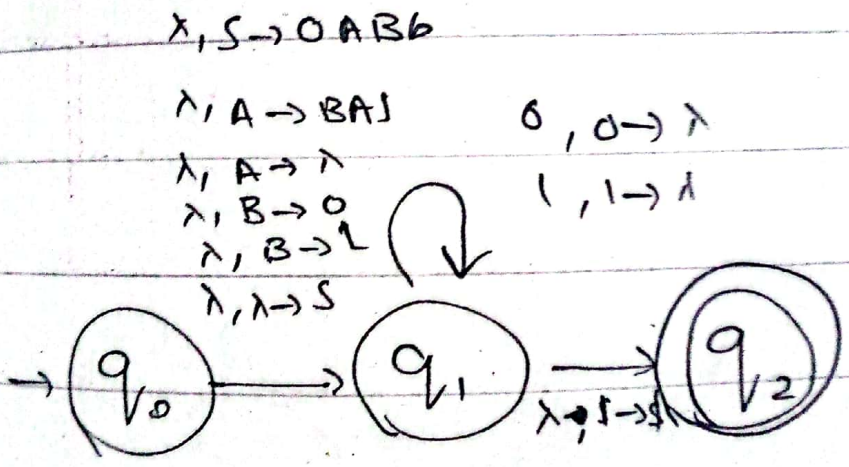


Q8

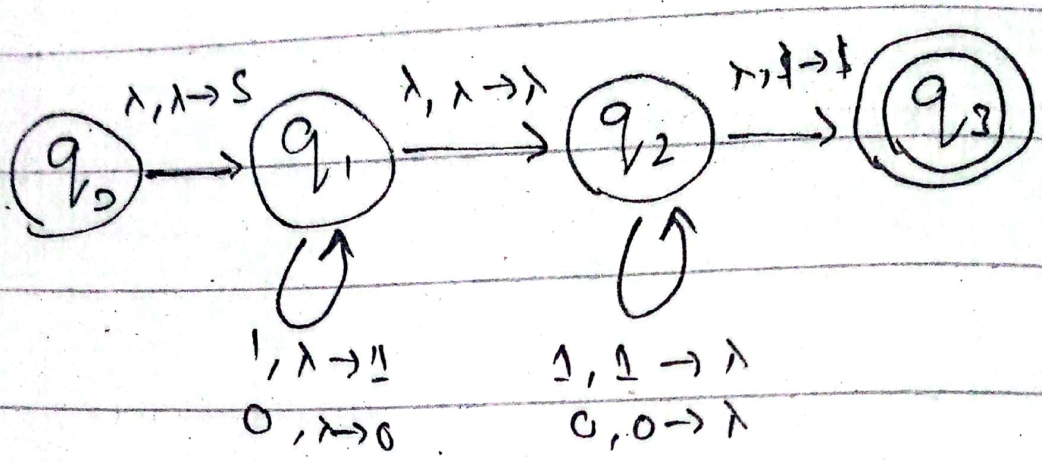
$S \rightarrow 0AB6$

$A \rightarrow BAS \mid \lambda$

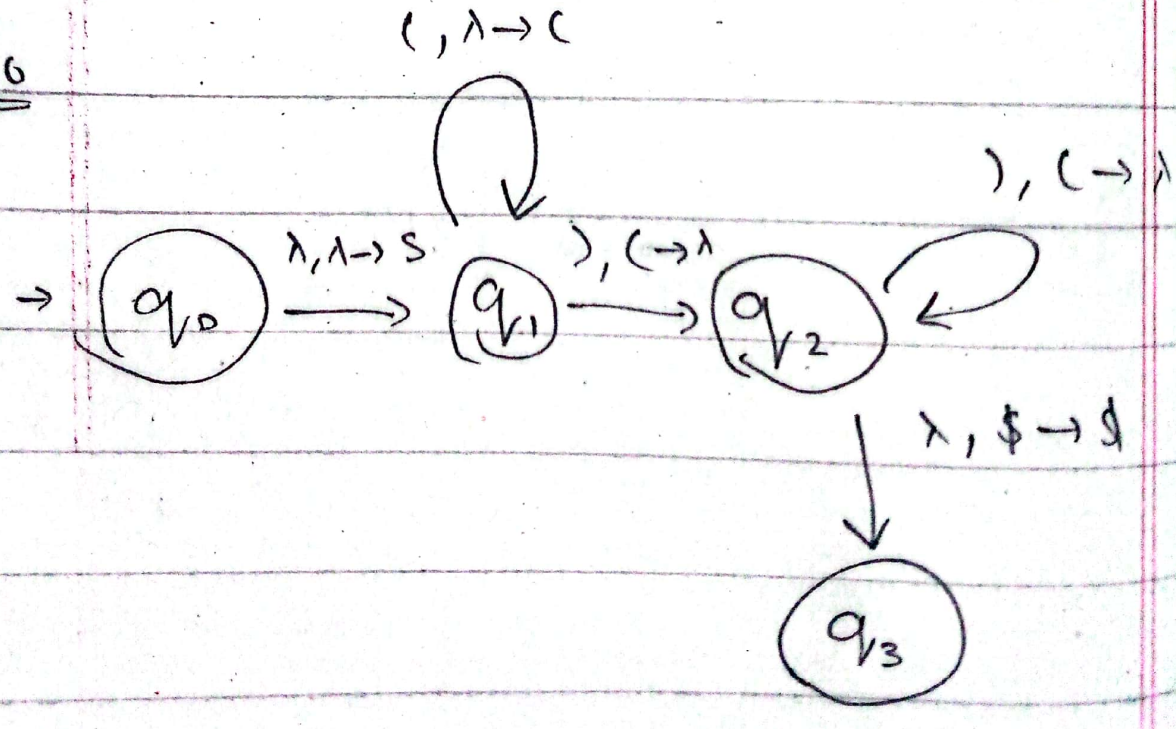
$B \rightarrow 01 \mid 1$



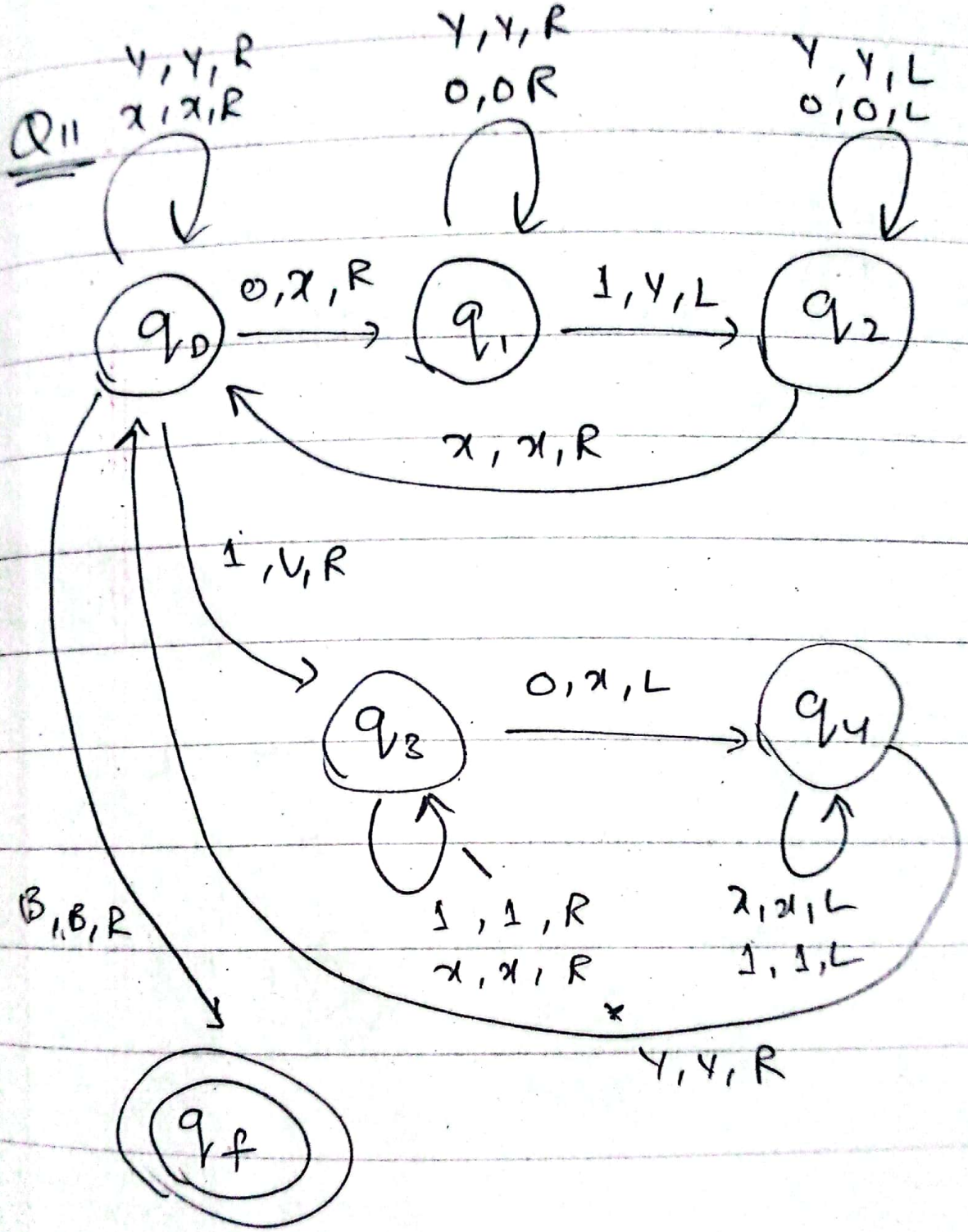
Q9



Q10



Q11


Y, Y, R
X, X, R
Y, Y, R
0, 0 R
Y, Y, L
0, 0, L
q_0
0, X, R
q_1
1, Y, L
q_2
X, X, R
1, Y, R
q_3
0, X, L
q_4
1, 1, R
X, X, R
X, X, L
1, 1, L
B, B, R
Y, Y, R
q_f

Q13

(a)