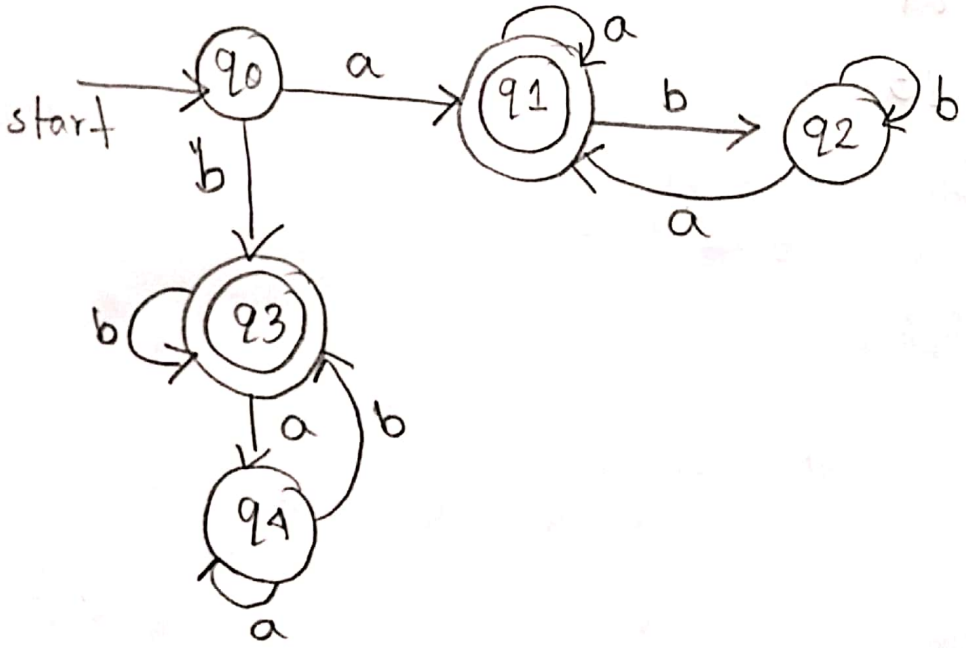
Q.1

a) The process of reducing a given DFA to its minimal form is called as minimization of DFA. It contains minimum number of states.

b) L = { starts and ends with same symbol }.
= { aa, aba, abbaba, bb, baab, ... }



Q - { q0, q1, q2, q3, q4 }

Σ → { a, b }.

q0 → { q0 }

F → { q1, q3 }

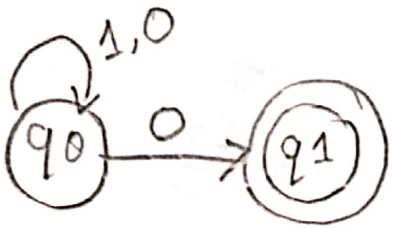
6- transition table.

$q0, a \rightarrow q1$
$q0, b \rightarrow q3$
$q1, a \rightarrow q1$
$q1, b \rightarrow q2$
$q2, a \rightarrow q1$
$q2, b \rightarrow q2$
$q3, a \rightarrow q4$
$q3, b \rightarrow q3$
$q4, a \rightarrow q4$
$q4, b \rightarrow q3$.

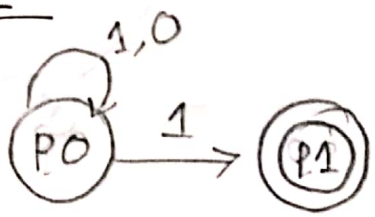
2

c) R1 for even numbers (the last no. must be zero)
R2 for odd numbers. (last no. must be 1)

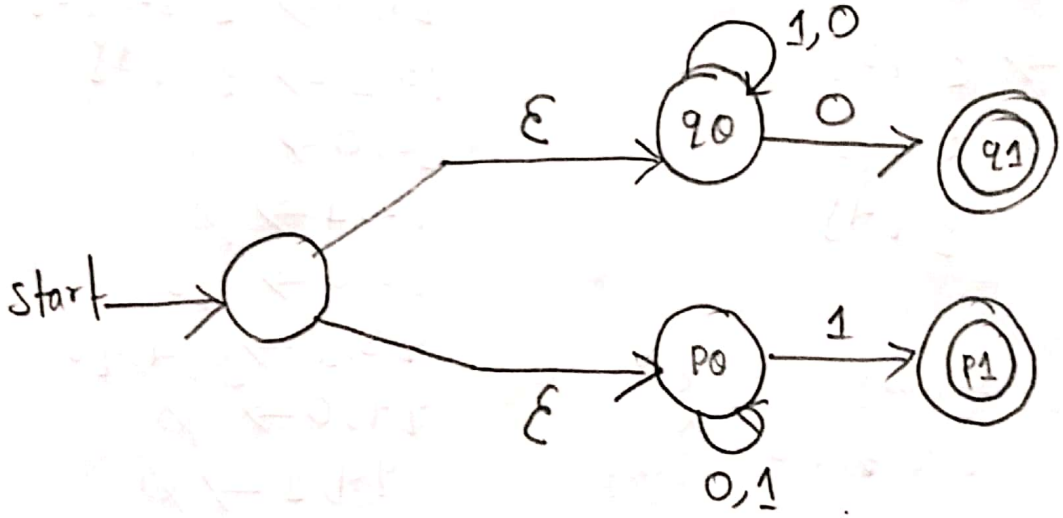
R1



R2



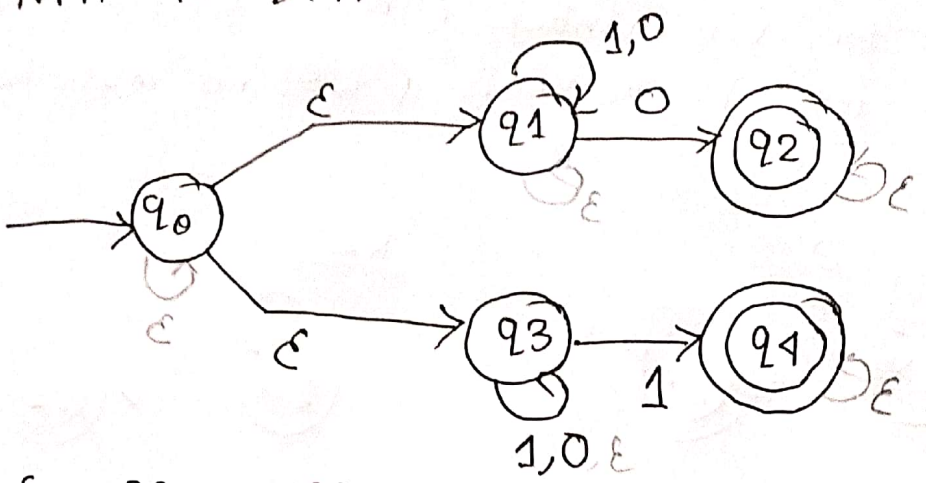
RE = R1 | R2



2. a) RE = $(0+1)^*0$

b) RE = $(0+1)^+1$

d) NFA to DFA.



first ε NFA → NFA.

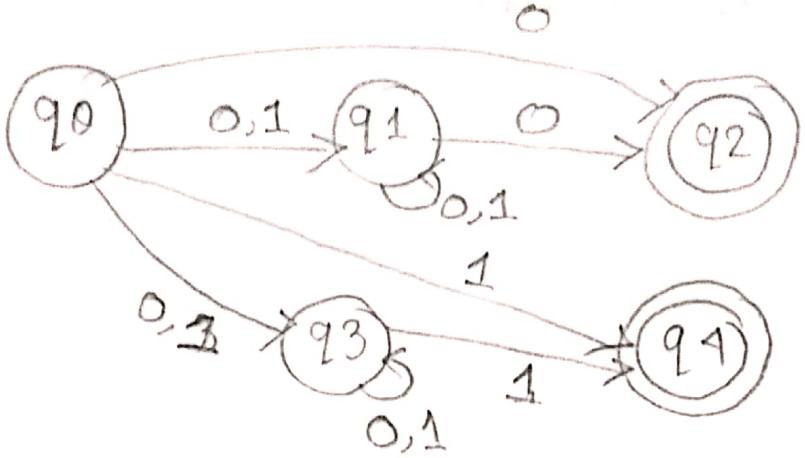
ε closure

ε* of q0 → {q0, q1, q3}
ε* of q1 → {q1}
ε* of q2 → {q2}
ε* of q3 → {q3}
ε* of q4 → {q4}

q0,0 → {q2, q1, q3}
q0,1 → {q3, q4, q1}
q1,0 → {q2, q1}
q1,1 → {q1}
q2,0 → {∅}
q2,1 → ∅
q3,0 → q3
q3,1 → {q4, q3}
q1,0 → ∅
q4,1 → ∅

states	ε*	symbol	ε*
q0,0	q0	{q2, q1}	x
	q1		q2, q1
	q3	{q3}	q3
q0,1	q0	{q1}	x
	q1		q1
	q3	{q3, q4}	q3, q4
q0,0	q1	{q2, q1}	q2, q1
q1,1	q1	{q1}	q1
q2,0	q2	∅	x
q2,1	q2	∅	x
q3,0	q3	q3	q3
q3,1	q3	q4, q3	q4, q3
q4,0	q4	∅	x
q4,1	q1	∅	x

→ NFA

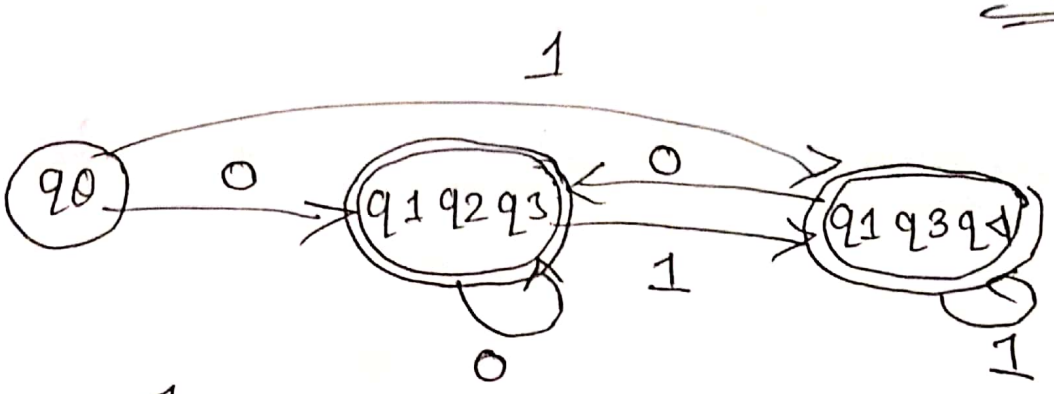


Transition table for NFA

states	0	1
q0	{q2, q1, q3}	{q1, q4, q3}
q1	{q1, q2}	{q1}
q2	{∅}	{∅}
q3	{q3,}	{q3, q4}
q4	{∅}	{∅}.

DFA

states	0	1
q0	[q1 q2 q3]	[q1 q3 q4]
[q1 q2 q3]	[q1, q2, q3]	[q1, q3 q4]
[q1, q3 q4]	[q1 q2 q3]	[q3 q4]



DFA ↗

2. e) Minimize –

		final	non-final
0	equivlent	[q1q2q3, q1q3q4]	[q0]
1	"	[q1q2q3, q1q3q4]	[q0].
2	"		

no minimization.

q1

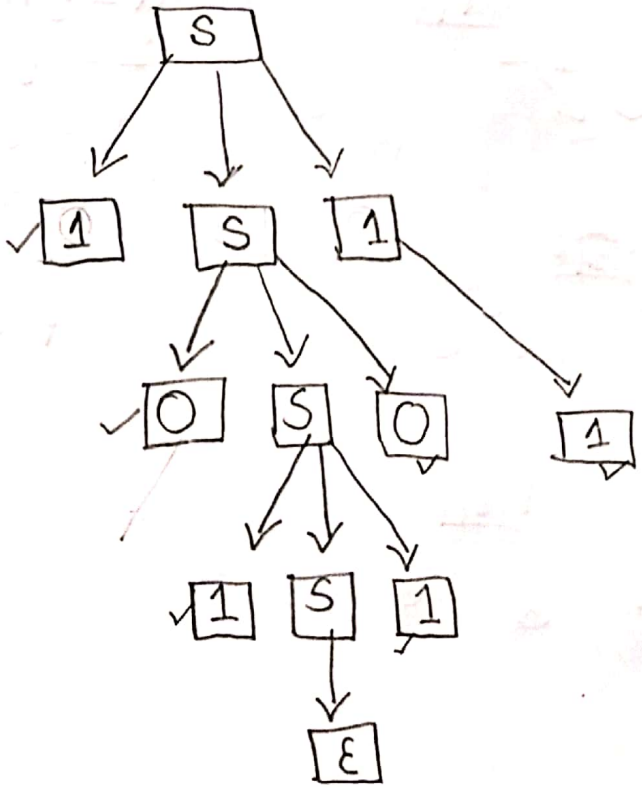
Q3

a) A PDA can only access the top of its stack, whereas TM can access any position on an infinite tape. The infinite tape cannot be simulated with a single stack, so a PDA is less powerful. ~~There or the another difference is the~~

b) $S \rightarrow 0S0 \mid 1S1 \mid \varepsilon$

for string 101101 :

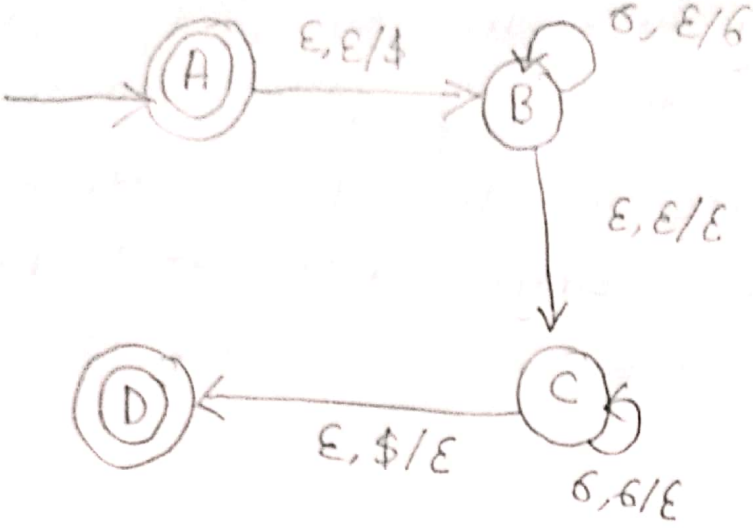
$S \rightarrow 0S0$
$S \rightarrow 1S1$
$S \rightarrow \varepsilon$



Pg- 8

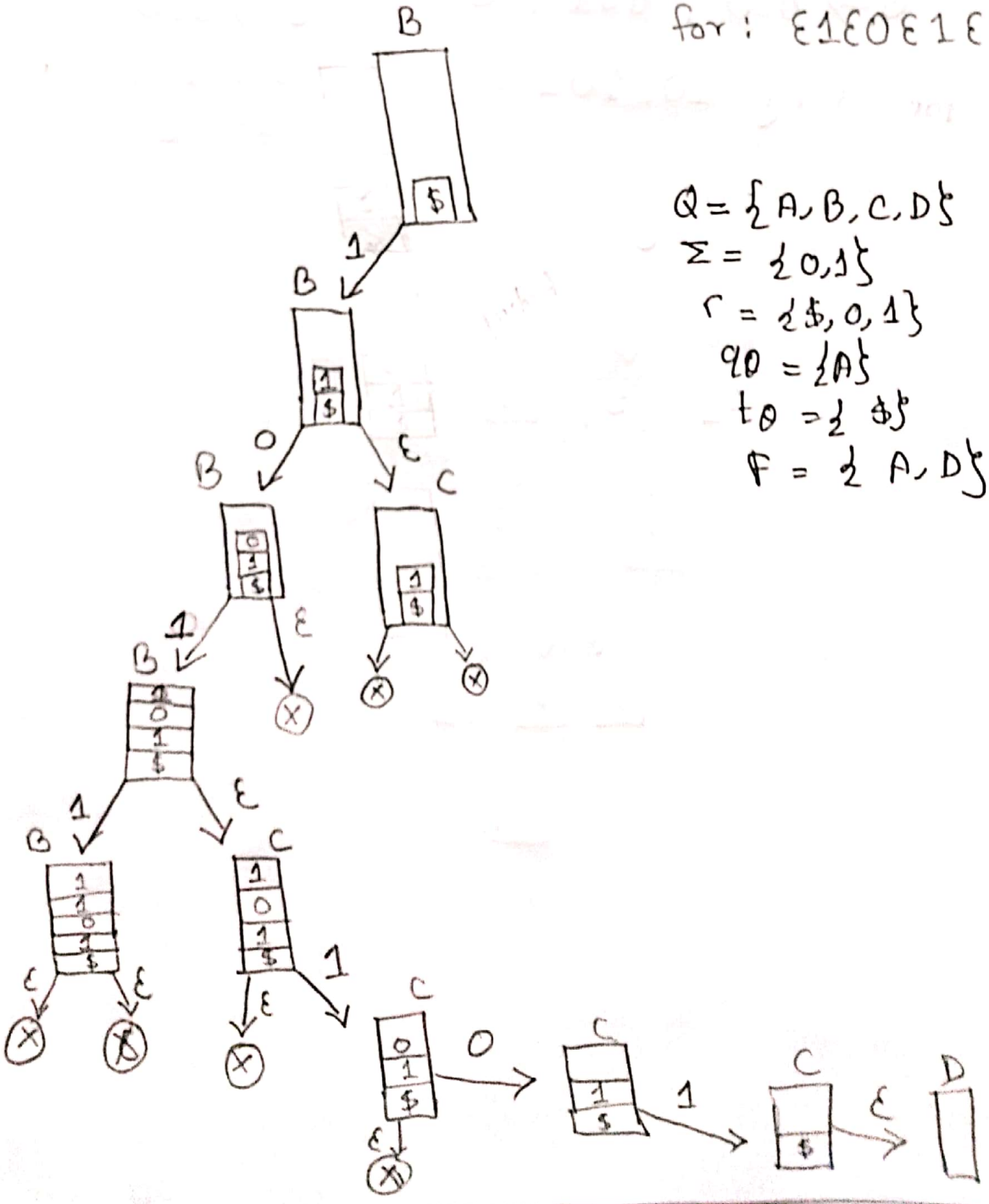
c)

for: 101101



for: ε1ε0ε1ε1ε0ε1

$Q = \{A, B, C, D\}$
$\Sigma = \{0, 1\}$
$\Gamma = \{\$, 0, 1\}$
$q_0 = \{A\}$
$t_0 = \{\$\}$
$F = \{A, D\}$.



Q.4

a) If the binary number is 100111, so ~~to~~ 1st start from the rightmost digit.
~~If the digit is 1 flip it unit found 0.~~
If the digit is 0, flip it ~~make it 0~~ and move left and halt.
If the digit is 1, flip it and move to the digit ≠ on the left.

b) for: 100111 → 101000