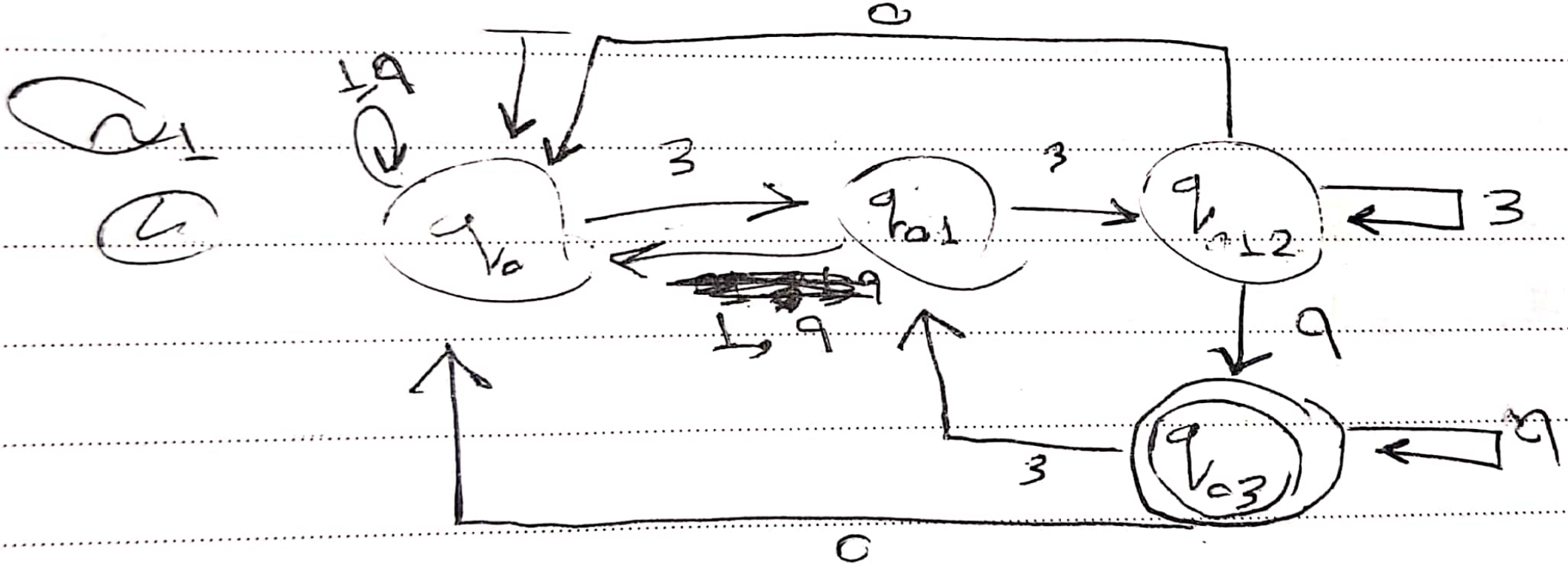
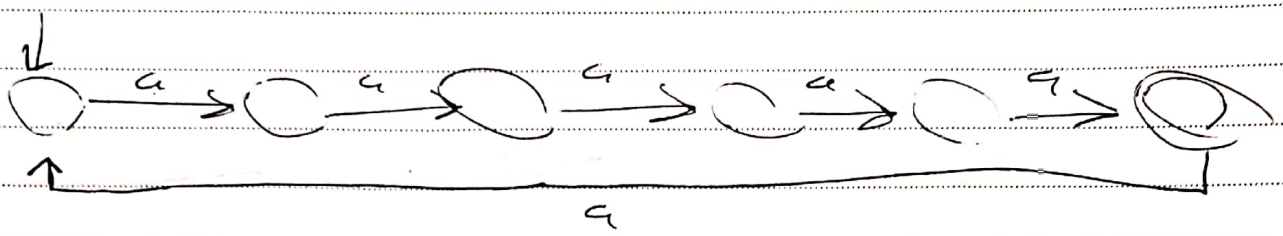
Mohand Al Rasheed 439101298

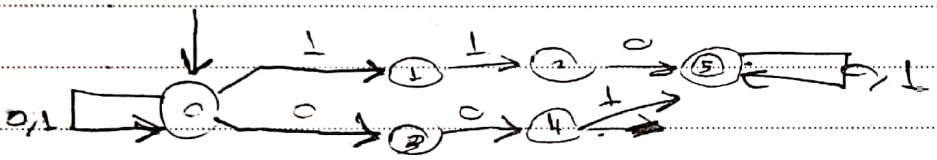


C_1 b

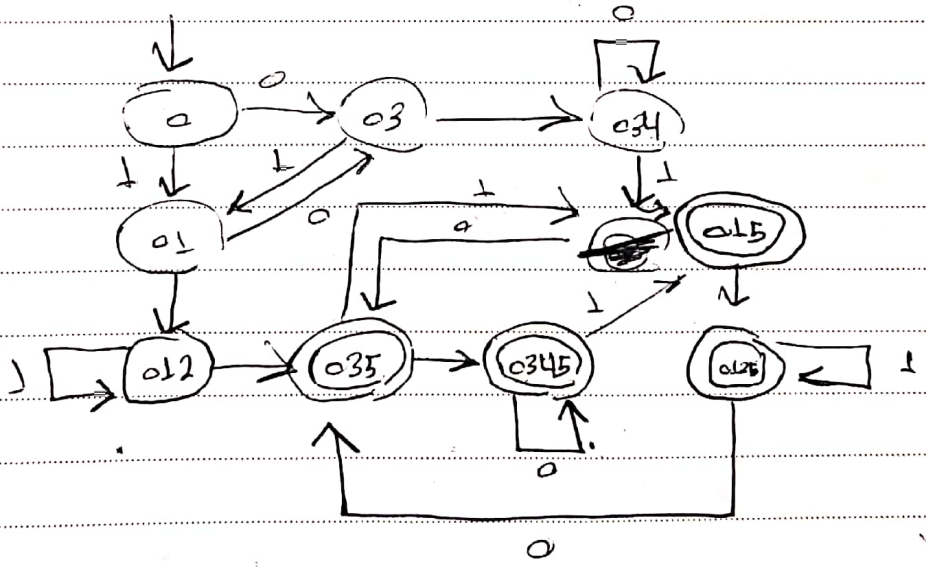


C_2 ε

NFA then to DFA

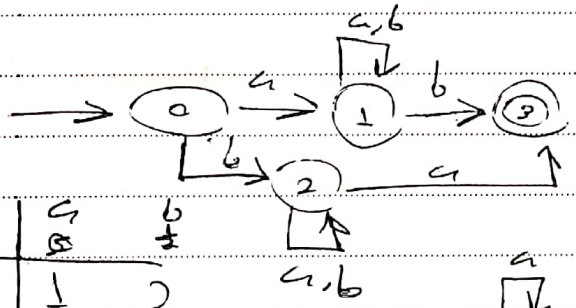


	0	1
0	03	01
03	034	01
01	03	012
034	034	015
012	035	012
015	025	0125
035	0345	015
0125	035	0125
0345	0345	015

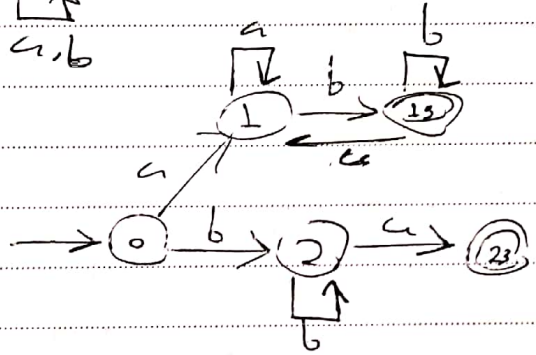


Q1 d

NFA then to DFA



	a	b
	✓	✓
0	1	2
1	1	13
2	23	2
13	~~1~~	~~13~~
23	23	2



Q2

1. $(\Sigma^* a \Sigma^* a \Sigma^* a) \cup (\Sigma^* b \Sigma^* b \Sigma^*)$
2. $\Sigma (\Sigma\Sigma)^* aba$
3. $(a \Sigma^* b) \cup (b \Sigma^* a)$
4. $(a \Sigma^* b) \cup (a) \cup (b \Sigma^* b) \cup (b)$
5. $(aa) \cup (bb)$ ~~Σ^*~~

Q3

(1) Palindrom Strings ww^R with the left half appended at the end → wwR_w

(Note: ε is a part of the language Since $w \in \Sigma^*$)

(2) Assume language L is regular

Choose S = "ab ba ab" $P = 3$
x | y | z

Pump → pumped S = "abb abb aab"
w | $\neq w^R$

Since w = "abb", but $w^R \neq$ "abb"
then pumped $S \notin L$

→ Language L is not regular

Q4

(1) $S \rightarrow XcXcXcX$
$X \rightarrow a \mid b \mid c \mid \varepsilon$

(2) ~~$S \rightarrow XbX \mid \ldots$~~
~~$X \rightarrow Xa \mid Xb \mid Xc \mid \varepsilon$~~
$S \rightarrow b \mid XSX$
$X \rightarrow a \mid b$

Q4

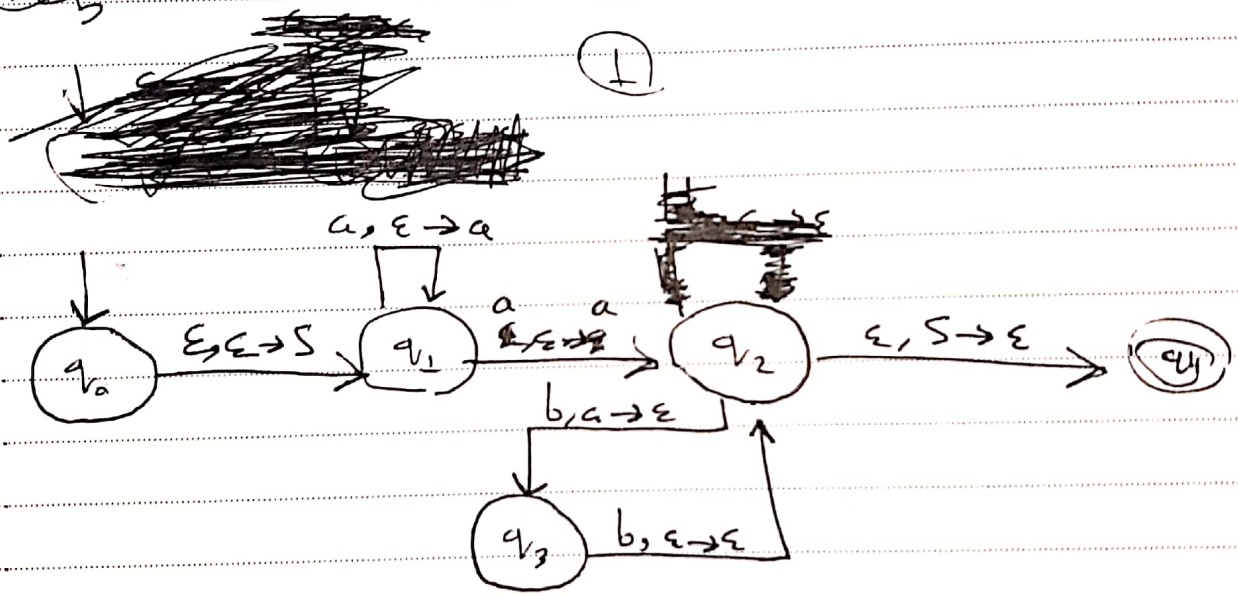
③ $S \rightarrow XcbX$

$X \rightarrow Xc \mid Xb \mid Xc \mid \varepsilon$

④ $S \rightarrow$ [redacted] $SXaXaXS \mid \varepsilon X$

$X \rightarrow bX \mid cX \mid \varepsilon$

Q5



② $Q = \{q_k \text{ for } k \in \{0, 1, 2, 3, 4\}\}$

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

$\Gamma = \{a, S\}$

$q_0 = q_0$

F [redacted] $\in \{q_4\}$

Start State, Read, Peak, End State, Push

$\delta = \{ (q_0, \varepsilon, \varepsilon) \rightarrow (q_1, S),\ (q_1, a, \varepsilon) \rightarrow (q_1, a),$

$(q_1, a, \varepsilon) \rightarrow (q_2, a),\ (q_2, b, a) \rightarrow (q_3, \varepsilon),$

$(q_3, b, \varepsilon) \rightarrow (q_2, \varepsilon),\ (q_2, \varepsilon, S) \rightarrow (q_4, \varepsilon)$

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