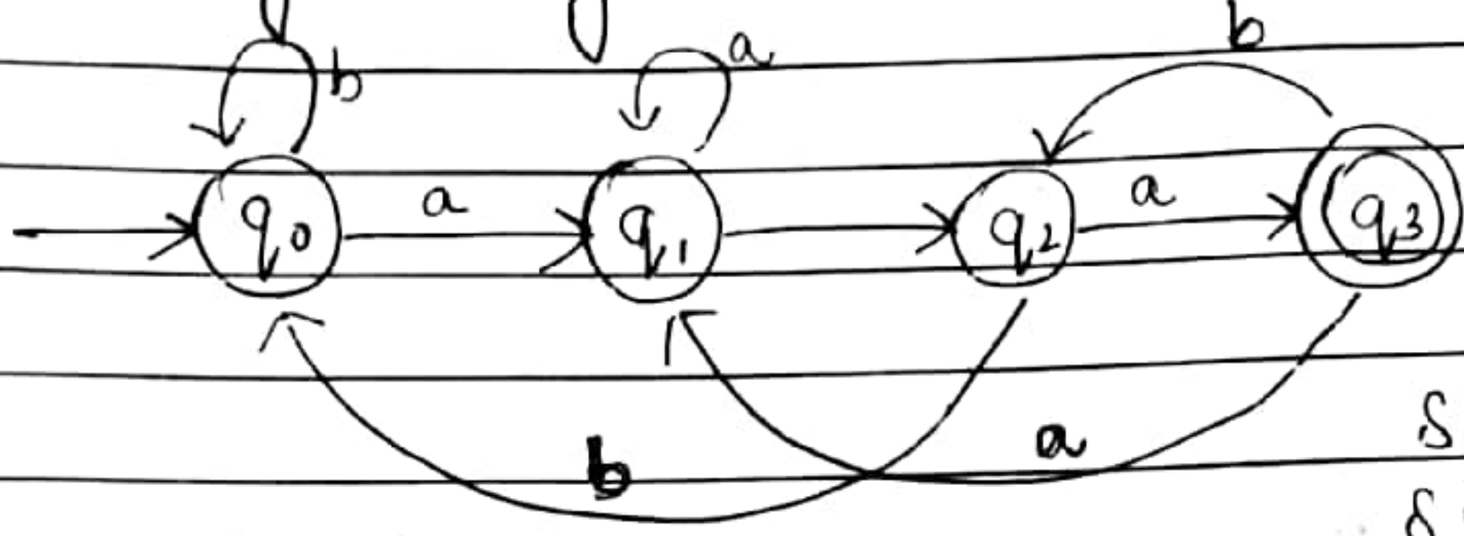
Vidyatree Modern World College

Tutorial 3

Q1) Design a DFA for a language accepting all strings ending with aba over $\Sigma = \{a, b\}$

A1) $L = \{aba, aaba, baba, bbaba \ldots\}$

Min length string = aba



$\delta(q_1, a) \rightarrow q_0$ (x) "aaba"

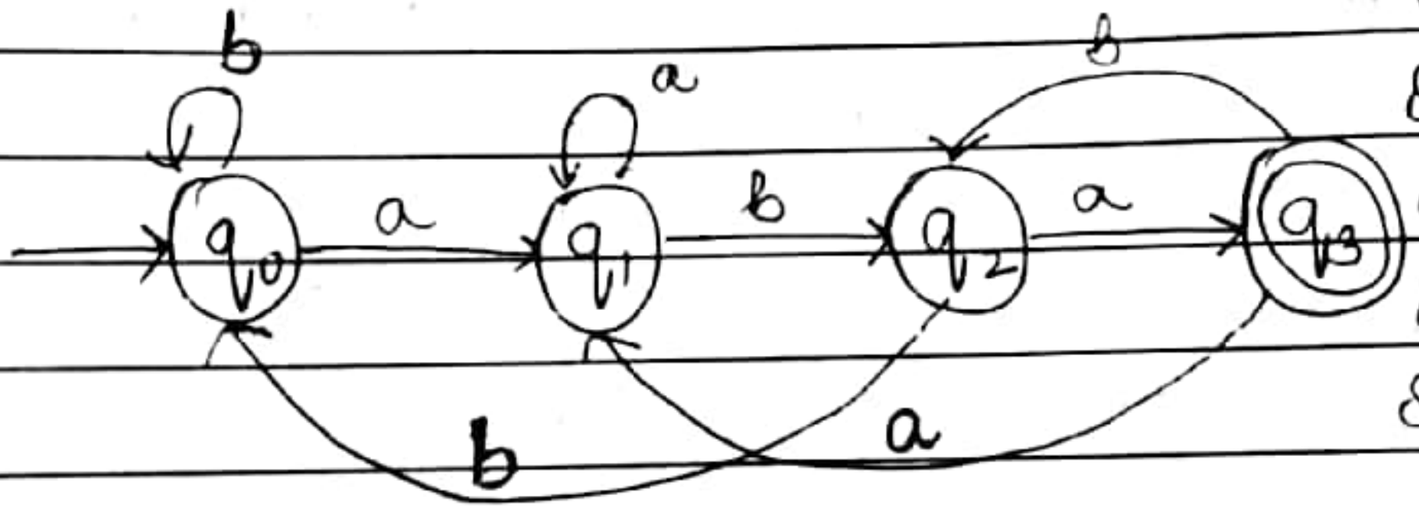
$\delta(q_2, b) \rightarrow q_1(x)$ "abbba"

$\delta(q_3, a) \rightarrow q_2(x)$ "abaaa"

$\delta(q_3, a) \rightarrow q_0(x)$ "abaaba"

$\delta(q_3, b) \rightarrow q_1(x)$ "ababa"

$\delta(q_3, b) \rightarrow q_0(x)$ "ababa"



Q2) Design a DFA for a language of string 0 and 1 that is

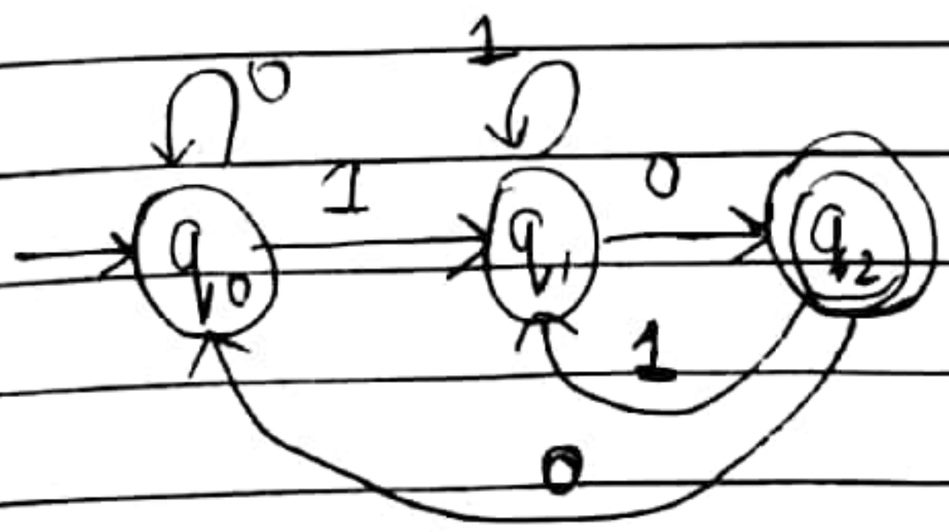
(i) String is ending with 10.

(ii) ending with 11

(iii) ending with 1.

A2) (i) $L = \{10, 010, 110, 01010, \ldots\}$

min = 10



$\delta(q_2, 1) \rightarrow q_0(x)$ "1010"

$\delta(q_2, 0) \rightarrow q_1(x)$ "1000"

$\delta(q_2, 0) \rightarrow q_0$

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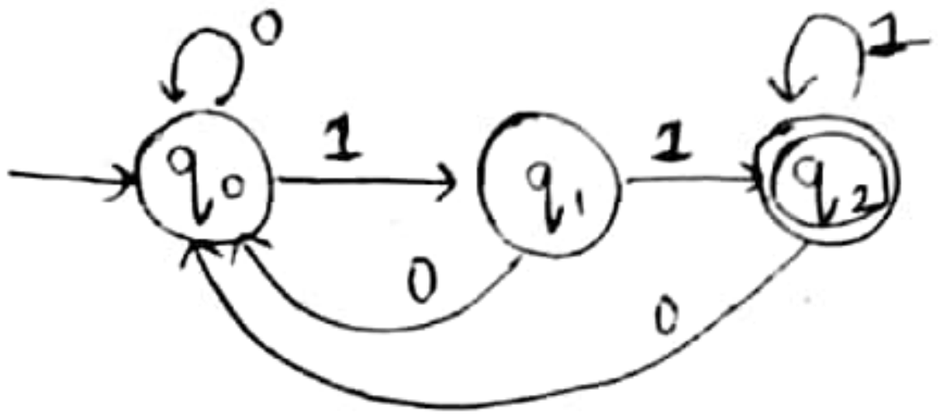
(ii) $L = \{11, 011, 111, 1011, \ldots\}$

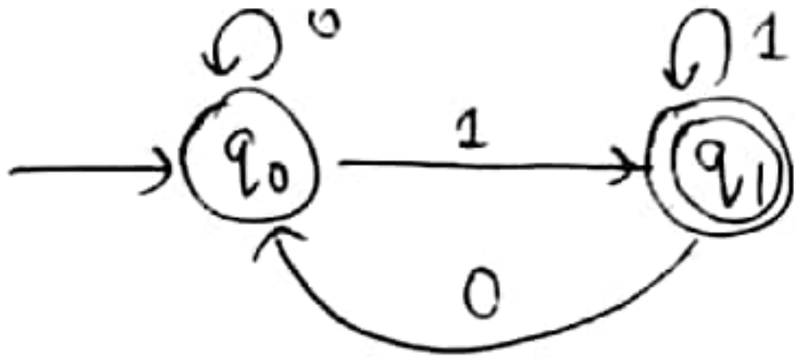
min = 11.

$\delta(q_2, 0) \to q_1$ "1101" (x)



(iii) $L = \{1, 01, 11, 1101 \ldots\}$

min = 1



Q3) Design a DFA for language $L = \{w/w$ does not contain bbb as substring$\}$ over $\Sigma = \{a, b\}$

Ans) L = String without bbb as substring

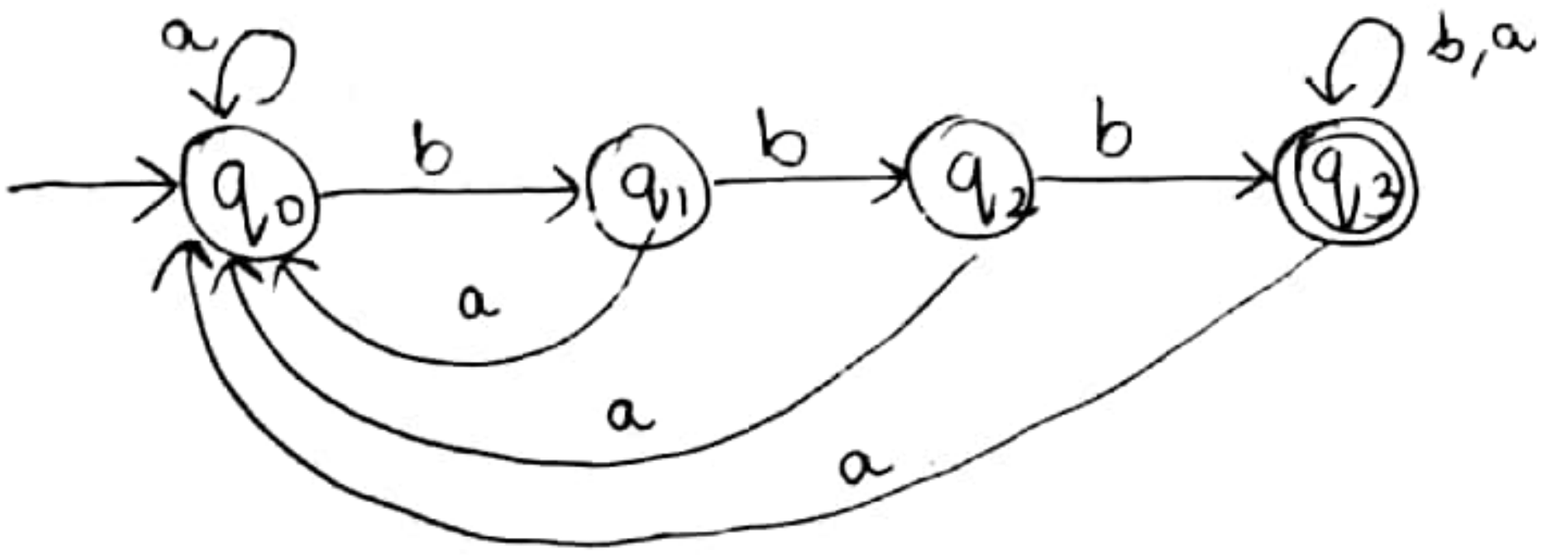
L^c = String with bbb as substring

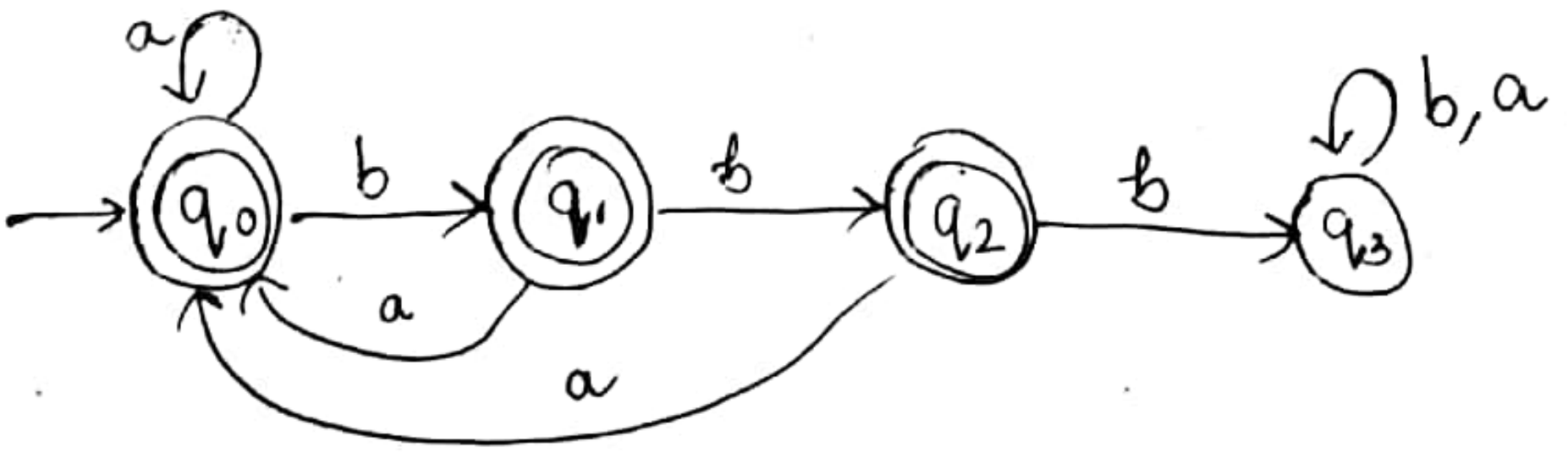
$L^c = \{abbb, bbbb, bbb \ldots\}$

min = bbb.

$\delta(q_0, a) \to q_3$ (x) "a"

$\delta(q_3, a) \to q_0$ (x) "bbba"





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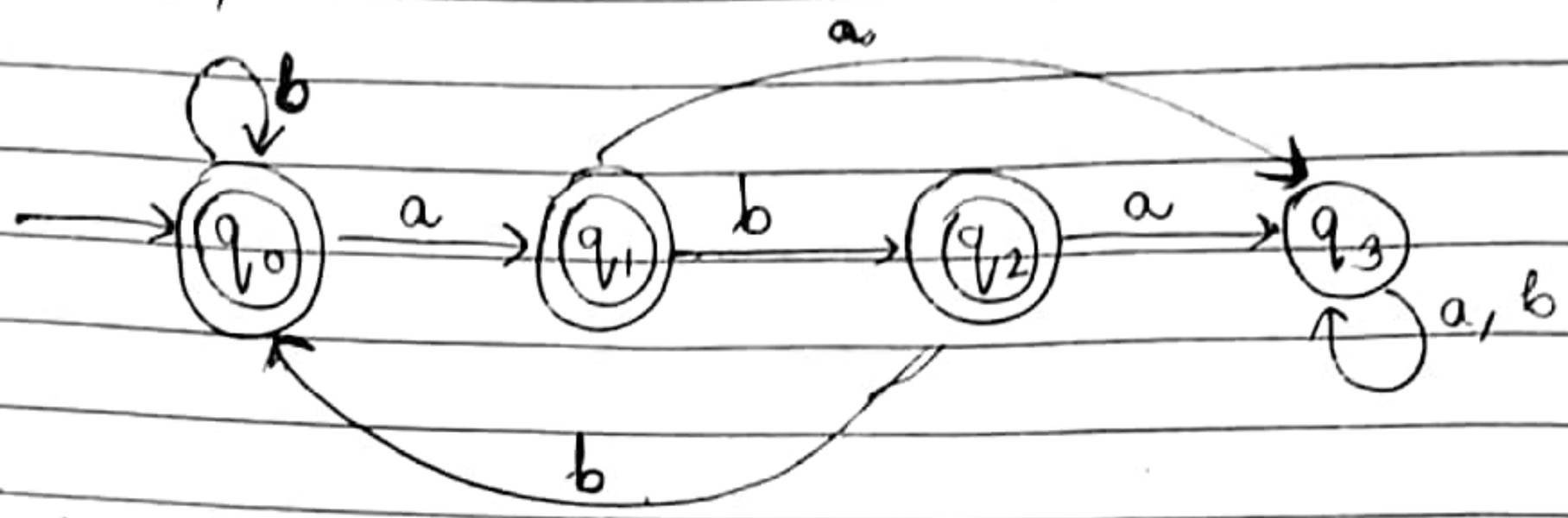
Q4) Design a DFA for set of strings over $\Sigma = \{a, b\}$ in which there are at least two occurences of b between any two occurences of a.

Ans) $L = \{bb, abba, abbba, abbabb, \ldots\}$

min - b, a.



State Transition Table :

Q/Σ	a	b
→ q_0 * *	q_0	q_1
q_1 *	ϕ	q_2
q_2	ϕ	q_0

Test :

Valid String :- abbbab

$\delta(q_0, abbbab) \rightarrow q_1$
$\delta(q_1, bbbab) \rightarrow q_2$
$\delta(q_2, bbab) \rightarrow q_0$
$\delta(q_0, bab) \rightarrow q_0$
$\delta(q_0, ab) \rightarrow q_1$
$\delta(q_0, b) \rightarrow q_2$

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- Invalid String - aba

$\delta(q_0, aba) \rightarrow q_1$

$\delta(q_1, ba) \rightarrow q_2$

$\delta(q_2, a) \rightarrow q_3$

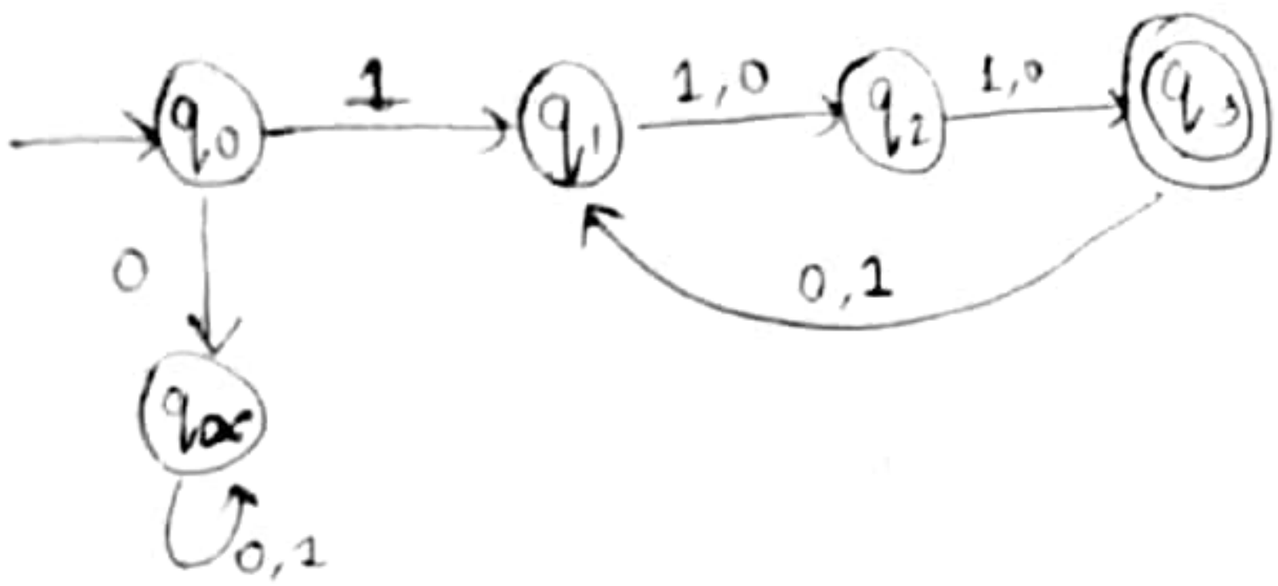
Q5) Design a DFA for language accepting all strings starting with 1 and length of string is divisible by 3.

A5) L = {111, 100, 101, 110, 100100111, .. }

min length string = 3

∴ min no of states = n+1

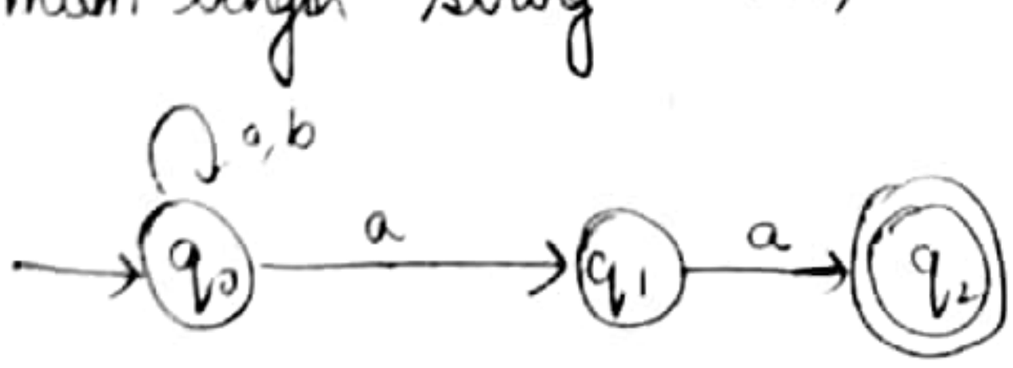
= 3+1 = 4



Q6) Design a NFA to accept the string with a's and b's to such that string ends with "aa".

A6) R.E = $(a+b)^*.aa$

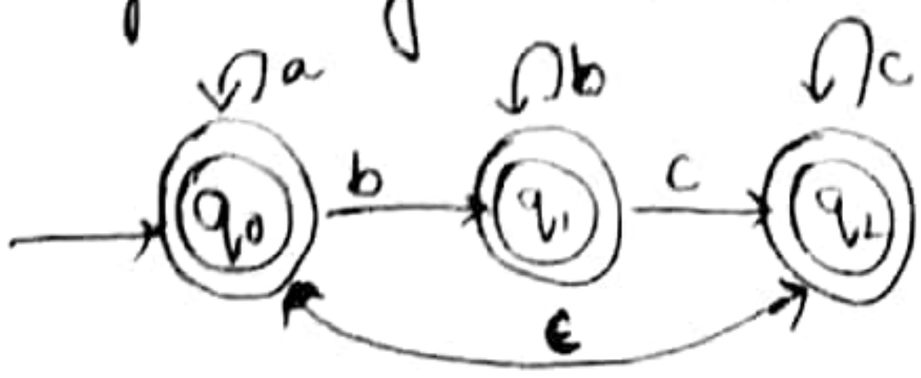
Minimum length string = 2(aa)



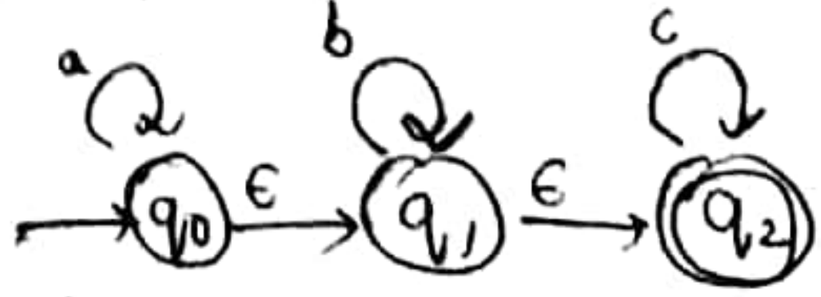
Q7) Design a NFA for any number of a's followed by any number of b's followed by any number of c's.

A7) R($(a)^*.(b)^*.(c)^*$

min length string - ϵ, a, b, c, aa, aab, ab, acc, ...



OR



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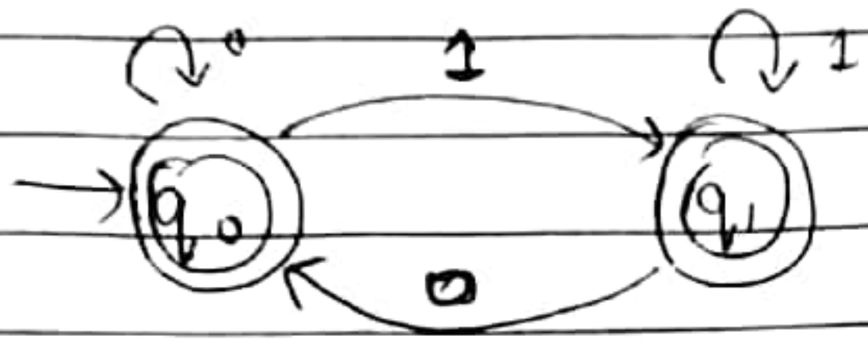
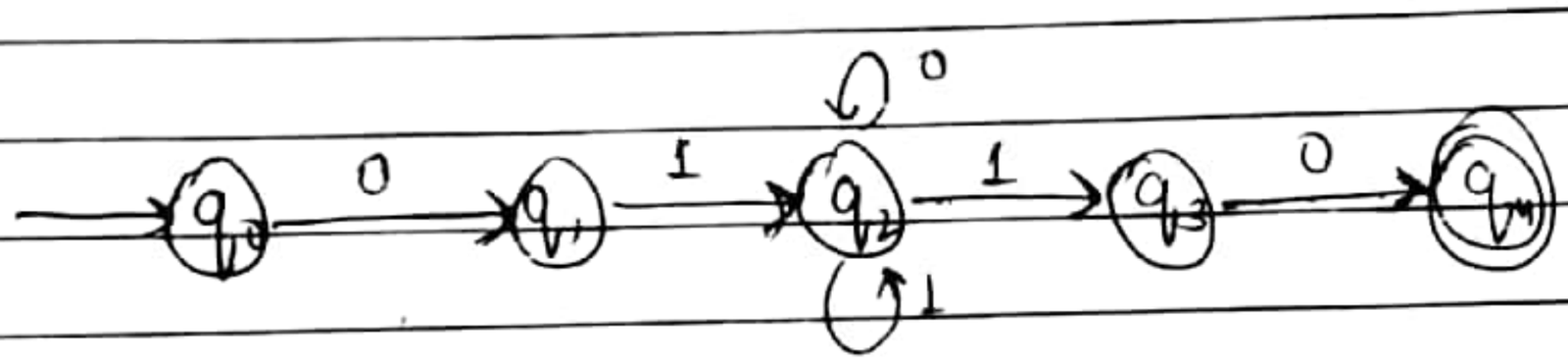
Q8) Design a NFA for binary number where first and last digit are same . $\Sigma = \{0, 1\}$.

A8) $L = \{0, 1, 00, 11, 010, 111, \ldots\}$ RE -



Q9) Design a NFA for a set of strings on $\Sigma = \{0, 1\}$ that ~~starts~~ starts with 01 and end with 10.

A9) Regular expression :- $01.(0+1)^*.10$ min = 0110



Q10) Design a NFA for $L = \{01 01^n \cup 0100\}$ where $n > 1$ over $\Sigma = \{0, 1\}$.

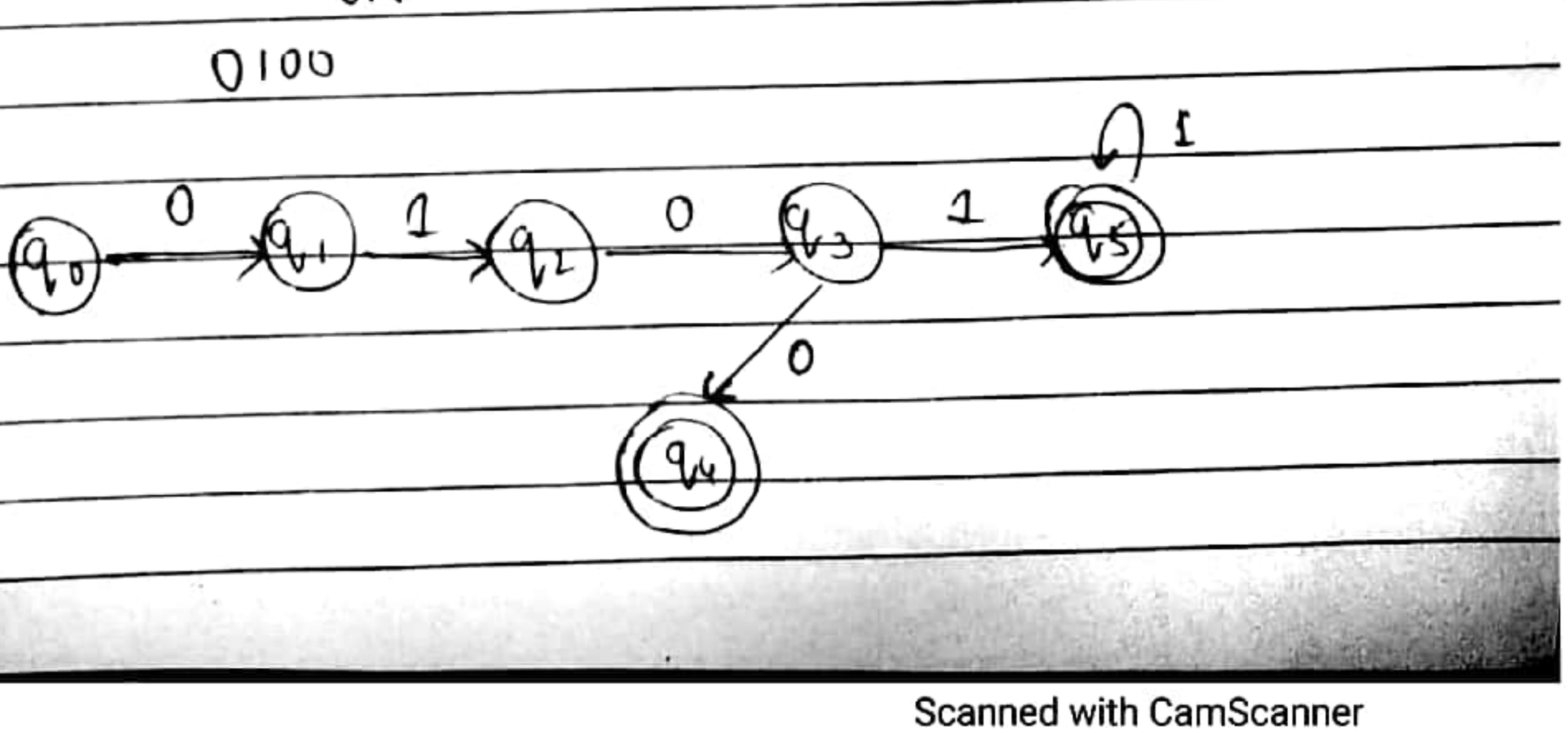
A10) R.E => $(010.1^*) + (0100)$

OR

010.1^*

OR

0100



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