Assignment-1

Q1. Let $A = \{\varepsilon, a\}$ and $B = \{ab\}$. List element of the following Sets.

Q2 Let $L = \{ab, aa, baa\}$ which of the following String are in L^* :

(1) abaabaaabaa
(2) aaaabaaaa
(3) baaaaabaaaab.
(4) baaaaabaa.

which String are in L^+ ?

Ans Any String which follow the. Combination Set of $\{ab, aa, baa\}$ will be in L^* ✓

String (1) abaabaaabaa (2) aaabaaaa (4) baaaaabaa follow the. Combination Set of $\{ab, aa, baa\}$ So they ✓ will be in L^*

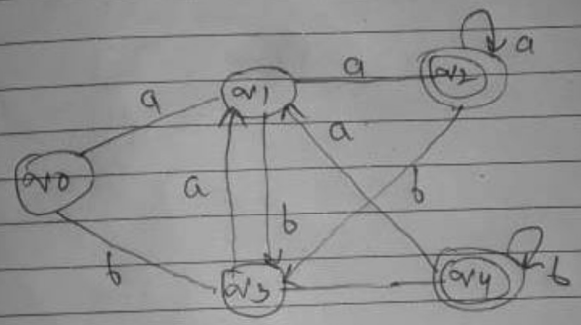
Q3 Let $\Sigma = \{a, b\}$ and $B = \{aa, bb\}$. use Set Notation. to describe Complement of L

Ans String generated by language $B = \{aa, bb\}$ will be even length.

So Complement will be universal Set of Strings $\{aa, bb\}$ is $\{\varepsilon, a, b, ab, ba\}$ and Strings.

$\{w \in (a,b)^* \mid |w| \geq 3\}$ String of length greater than equal to 3

Draw a DFA that accepts Set of all String of 0 and 1 that end in the last two Same Symbols



Draw a DFA that accepts the language.

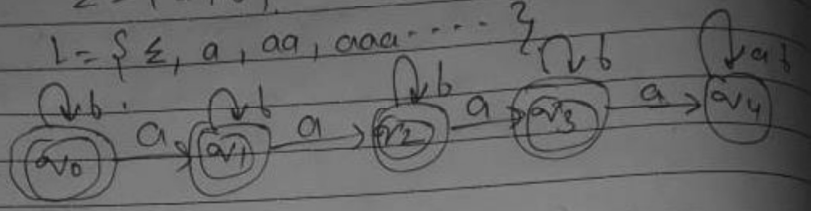
$L = \{a^{2n} \mid n \geq 1\}$.

Q. Construct DFA for the following language over the alphabet $\{a, b\}$.

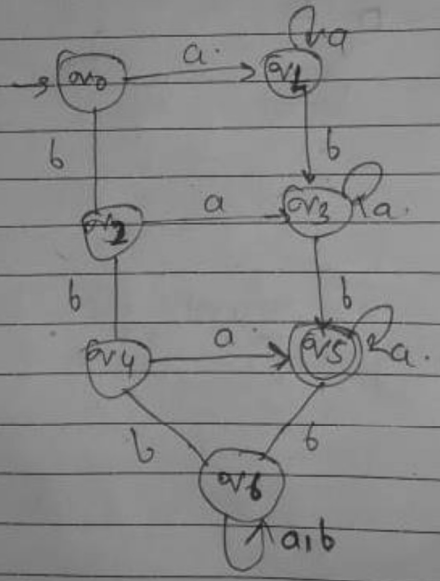
(1) All the string no more than 3 a's

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

$L = \{\varepsilon, a, aa, aaa \ldots\}$



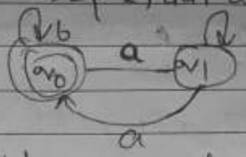
(2) All Strings with at least one a and 2 b's.



(3) All the Strings with even number of a's and odd number of b's ?

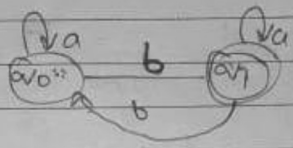
(i) even num of a's

$L = \{ \varepsilon, aa, aaaa \cdots \}$.

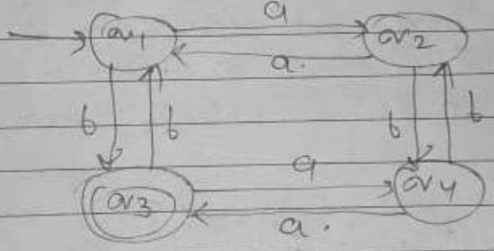


(ii) odd num of b's

$L = \{ b, bbb, bbbbb \cdots \}$.



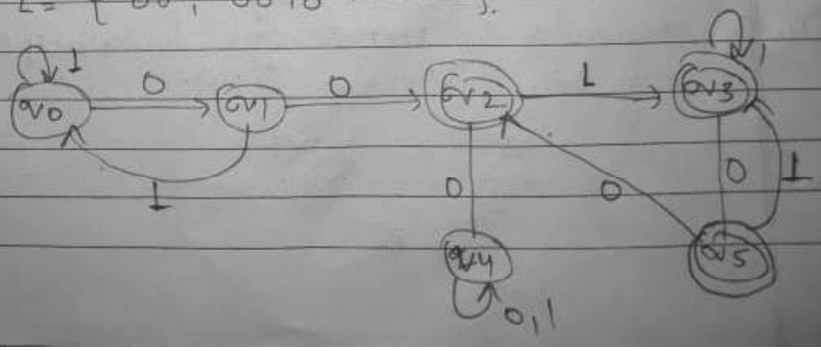
both Combine we get



Que-7 Consider $\Sigma = \{0, 1\}$ find DFA's for the following.

(a) All Strings Containing 00 but not 000.

$L = \{ 00, 0010 \cdots \}$.

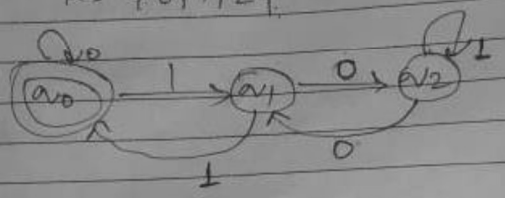


Qu-10 Construct a DFA for accepting a the Set of all String over alphabet $\{0,1\}$ which when interpreted as a binary number is a multiple of 3

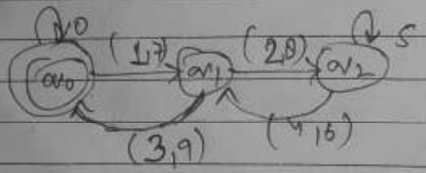
~~$w = \{0, 01, 10, 1001 \ldots\}$~~

$w = \{0, 01, 10, 11 \ldots\}$.

$R = \{0, 1, 2\}$.



Qu-11 Design a DFA that accepts the language divisible by 3 over the input alphabet $\Sigma = \{0,1,2,3,4,5,6,7,8,9\}$.



Qu-12 Informally describe the language accepted by the following DFA.

$L = \{w \mid w$ is String followed by odd num of 0's$\}$

Section B (NFA to DFA Conversion)

(1) Construct DFAs for the following NFAs and informally describe the language they accept.

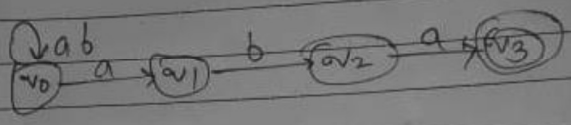
(a)

Qu-2 Construct NFA for accepting the set of all strings over {a,b} ending in aba. Use it to construct the DFA for accepting the same set of string.

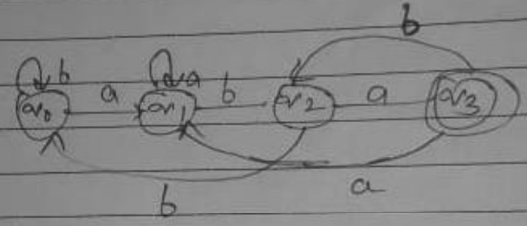
Ans. $\Sigma = \{a, b\}$

L = xxxaba.

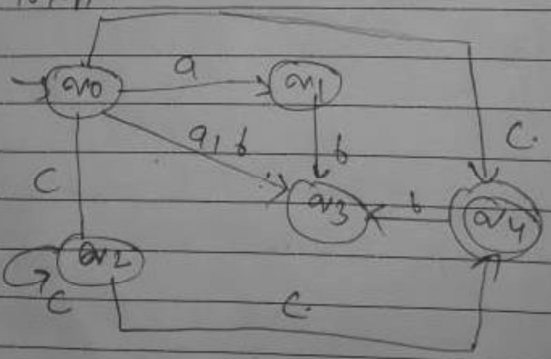
NFA



DFA



Qu-3 Construct DFA equivalent to following NFA.

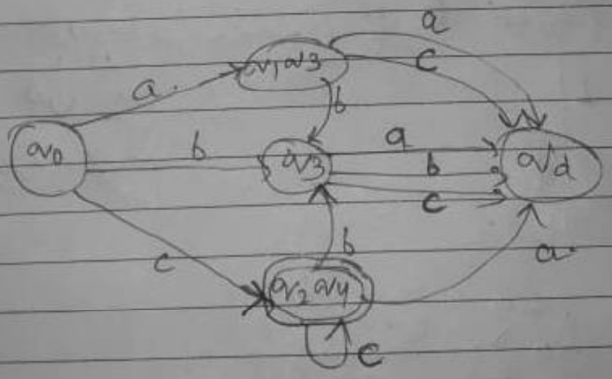


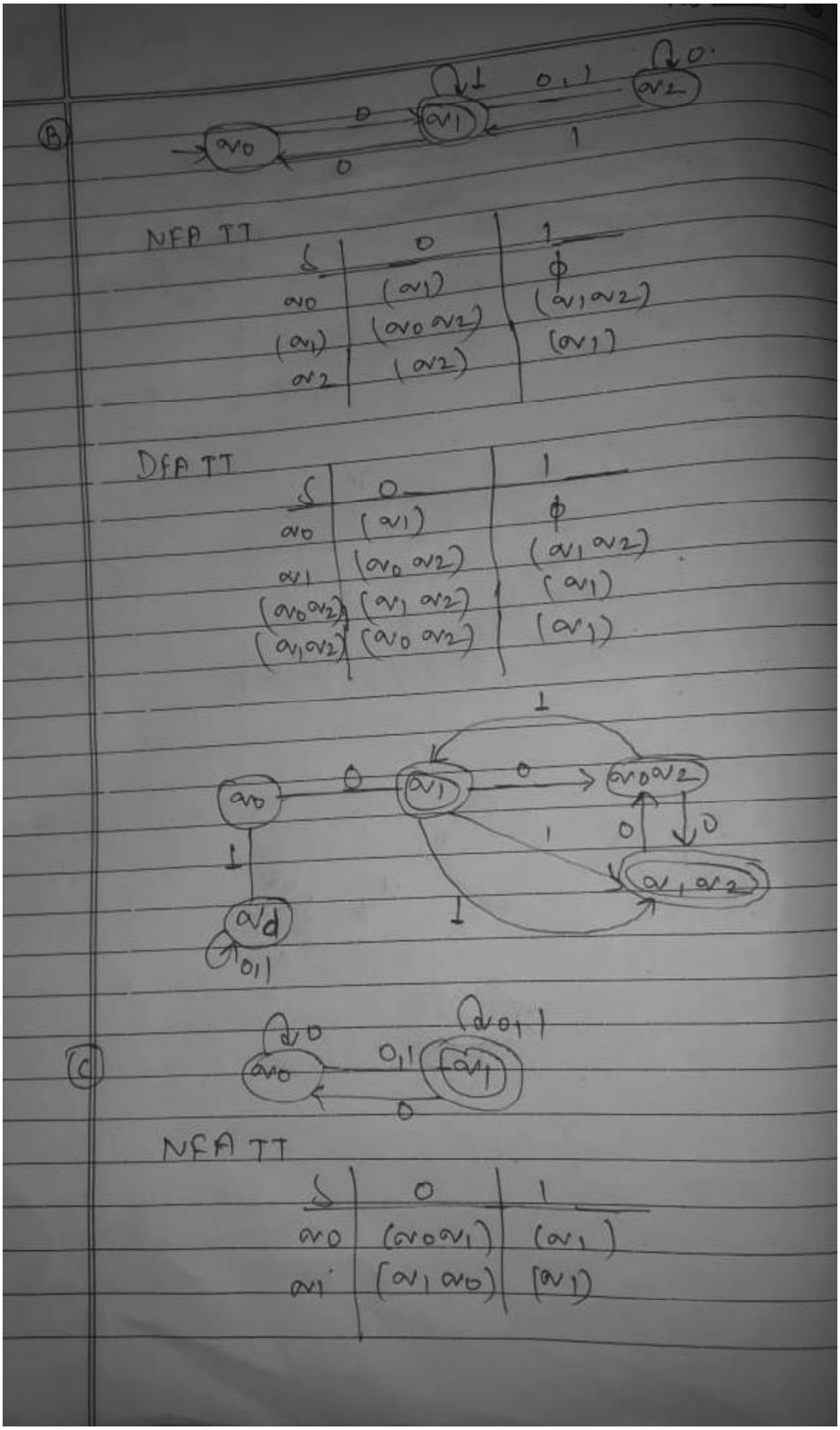
NFA TT

δ	a	b	c
→ q_0	$(q_1\ q_3)$	(q_3)	$(q_2\ q_4)$
q_1	ϕ	(q_3)	ϕ
q_2	ϕ	ϕ	$(q_2\ q_4)$
q_3	ϕ	ϕ	ϕ
* q_4	ϕ	(q_3)	ϕ

DFA TT

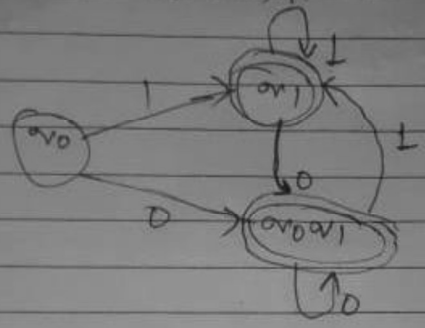
δ	a	b	c
q_0	$(q_1 q_3)$	(q_3)	$(q_2\ q_4)$
$(q_1 q_3)$	ϕ	(q_3)	ϕ
(q_3)	ϕ	ϕ	ϕ
$(q_2\ q_4)$	ϕ	(q_3)	$(q_2\ q_4)$




B
q_0
q_1
q_2
0
1
0,1
0
1
0
NFA TT
δ | 0 | 1
q_0 | (q_1) | ϕ
(q_1) | $(q_0 q_2)$ | $(q_1 q_2)$
q_2 | (q_2) | (q_1)
DFA TT
δ | 0 | 1
q_0 | (q_1) | ϕ
q_1 | $(q_0 q_2)$ | $(q_1 q_2)$
$(q_0 q_2)$ | $(q_1 q_2)$ | (q_1)
$(q_1 q_2)$ | $(q_0 q_2)$ | (q_1)
q_0
q_1
$q_0 q_2$
$q_1 q_2$
q_d
0,1
C
q_0
$q_{0,1}$
0,1
0
NFA TT
δ | 0 | 1
q_0 | $(q_0 q_1)$ | (q_1)
q_1 | $(q_1 q_0)$ | (q_1)

DFA TT

δ	0	1
q_0	(q_0q_1)	q_1
(q_0q_1)	(q_0q_1)	q_1
q_1	(q_0q_1)	q_1



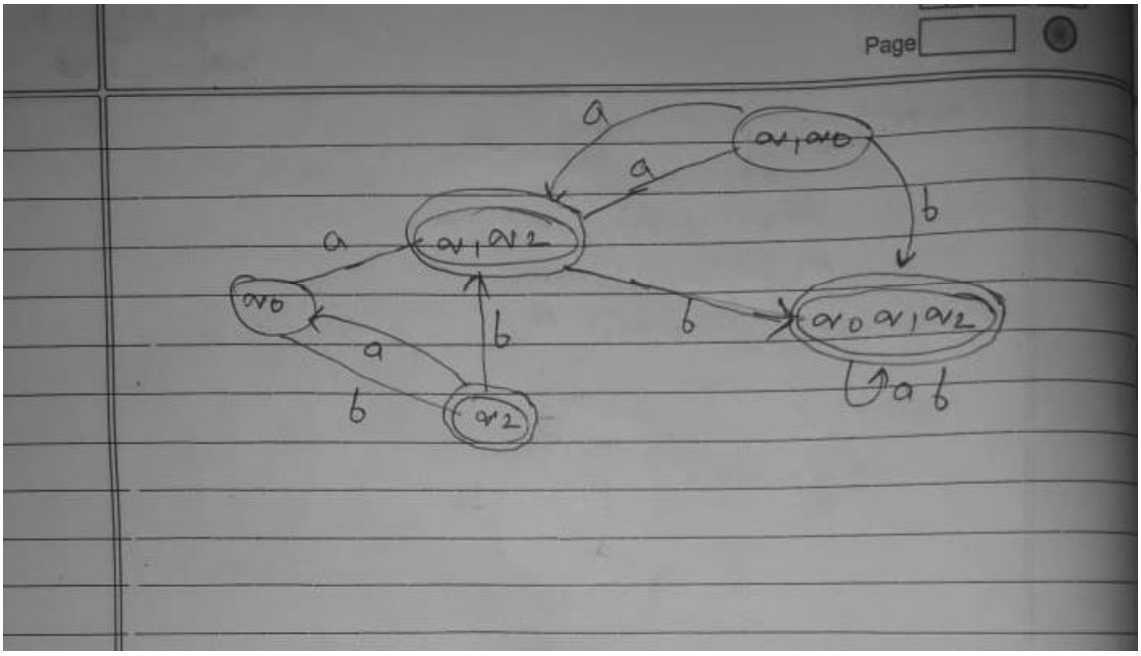
Que-4 Let $M = (\{q_0, q_1, q_2\}, \{a, b\}, q_0, \delta, \{q_2\})$ be an NFA where δ is given by.

NFA TT

δ	a	b
q_0	(q_1, q_2)	(q_2)
q_1	(q_1)	(q_0q_1)
q_2	(q_0)	(q_1, q_2)

DFA TT

δ	a	b
q_0	(q_1q_2)	q_2
(q_1, q_2)	(q_1, q_0)	$(q_0 q_1 q_2)$
(q_2)	(q_0)	(q_1, q_2)
(q_1, q_0)	(q_1, q_2)	$(q_0 q_2 q_1)$
$(q_0 q_1 q_2)$	$(q_0 q_1 q_2)$	$(q_0 q_1 q_2)$


Page
a
a
b
a
b
a
b
b
a
b
a b