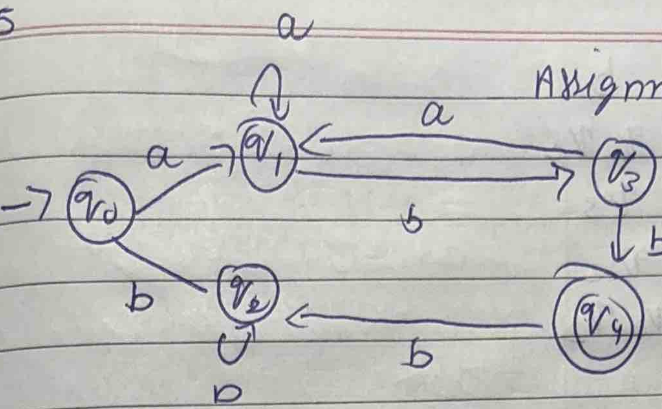
5/10/25

Assignment - 2



first we will make transition Table ~~State~~

States	a	b
$\rightarrow q_0$	q_1	q_2
q_1	q_1	q_3
q_2	q_1	q_2
q_3	q_1	q_4
q_4	q_1	q_2

Now we will make 2 set of states in 1 set we will have all other state and in one we will have final state

$S_1 = \{q_0, q_1, q_2, q_3\} \{q_4\}$

Now, we will divide them on the basis of transition of input symbol

$S_2 = \{q_0, q_1, q_2\} \{q_3\}, \{q_4\}$

do it ~~ag~~ again until answer come

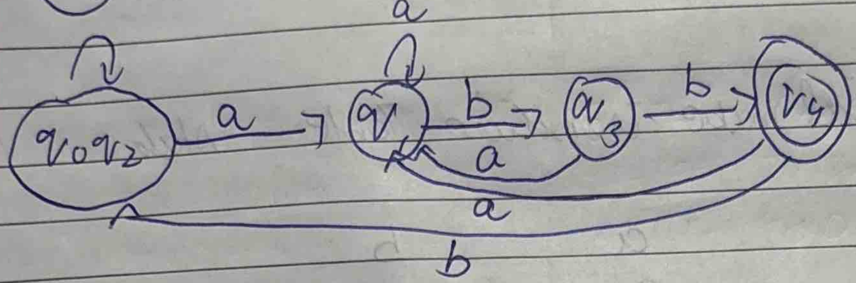
$S_3 = \{q_0, q_2\}, \{q_1\} \{q_3\} \{q_4\}$

$S_4 = \{q_0, q_2\} \{q_1\} \{q_3\} \{q_4\}$

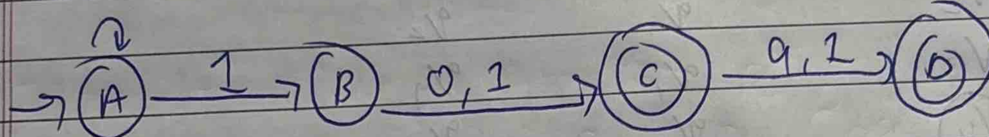
As, $S_3 = S_4$

S_4 is the minimize set of state

States	a	b
$q_0 q_2$	q_1	$q_0 q_2$
q_1	q_1	q_3
q_3	q_1	q_2
q_4	q_1	$q_0 q_2$



2 NFA - RFA



$A = A0 + A1$
$B = A1$
$C = B0 + B1$
$D = C0 + C1$

$A = \cancel{A0}\ \Lambda + (0+1)A$ by using $R = Q + RP$ so $R = QP^*$

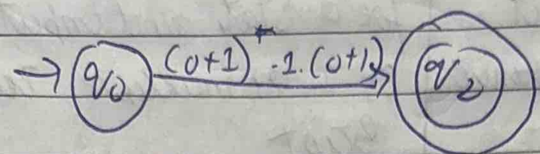
$A = (0+1)^*$
put in B
$B = (0+1)^* . 1$
put in C
$C = (0+1)^* . 1(0+1)$

$D = (0+1)^* . 1(0+1) . (0+1)$

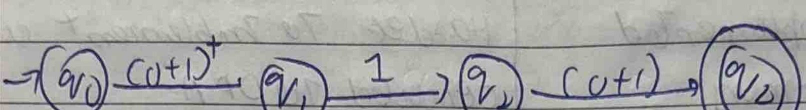
So final regular expression will be ~~C+D~~ C+D
$(0+1)^* . 1 . (0+1) + (0+1)^* . 1 . 1 (0+1) . (0+1)$

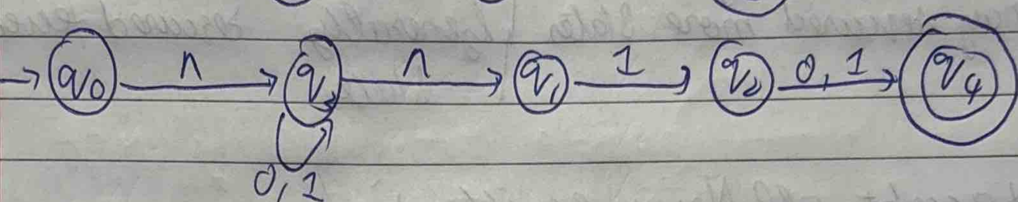
$(0+1)^* \cdot 1 \cdot (0+1) \cdot (\wedge + (0+1))$

3 $(0+1)^* \cdot 1 \cdot (0+1)$



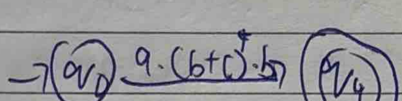
As there are 2 multiplication there will be 2 states

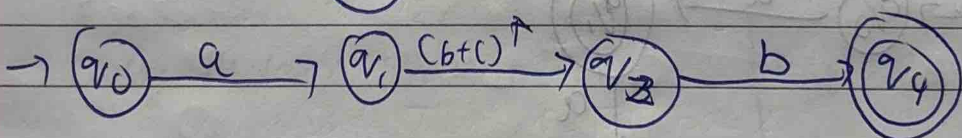


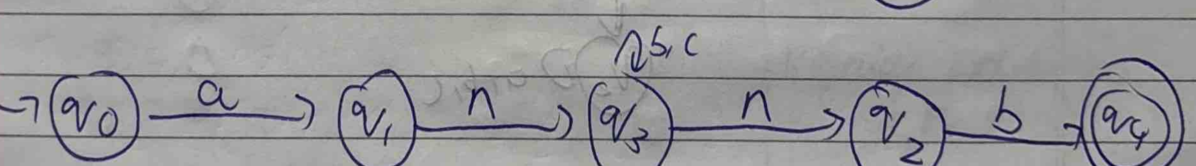


So this ENFA of the following RE

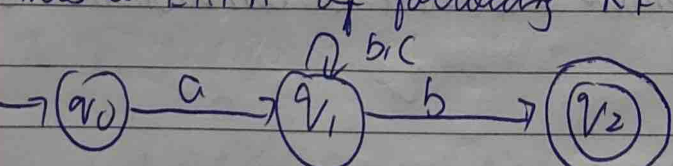
4 $a,\ a \cdot (b+c)^* \cdot b$







This is ENFA of following RE converting into NFA



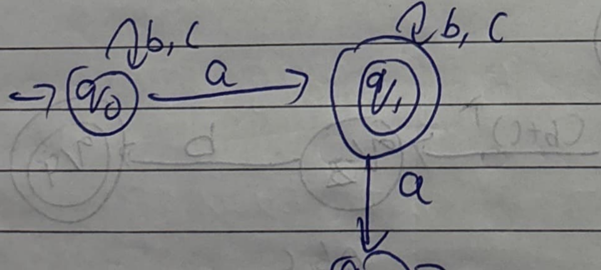
DFA Deterministic Finit Automata	NFA Non-Differentiate finit Automata
for each State and Input Symbol, exactly one Transition is defined	for a State and input Symbol 0, 1 or multiple Transition Exist
NO ε-Transition allowed	ε-Transition are allowed
Easy To Implemented in programming	Harder To Implement usually converted To DFA
may required more States	Generally required fewer States

6 It accept all Strings exactly 1 'a'

Language = {a, ab, abc, cab, cba, ccba ....}

So RE = $(b+c)^* \, a \, (b+c)^*$

Let it's DFA will be



7 Firstly we will remove all dead or unreachable State so we, remove q_3

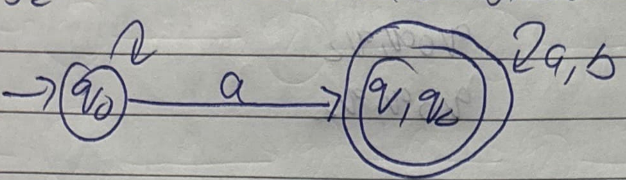
$S_1 = \{q_0\} \{q_1, q_2\}$

$S_2 = \{q_0\} \{q_1, q_2\}$

As $S_1 = S_2$

States	a	b
$\rightarrow q_0$	q_1	q_2
q_1	q_1	q_2
q_2	q_1	q_2

S_2 is all minimised states



States	a	b
$q_1 q_2$	$q_1 q_2$	q_2
q_1, q_2	q_1, q_2	q_1, q_2

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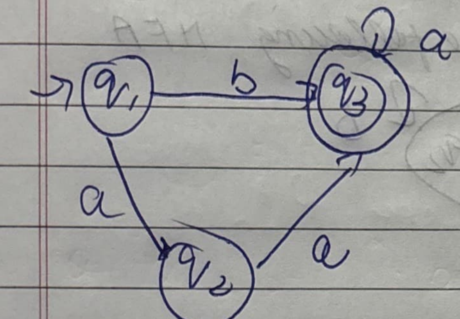


~~States~~

Using Arden's Theorem

$q_1 = \Lambda$

$q_2 = q_1 a$

$q_3 = q_1 b + q_2 a + q_3 a$

In q_2 put q_1

$q_2 = a$

put value of q_1 and q_2 in q_3

$q_3 = b + aa + q_3 a$

by using $R = Q + RP$

$R = QP^*$

$q_3 = (b + aa) + q_3 a$

Regular Expression

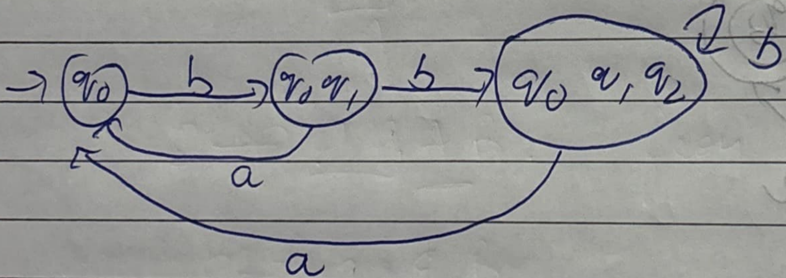
$= (b + aa) . a^*$

9 NFA to DFA

States	a	b
q_0	q_0	$q_0 q_1$
q_1	-	q_2
q_2	-	-

States	a	b
$\rightarrow q_0$	q_0	$q_0 q_1$
$q_0 q_1$	q_0	$q_0 q_1 q_2$
$q_0 q_1 q_2$	q_0	$q_0 q_1 q_2$

So this equivalent DFA to the following NFA



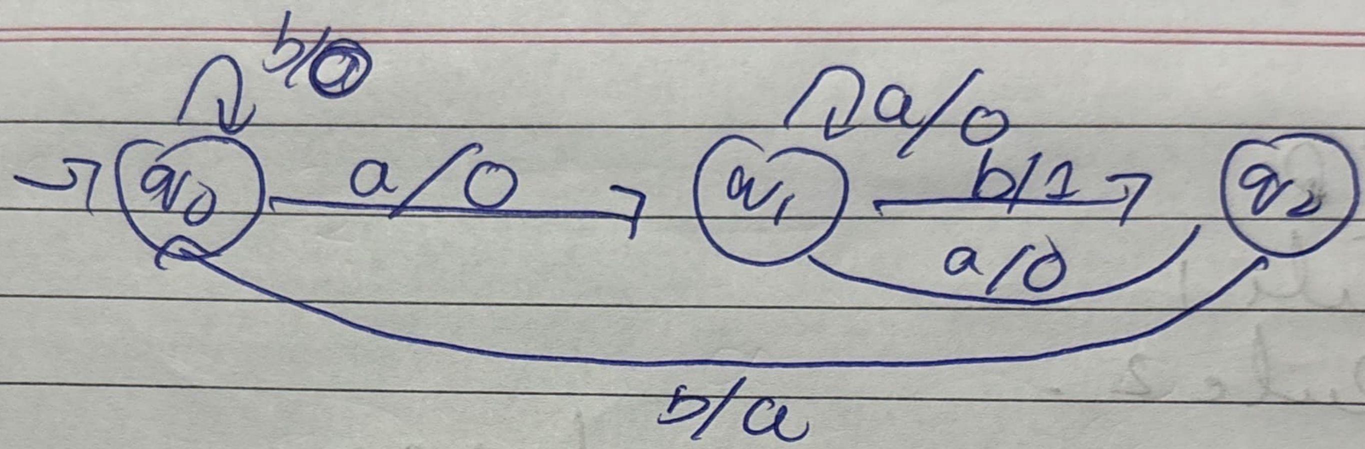
10

Present States	Next State a	b	output
			ε
q_0	q_1	q_0	0
q_1	q_1	q_2	0
q_2	q_1	q_0	1

moore machine

↓

Present State	a state	a op	b state	b op
q_0	q_1	0	q_0	0
q_1	q_1	0	q_2	1
q_2	q_1	0	q_0	0



b/0
a/0
q_0
a/0
q_1
b/1
a/0
q_2
b/a