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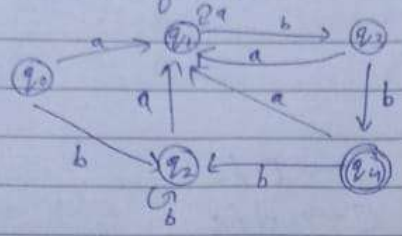
Assignment 2

1] Minimization of DFA



S1 Remove any unreachable state if present
→ There is no unreachable state

S2 Distribute between final & non final states

Non-final State

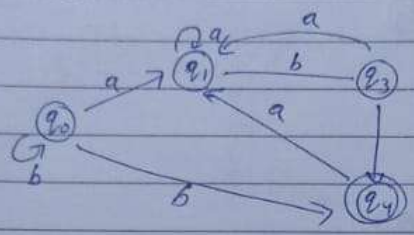
	a	b
q_0	q_1	q_2
q_1	q_1	q_3
q_2	q_1	q_2
q_3	q_1	q_4

q_0 and q_2 have same state, so we remove one of them

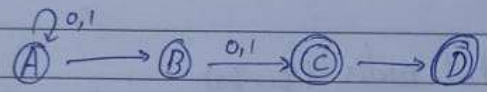
Final Statis	a	b
q_4	q_1	q_2

S3 Combined State

State	a	b
q_0	q_1	q_0
q_1	q_1	q_3
q_3	q_1	q_4
(q_4)	q_1	q_0



2] NFA to R.E



$A = A \cdot 0 + A \cdot 1$

$B = A \cdot 1$

$C = B \cdot 0 + B \cdot 1$

$D = C \cdot 0 + C \cdot 1$

$A = A(0+1) + \epsilon$

$R = RP + Q$

$R = QP^*$

$A = \epsilon (0+1)^*$

$B = A \cdot 1$

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

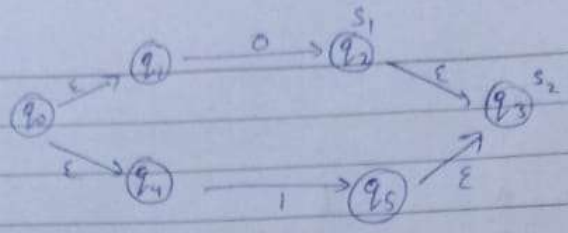
$C = B(0+1)$

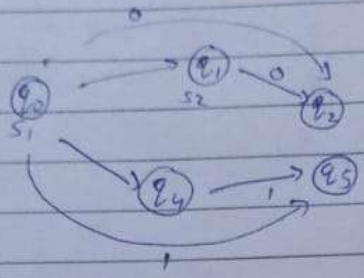
$(0+1)^* \cdot 1(0+1)$

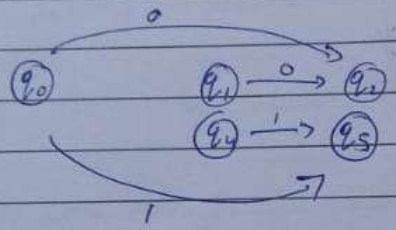
$D = C(0+1)$

$(0+1)^*(0+1)(0+1)$

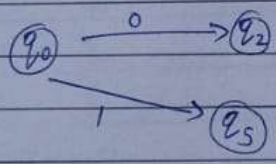
3]





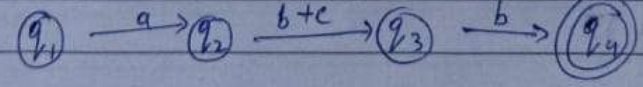


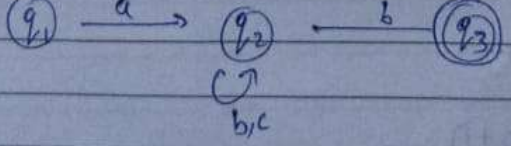
Remove unvisited nodes (q_1, q_4)



4] RE to FA

$a(b+c)^*b$



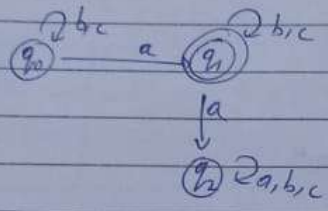


6] It accepts all strings exactly 1 'a'

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

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

its DFA will be

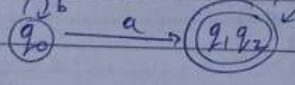


7] Firstly, we will remove all unreachable state, so we remove q_3.

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

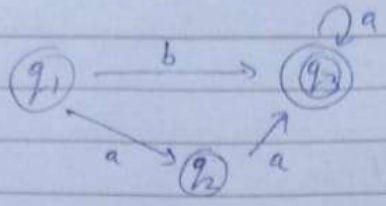
$S_2 = \{q_0\}\ \{q_1, q_2\}$

	a	b
q_0	q_1	q_2
q_1	q_1	q_1
q_2	q_1	q_2



q_0	q_1q_2	q_0
q_1q_2	q_1q_2	q_1q_2

8]



Using ardem theorem

$q_1 \Rightarrow \epsilon$

$q_2 \Rightarrow q_1 \cdot a$

$q_3 \Rightarrow q_1 b + q_2 a + q_3 a$

put value of q_1 and q_2 in q_3

$q_3 = b + q_1 a + q_3 a$

by using $R = Q + RP$

$R = QP^*$

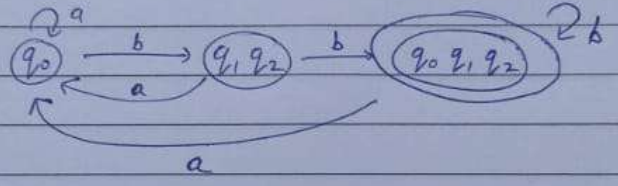
$q_3 = (b + q_1 a) + q_3 a$

Regular exp = $(b + qa) \cdot a^*$

9] NFA to DFA

States	a	b
q_0	q_0	$q_0\,q_1$
q_1	—	q_2
q_2	—	—

States	a	b
$\to q_0$	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	$q_0\,q_1\,q_2$



10] Present State | Next State (a, b) | Output

Present State	Next State a	Next State b	Output
q_0	q_1	q_0	0
q_1	q_1	q_2	0
q_2	q_1	q_0	1

→

Present State	a		b	
	State	O/P	State	O/P
q_0	q_1	0	q_0	0
q_1	q_1	0	q_2	1
q_2	q_1	0	q_0	0