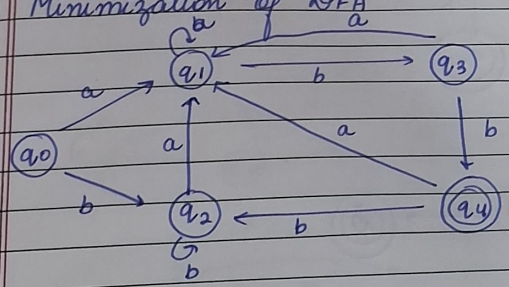
TOC - Assignment 2

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

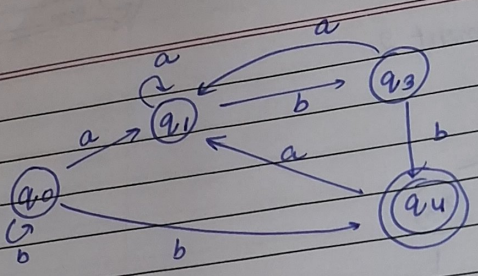
q_0 & q_2 have same states so we remove one of them

Final

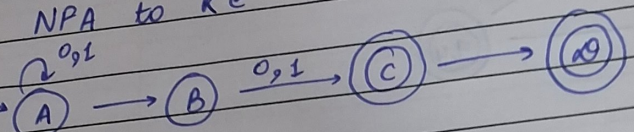
State	a	b
q_4	q_1	q_2

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) NPA to RE



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

$B = A \cdot 1$

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

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

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

$R = RP + Q$

$R = QP^*$

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

$B = A \cdot 1$

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

$C = B(0+1)$

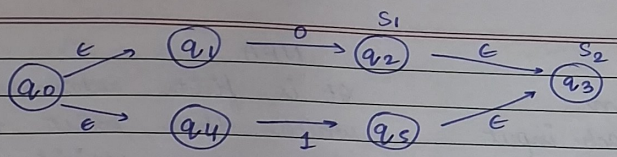
$(0+1)^* \cdot 1 (0+1)$

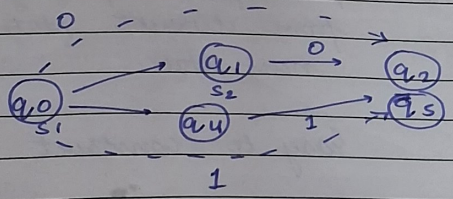
$D = C(0+1)$

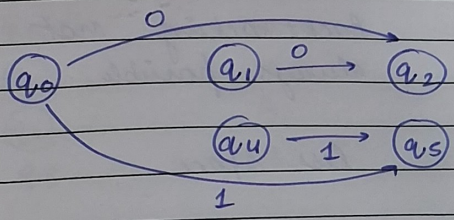
$(0+1)^* (0+1)(0+1)$

3)

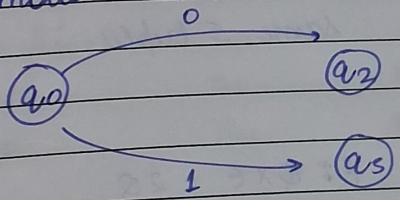
3)





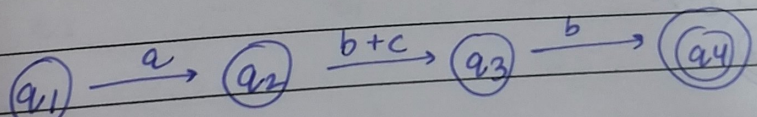


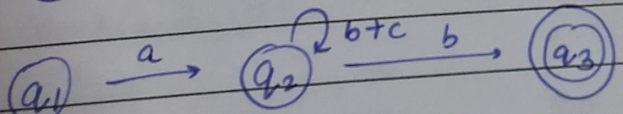
Remove unvisited nodes (q_1, q_4)

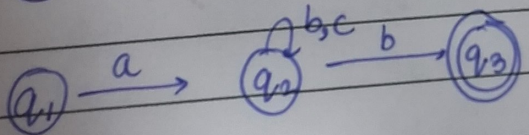


4) RE to FA

$a(b+c)^* b$







5) DFA

Fixed no of n states and each input symbol uniquely determine next state

Hard to construct

Backtracking is possible

Requires more space

5 tuple
$(Q, \Sigma, \delta, q_0, F)$

$\delta : Q \times \Sigma = Q$

NFA

It is finite automata in which these exist many path from specific input from current state to next state

Easy to construct

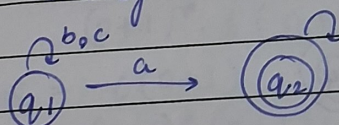
Backtracking not always possible

less space

same 5 tuples

$\delta : Q \times \epsilon = 2^Q$

6) $\Sigma = \{a, b, c\}$
exactly one 'a'



$q_1 = q_1 b + q_1 c + \epsilon$

$q_2 = q_1 a + q_2 b + q_2 c$

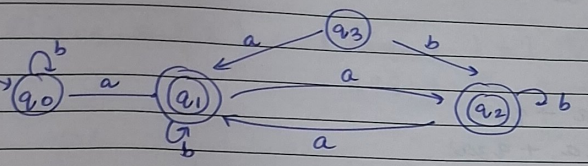
$q_1 = q_1 (b+c) + \epsilon$

$R = RP + Q$

$R = Qp^*$

$q_2 = (b+c)^* a (b+c)^*$

7)



State	a	b
q_0	q_1	q_0
(q_1)	q_2	q_1
(q_2)	q_1	q_2
q_3	q_1	q_3

q_3 is unreachable

Now final

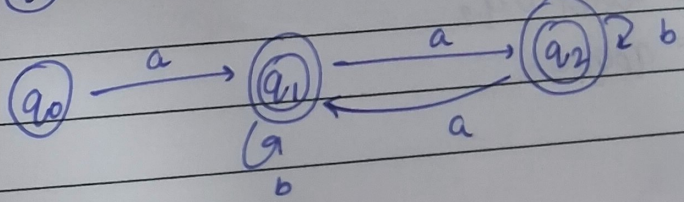
State	a	b
q_0	q_1	q_0

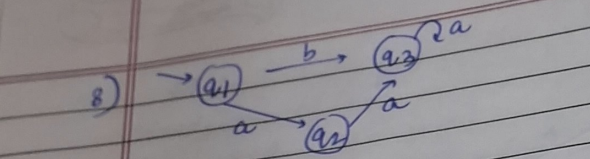
Final

State	a	b
q_1	q_2	q_1
q_2	q_1	q_2

Combined II

State	a	b
q_0	q_1	q_0
(q_1)	q_2	q_1
(q_2)	q_1	q_2



8) 

$q_1 = \epsilon$

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

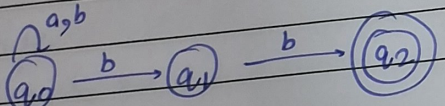
$q_3 = q_1 b + q_1 aa + q_3 a$

$q_3 = q_1 (b + aa) + q_3 \cdot a$

$R = Q + RP$

$R = QP^*$

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

9) 

State	a	b
q_0	q_0	$q_0 q_1$
q_1	—	q_2
q_2	—	—

$\delta(q_0, a) = q_0$ $\quad \delta(q_0, b) = q_0 q_1$

$\delta(q_0, a) = \epsilon$ $\quad \delta(q_1, b) = q_2$

$\delta(q_2, a) = \epsilon$ $\quad \delta(q_2, b) = \epsilon$

$\delta((q_0 q_1), a) = \delta(q_0, a) \cup \delta(q_1, a)$

$q_0 \cup \epsilon = q_0$

$\delta(q_0, q_1), b) = \delta(q_0, b) \cup \delta(q_1, b)$

$= q_0 q_1 \cup q_2$

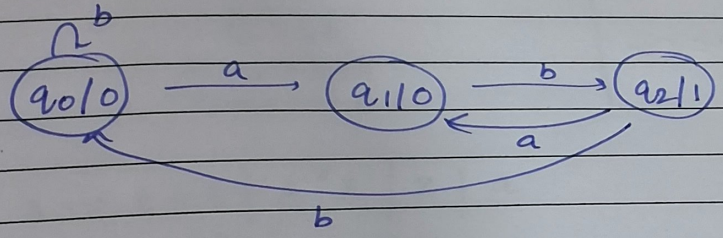
$= q_0 q_1 q_2$

$\delta(q_0q_1q_2, a) = \delta'(q_0,q_1)a) \cup \delta(q_2,a)$
$= q_0 \cup \phi = q_0$

$\delta((q_0q_1q_2), b) = \delta'[(q_0,q_1), b] \cup \delta(q_2,b)$
$q_0q_1q_2 \cup \phi = q_0q_1q_2$

state	a	b
q_0	q_0	q_0q_1
q_1	–	q_2
q_2	–	ϕ –
q_0q_1	q_0	$q_0q_1q_2$
$q_0q_1q_2$	q_0	$q_0q_1q_2$

10)



State	a	b	o/p
q_0	q_1	q_0	0
q_1	q_1	q_2	0
q_2	q_1	q_0	1

$\lambda'(q_0,a) = \lambda(\delta(q_0,a)) = \lambda(q_1)$
$\lambda'(q_0,b) = \lambda(\delta(q_0,b)) = \lambda(q_1) = 0$
$\lambda'(q_1,b) = \lambda(\delta(q_1,b)) = \lambda(q_2) = 1$
$\lambda'(q_2,a) = \lambda(\delta(q_2,a)) = \lambda(q_1) = 0$
$\lambda'(q_2,b) = \lambda(\delta(q_2,b)) = \lambda(q_0) = 0$