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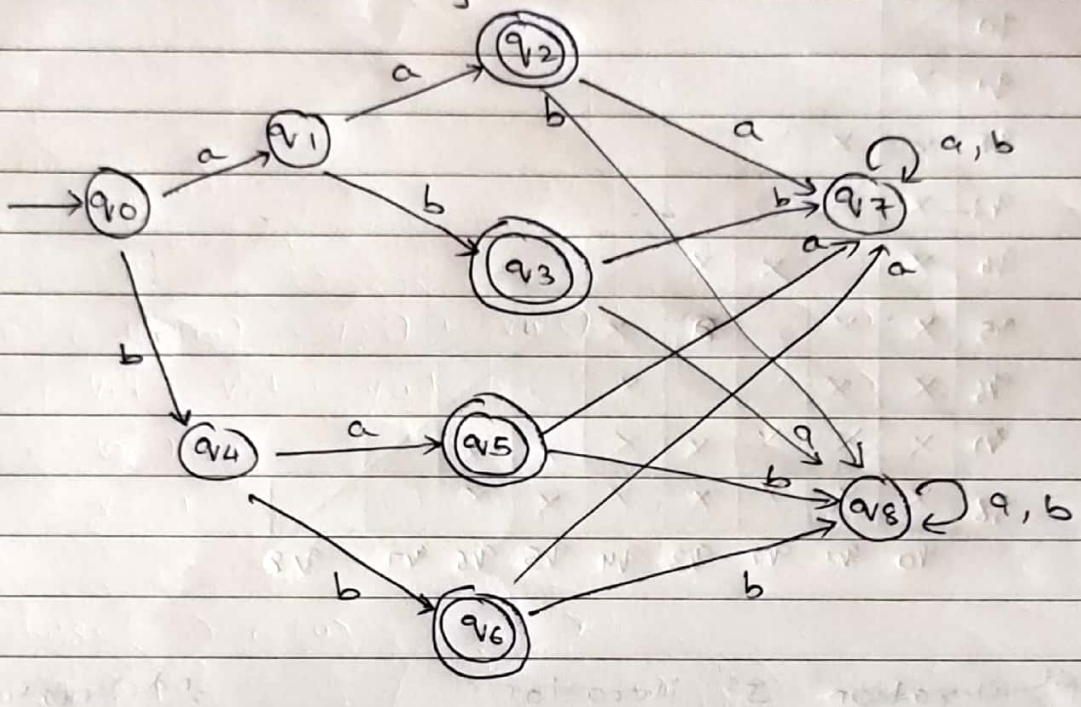
11/04/22

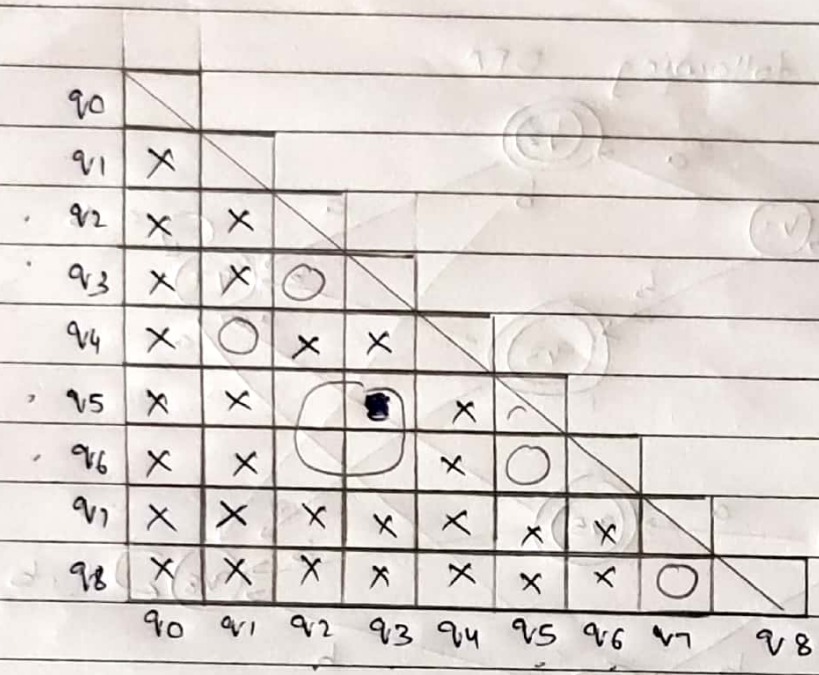
FLAT Tutorial 2

1) Minimize the following DFA

→



Q \ Σ	a	b
→ q_0	q_1	q_4
q_1	q_2	q_3
q_2*	q_7	q_8
q_3*	q_8	q_7
q_4	q_5	q_6
q_5*	q_7	q_8
q_6*	q_7	q_8
q_7	q_7	q_7
q_8	q_8	q_8



~~1st iteration~~ 1st iteration

$\delta(q_0, q_1)$

$\delta(q_0, a) = q_1$

$\delta(q_1, a) = q_2$

$\delta(q_0, q_4)$

$\delta(q_0, a) = q_1$

$\delta(q_4, a) = q_5$

2nd iteration

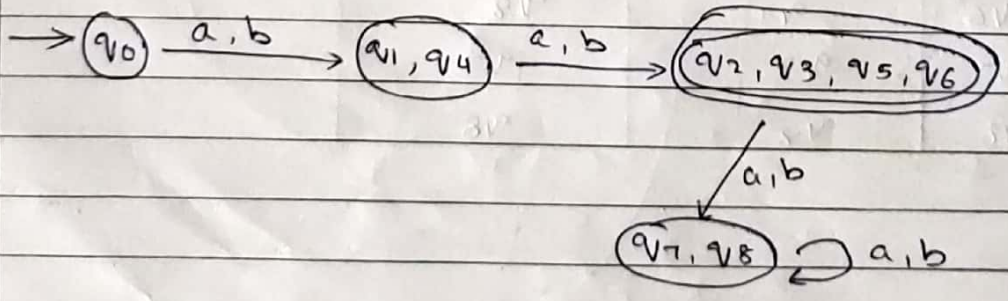
(q_0, q_7)

$\delta(q_0, a) = q_1$

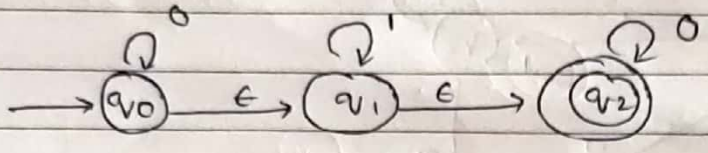
$\delta(q_7, a) = q_7$

Now, merging states:

Transition diagram:

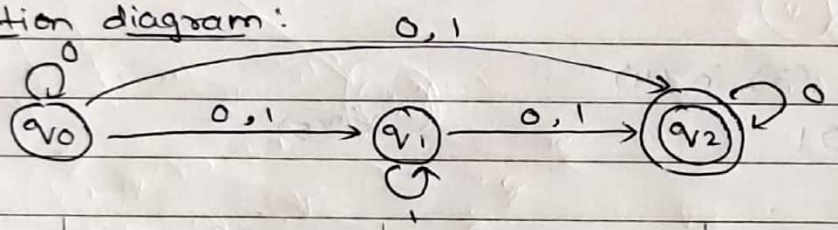


→ 2)



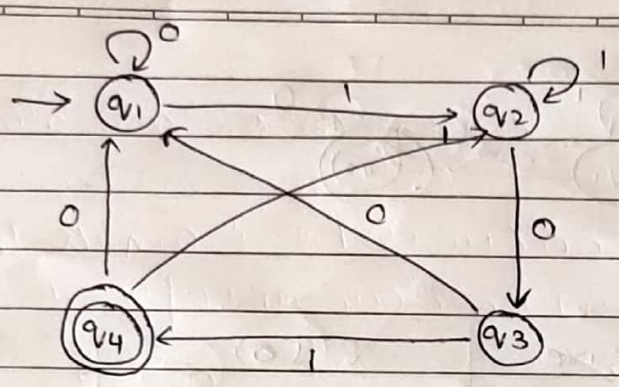
States	$Y = \epsilon$-closure	$\delta(Y, 0)$	$\delta(Y, 1)$
→ $\{q_0\}$	$\{q_0, q_1, q_2\}$	$\{q_0, q_1, q_2\}$	$\{q_1, q_2\}$
$\{q_1\}$	$\{q_1, q_2\}$	$\{q_2\}$	$\{q_1, q_2\}$
$\{q_2\}^*$	$\{q_2\}$	$\{q_2\}$	$\{\}$

Transition diagram:



	$Y = \epsilon$-closure	$\delta(Y, 0)$	$\delta(Y, 1)$
→ $\{q_0\}$	$\{q_0, q_1, q_2\}$	$\{q_0, q_1, q_2\}$	$\{q_1, q_2\}$
$\{q_0, q_1, q_2\}^*$	$\{q_0, q_1, q_2\}$	$\{q_0, q_1, q_2\}$	$\{q_1, q_2\}$
$\{q_1, q_2\}^*$	$\{q_1, q_2\}$	$\{q_2\}$	$\{q_1, q_2\}$
$\{q_2\}^*$	$\{q_2\}$	$\{q_2\}$	$\{\}$
$\{\}$	$\{\}$	$\{\}$	$\{\}$

→ 3)



$q_1 = \epsilon + q_1 0 + q_3 0 + q_4 0$ — (1)

$q_2 = q_1 1 + q_2 1 + q_4 1$ — (2)

$q_3 = q_2 0$ — (3)

$q_4 = q_3 \cdot 1$ — (4)

Substitute (3) in (4)

$q_4 = q_2 01$ — (5)

Substitute (5) in (2)

$q_2 = q_1 1 + q_2 1 + q_2 011$

$q_2 = q_1 1 + q_2 [1 + 011]$

As above equation is of form $R = Q + RP$

∴ By Arden's theorem, $R = QP^*$

~~$\therefore q_2 = q_1 1 + [1 + 011]^*$ — (6)~~

$q_2 = q_1 1 (1 + 011)^*$ — (6)

Substitute (6) in (3) & (5)

$q_3 = q_1 1 (1 + 011)^* 0$ — (7)

$q_4 = q_1 1 (1 + 011)^* 01$ — (8)

Substitute (7) and (8) in (1)

$$q_1 = E + q_1 0 + q_1 1(1+011)^* 00 + q_1 1(1+011)^* 010$$
$$q_1 = \epsilon + q_1[0 + 1(1+011)^* 0 \cdot 0 + 1(1+011)^* 010]$$

As above equation is of form $R = Q + RP$

∴ By Arden's theorem, $R = QP^*$

$$\therefore q_1 = \epsilon(0 + 1(1+011)^* 00 + 1(1+011)^* 010)^* \quad \text{— (9)}$$

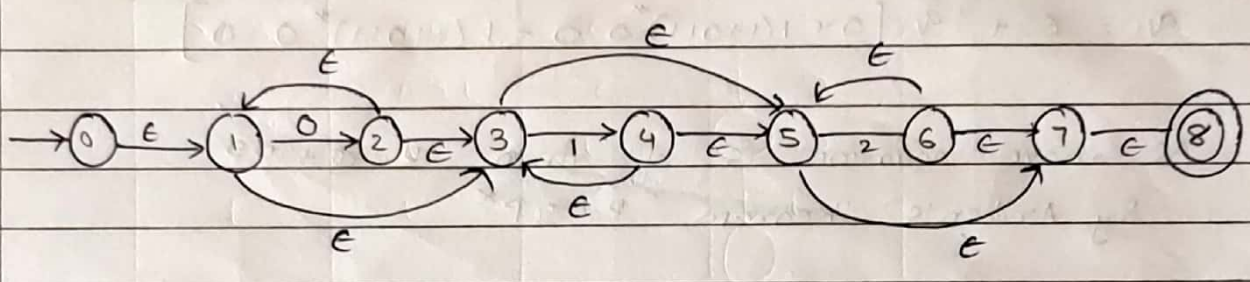
Substitute (9) in (8),

$$q_4 = [0 + 1(1+011)^* 00 + 1(1+011)^* 010]^* 1(1+011)^* 01$$

$$\therefore RE = [0 + 1(1+011)^* 00 + 1(1+011)^* 010]^* 1(1+011)^* 01$$

→ 4) . RE : $0^* . 1^* . 2^*$

. RE to NFA



. ε - closure (x)

		q = ε-closure	δ(q,0)	δ(q,1)	δ(q,2)
A →	{0}*	{1,3,5,7,8}	{2} B	{4} C	{6} D
B	{2}*	{2,3,5,7,8}	{2} B	{4} C	{6} D
C	{4}*	{5,7,8,4,3}	{ } E	{4} C	{6} D
D	{6}*	{6,5,7,8}	{ } E	{ } E	{6} D
E	{ }	{ }	{ } E	{ } E	{ } E

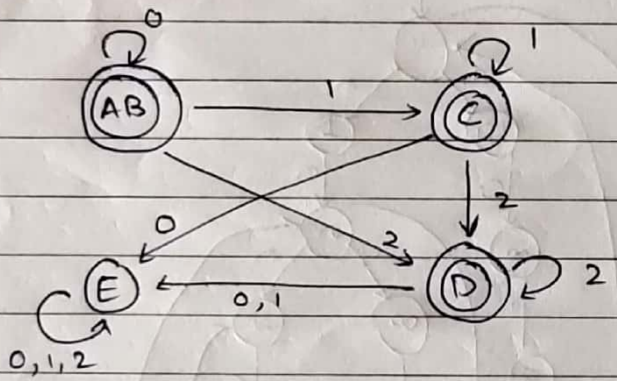
DFA

Q \ Σ	0	1	2
→ A*	B	C	D
B*	B	C	D
C*	E	C	D
D*	E	E	D
E	E	E	E

Minimized DFA

Q \ Σ	0	1	2
→ AB*	AB	C	D
C*	~~AB~~ E	C	D
D*	E	E	D
E	E	E	E

Transition diagram for min DFA



→ 5) $01[((10)^+ + 111)^* + 0]^* 1$