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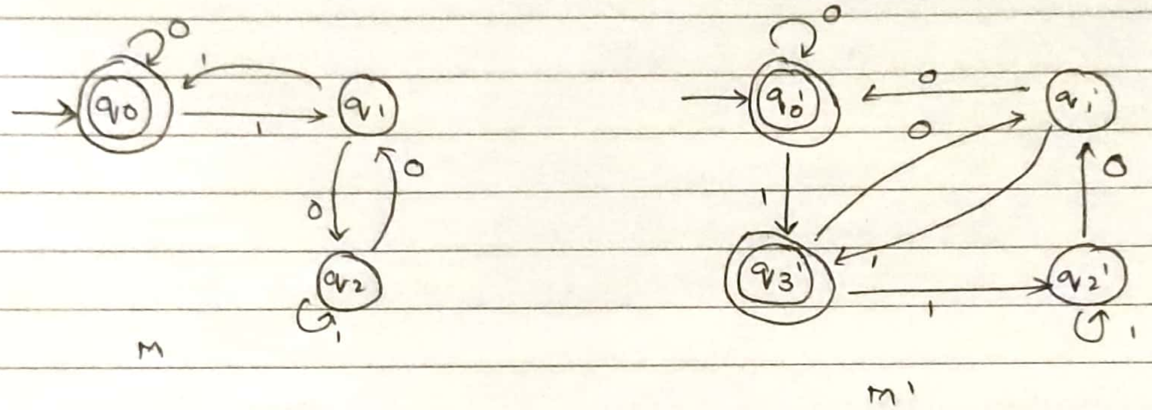
FLAT - Tutorial 3

→ 1) Two FSM's M and M' are given below. Check the equivalence of the two by applying moore's algorithm



Sol: For given FSM,

$\Sigma = \{0, 1\} = n$

So we need to create n+1 columns = 3

(V, V')	(V0, V0')	(V1, V1')
(q0, q0')	(q0, q0')	(q1, q3')

∵ (q1, q3') is a combination of intermediate state and final state, two FSM's are not equivalent.

→ 2) $(0+1)^*(00+11)$

Mealy machine is a machine in which output symbol is associated with each transition.

$M = (q_0, \Sigma, \delta, Q, S, \Delta)$

where $\Sigma = \{0, 1\}$

q_0 = initial state (q_s)

$Q = \{q_s, q_0, q_1, q_2, q_3\}$

$\Delta = (Y, N)$ Y: Accept , N: Reject

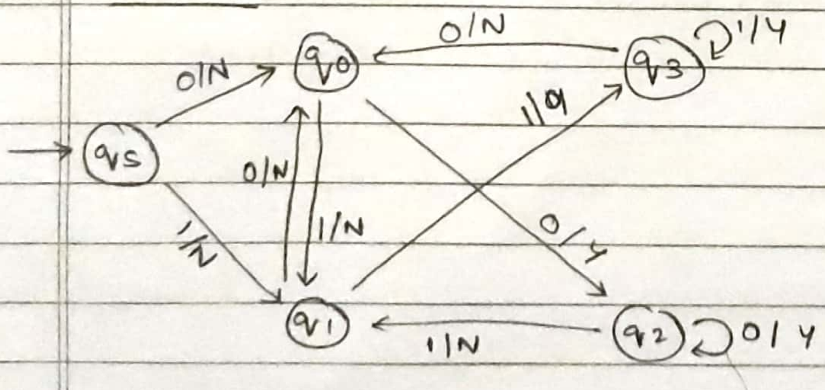
Transition Table:

Q \ Σ	0	1
→ q_s	q_0	q_1
(0) q_0	q_2	q_1
(1) q_1	q_0	q_3
(00) q_2	q_2	q_1
(11) q_3	q_0	q_3

Output Mapping:

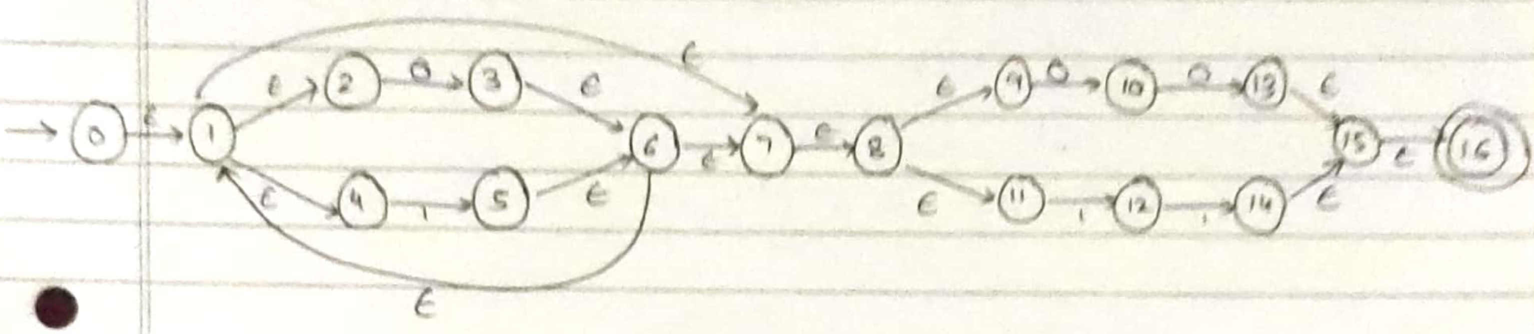
Q \ Σ	0	1
→ q_s	N	N
(0) q_0	Y	N
(1) q_1	N	Y
(00) q_2	Y	N
(11) q_3	N	Y

Diagram:



(1) Construct DFA:

RE: $(0+1)^*(00+11)$



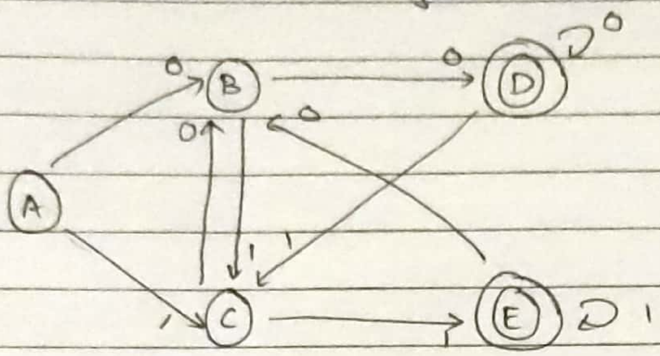
Step 2:

	ε-closure (y)	δ(y,0)	δ(y,1)
A → {0}	{0,1,2,4,7,8,9,11}	{3, 10} (B)	{5, 12} (C)
B {3,10}	{3,6,7,1,2,4,8,9,11,10,}	~~{3,10,13}~~ {3,10,13} (D)	{5,12} (C)
C {5,12}	{5,12,6,7,8,9,11,1,2,4}	{10,3} (B)	{12,14,5} (E)
D {3,10,13}*	{3,10,13,6,7,8,9,11,1,2,4,15,16}	{3,10,13} (D)	{5,12} (C)
E {5,12,14}*	{5,12,14,6,7,8,9,11,1,2,4,15,16}	{10,3} (B)	{5,12,14} (E)

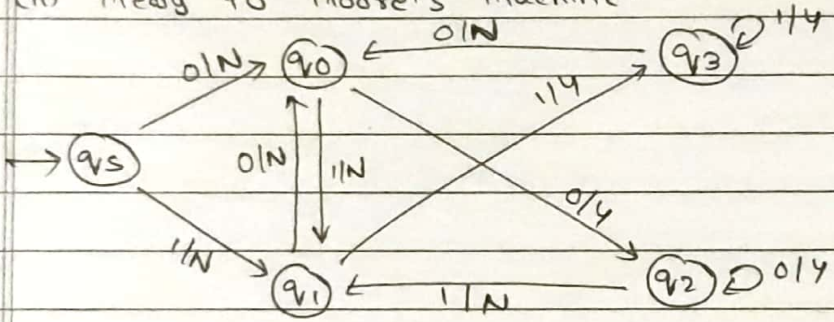
Step 3:

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

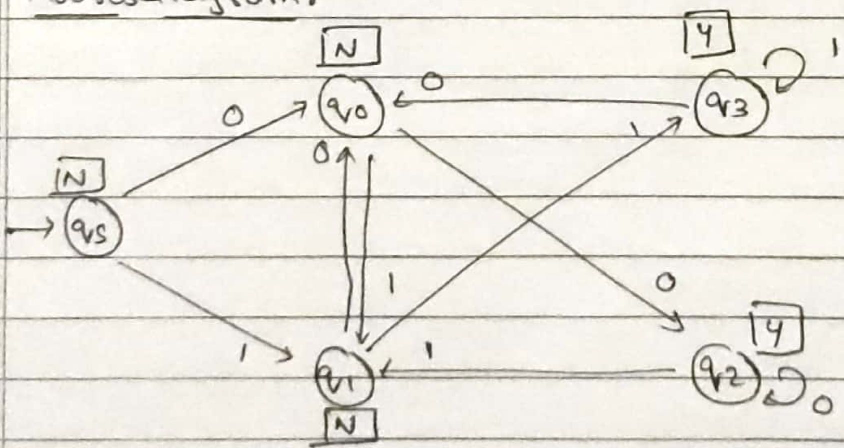
Step 4: Transition diagram DFA



(ii) Mealy to Moore's Machine:



Moores diagram:



→ 3) $S \rightarrow aB \mid bA$

$A \rightarrow a \mid aS \mid bAA$

$B \rightarrow b \mid bS \mid aBB$

String: 'aaabbabbba'

i) LMD

$S \rightarrow aB$ $(S \rightarrow aB)$

$\xrightarrow{lmd} aaBB$ $(B \rightarrow aBB)$

$\xrightarrow{lmd} aaaBBB$ $(B \rightarrow aBB)$

$\xrightarrow{lmd} aaabBB$ $(B \rightarrow b)$

$\xrightarrow{lmd} aaabbSB$ $(B \rightarrow bS)$

$\xrightarrow{lmd} aaabbaBB$ $(S \rightarrow aB)$

$\xrightarrow{lmd} aaabbabB$ $(B \rightarrow b)$

$\xrightarrow{lmd} aaabbabbS$ $(B \rightarrow bS)$

$\xrightarrow{lmd} aaabbabbbA$ $(S \rightarrow bA)$

$\xrightarrow{lmd} aaabbabbba$ $(A \rightarrow a)$

2) RMd

$S \rightarrow aB$ $(S \rightarrow aB)$

$\xrightarrow{rmd} aaBB$ $(B \rightarrow aBB)$

$\xrightarrow{rmd} aaBbS$ $(B \rightarrow bS)$

$\xrightarrow{rmd} aaBbbA$ $(S \rightarrow bA)$

$\xrightarrow{rmd} aaBbba$ $(A \rightarrow a)$

$\xrightarrow{rmd} aaaBBbba$ $(B \rightarrow aBB)$

$\xrightarrow{rmd} aaaBbbba$ $(B \rightarrow b)$

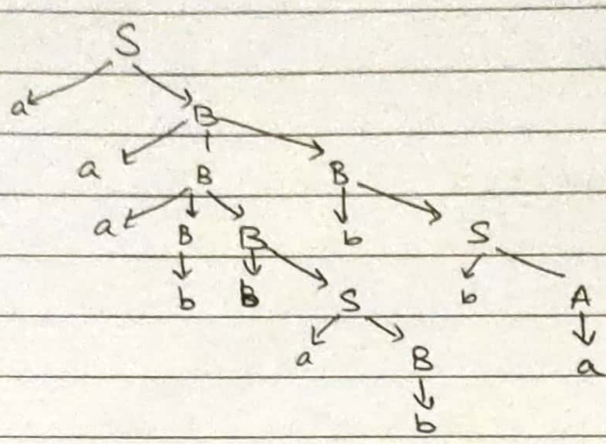
$\xrightarrow{rmd} aaabSbbba$ $(B \rightarrow bS)$

$\xrightarrow{rmd} aaabbAbbba$ $(S \rightarrow bA)$

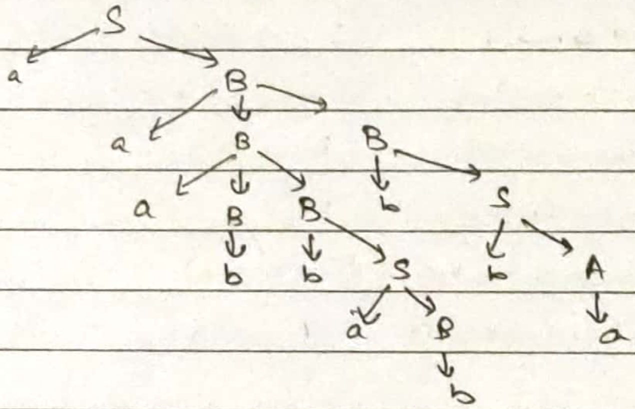
$\xrightarrow{rmd} aaabbabbba$ $(A \rightarrow a)$

Parse tree

LMD



RMD



→ 4) $S \rightarrow xSY \mid xx \mid yY$

$X \rightarrow xA \mid \epsilon$

$Y \rightarrow yB \mid \epsilon$

Here, there are two ϵ- productions,

$X \rightarrow \epsilon$, $Y \rightarrow \epsilon$

After eliminating ϵ- production,

$\therefore S \rightarrow xSY \mid xx \mid yY \mid xS \mid x \mid y$

$X \rightarrow xA$

$Y \rightarrow yB$

~~Productions of A and B are not present, they can be eliminated~~

~~$\therefore S$ —~~

→ 5) $S \rightarrow A \mid bb$ $\quad\Rightarrow\quad$ $S \rightarrow A \mid bb \mid a$

$A \rightarrow B \mid b$ $\quad\quad\quad\quad$ $A \rightarrow B \mid b$

$S \rightarrow a$

Production B is not present, hence it can be removed

$\therefore S \rightarrow A \mid bb \mid a$

$A \rightarrow b$

$\because S \rightarrow A$ is a unit product, it can be eliminated.

$\therefore S \rightarrow b \mid bb \mid a$