Q2

Q \ Σ	0	1
→q_0	q_1	q_2
q_1	q_3	q_4
q_2	q_5	q_6
q_3	q_3	q_4
q_4	q_5	q_6
q_5	q_3	q_4
q_6	q_5	q_c
q_7	q_4	q_5

(1) Redundant state.

$\delta(q_0, 0) = q_1$ $\delta(q_0, 1) = q_2$ $S = \{q_0 q_1 q_2\}$

→ $S = \{q_0 q_1 q_2 q_3 q_4\}$

→ $S = \{q_0 q_1 q_2 q_3 q_4 q_5 q_6\}$

→ —"—

→ —"—

→ —"—

q_6 → —"—

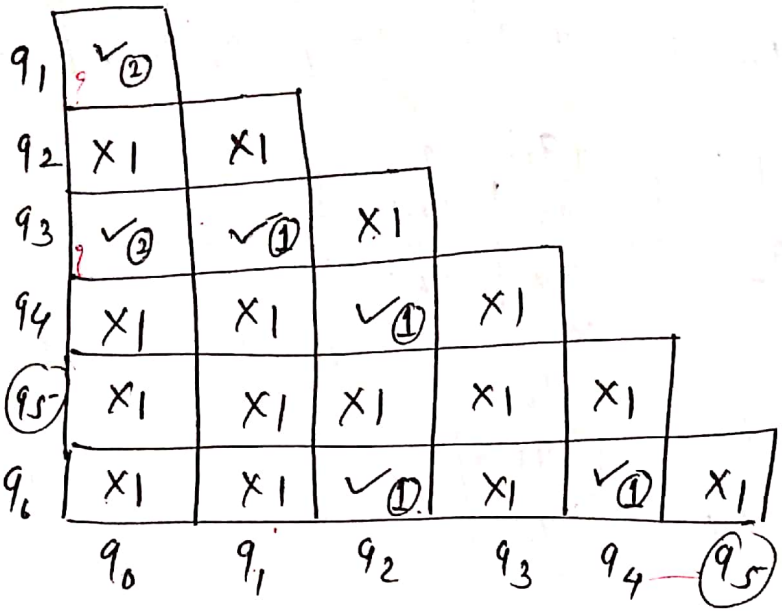
$S = \{q_0 q_1 q_2 q_3 q_4 q_5 q_6\}$

$\{Q - S\} = \{q_7\}$ redundent state.

(3)

square optimisation

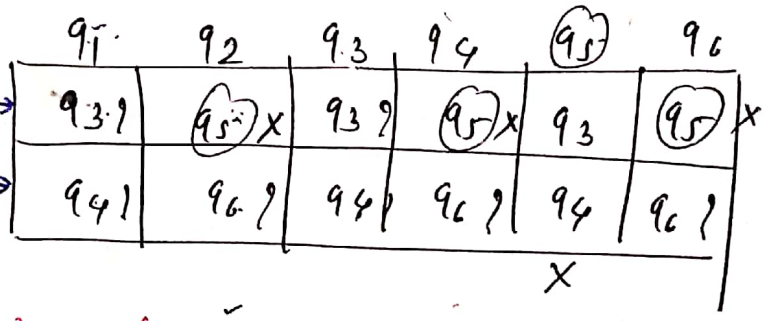
Visualization

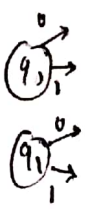


pass1

$\delta(q_0, 0) = q_1$

$\delta(q_0, 1) = q_2$



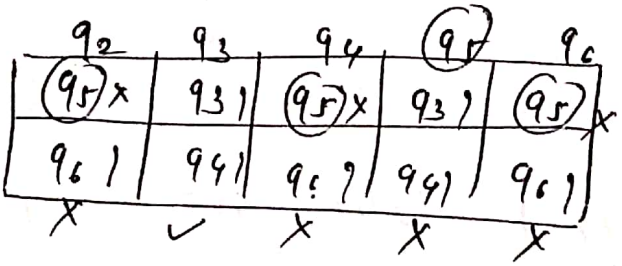


① $(q_0\ q_1) = (q_1\ q_3)\ (q_2\ q_4)$

② $(q_0\ q_3) = (q_1\ q_3)\ (q_2\ q_4)$

$\delta(q_1, 0) = q_3$

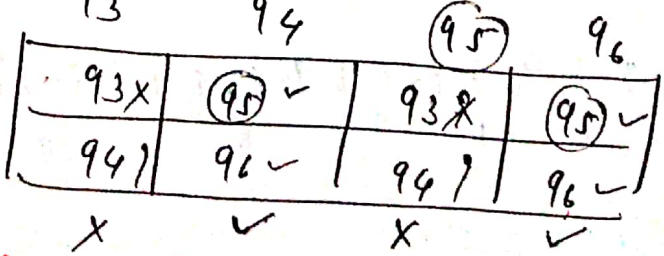
$\delta(q_1, 1) = q_4$



③ $(q_1\ q_3) = (q_3\ q_3)\ (q_4\ q_4)$ ✓

$\delta(q_2, 0) = q_5$

$\delta(q_2, 1) = q_6$



$(q_2\ q_4) = (q_5\ q_5)\ (q_6\ q_6)$ ✓

$(q_2\ q_6) = (q_5\ q_5)\ (q_6\ q_6)$ ✓

④

q_1 q_5 $q_0 \dots q_6$

$\delta(q_3, 0) = q_3$

$\delta(q_3, 1) = q_4$

q_4	q_5	q_6
q_5 X	q_3	q_5 X
q_6 ✓	q_4	q_6 ✓
X	X	X

$\delta(q_4, 0) = q_5$

$\delta(q_4, 1) = q_6$

q_5	q_6
q_3	q_5 ✓
q_4	q_6 ✓
X	✓

$(q_4\ q_6) = (q_5, q_5)\ (q_6\ q_6)$ ✓

$\delta(q_5, 0) = q_3$

$\delta(q_5, 1) = q_4$

q_6
q_5 X
q_6 ✓
X

pass 2

$(q_0\ q_1) = (q_1\ q_3)\ (q_2\ q_4)$ so ✓ pass 2

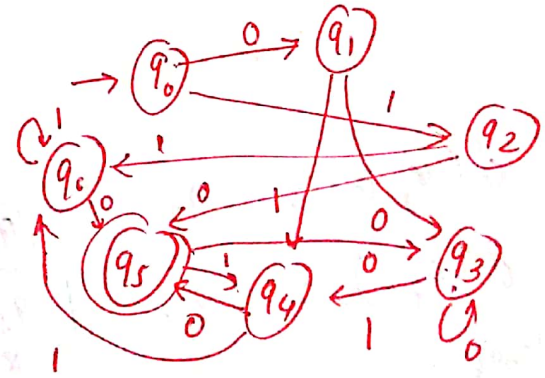
$(q_0\ q_3) = (q_1\ q_3)\ (q_2\ q_4)$ so ✓ in pass 2

$(q_1\ q_3)$ ✓

$(q_2\ q_4)$ ✓

$(q_2\ q_6)$ ✓

$(q_4\ q_6)$ ✓

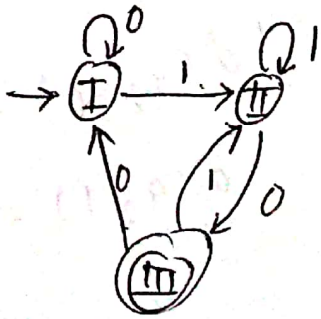


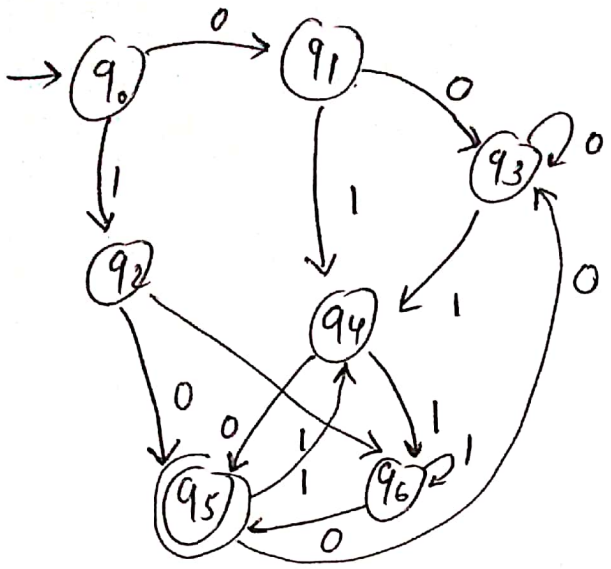
equivalent states are

$Q = \{\{q_0\ q_1\ q_3\}\ \{q_2\ q_4\ q_6\}\ \{q_5\}\}$

DFA $Q = \{[q_0\ q_1\ q_3]\ [q_2\ q_4\ q_6]\ [q_5]\}$

I II III





$\pi_0 = [\{q_0\ q_1\ q_2\ q_3\ q_4\ q_5\ q_6\}$
NF

$q_0 \equiv \{q_1, q_3\}$

$q_2 \equiv \{q_4, q_6\}$

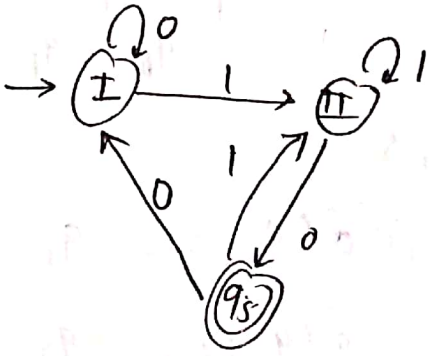
$\pi_1 = [\{q_0\ q_1\ q_3\}\ \{q_2\ q_4\ q_6\}\ \{q_5\}$

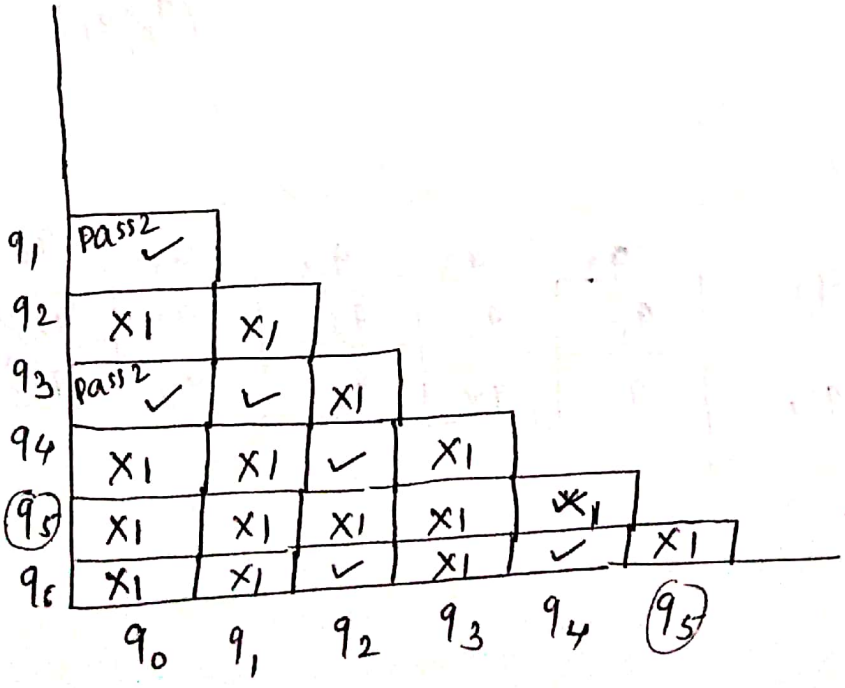
$q_0 \equiv q_1, q_3$

$q_2 \equiv q_4\ q_6$

π_0 & π_1 are same.

Q	0	1
→ [$q_3\ q_1\ q_0$] I	[$q_0\ q_1\ q_3$]	[$q_2\ q_4\ q_6$]
[$q_2\ q_4\ q_6$] II	{q_5}	[$q_2\ q_4\ q_6$]
(q_5) III	[$q_0\ q_1\ q_3$]	[$q_2\ q_4\ q_6$]





q_1, q_3, q_0

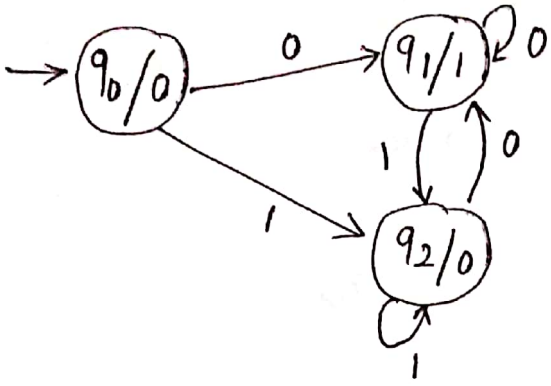
$q_2\ q_4\ q_6$

q_5

(2) Moore machine – 1's complement of given binary no.

$M = (Q, \Sigma, \Delta, \delta, \lambda, q_0)$ $\Sigma = \{0, 1\}$ $\Delta = \{0, 1\}$

$q_0 = \{q_0\}$

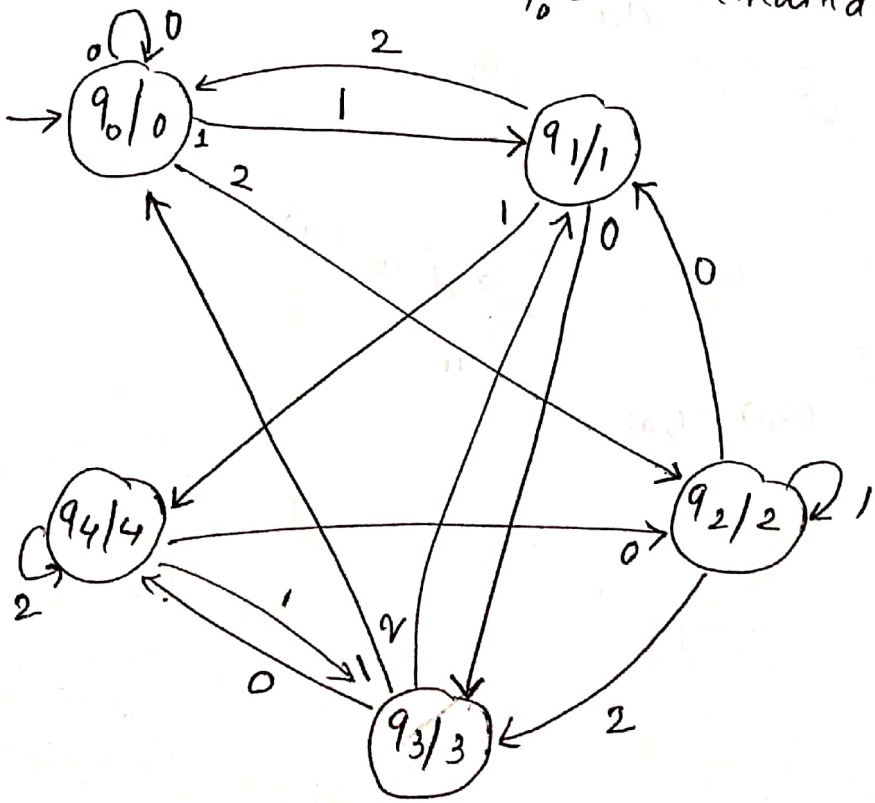


δ:	0	1	o/p (λ)
→ q_0	q_1	q_2	0
q_1	q_1	q_2	1
q_2	q_1	q_2	0

(2) $\Sigma = \{0, 1, 2\}$ residue modulo 5 [ternary no.]

residue mod 5 = remainder 5 kesher

n % 5 remainder 0, 1, 2, 3, 4



0: 0
1: 01
2: 02
3: 0010
4: 0011

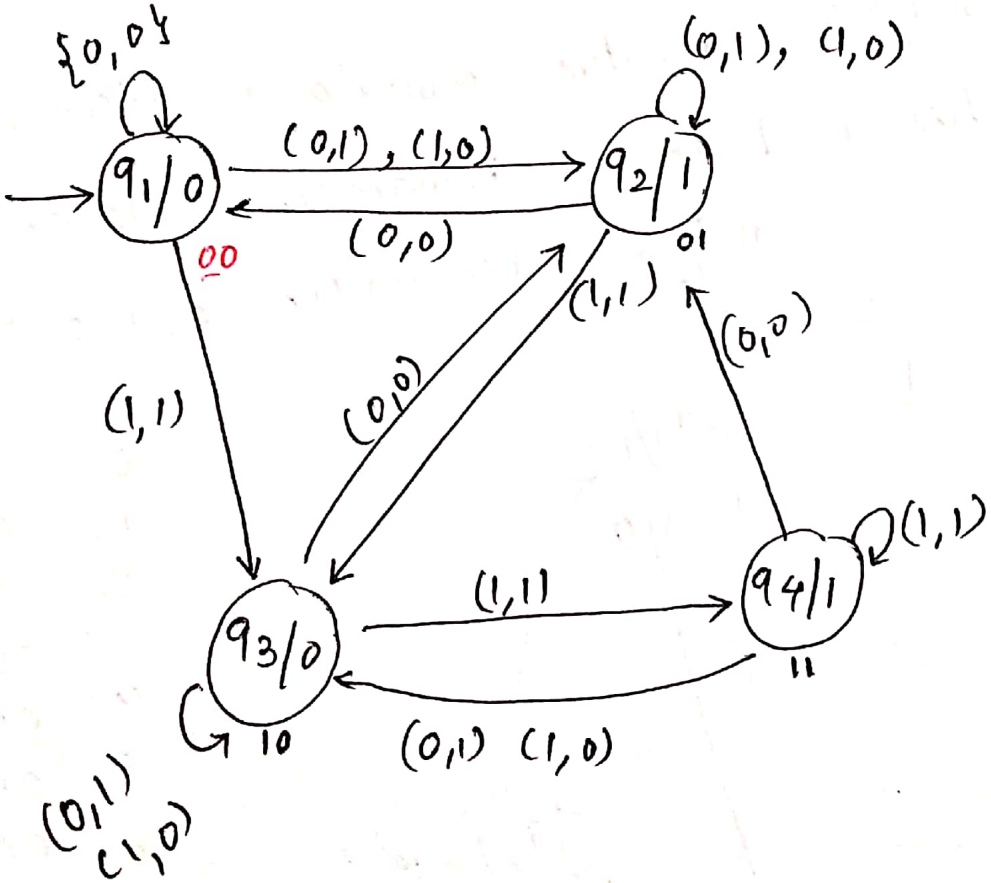
0 5: 0012
1 6: 0020
2 7: 0021
3 8: 0022
4 9: 0100

0 10: 0101
1 11: 0102
2 12: 1000
3 13: 1001
4 14: 1002
15: 1010

1000 (27/5) = 0112

(4) moore machine – adds binary numbers.

		c	sum	
	0+0 =	0	0	$\longrightarrow q_1$
	0+1 =	0	1	$\longrightarrow q_2$
	1+0 =	0	1	
NC	1+1 =	1	0	$\longrightarrow q_3$
C	1+1 =	10 + 1 = 11		$\longrightarrow q_4$



1011
+ 1001
10100

00010

I/P 10011000101 1

↓ ↓

CCACBCAACCCB

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

ends 00 → A

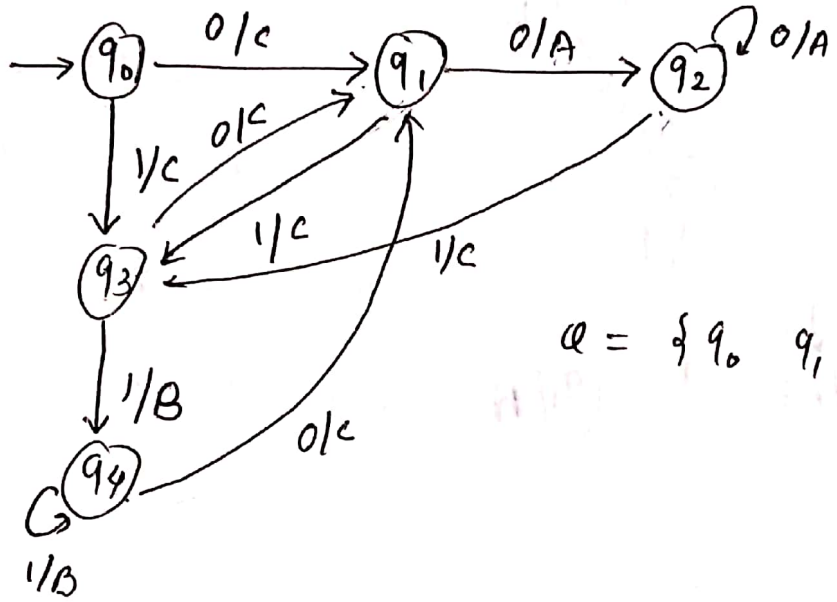
ends 11 → B

else → C

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

$\Sigma = \{0, 1\}$ $\Delta = \{A, B, C\}$ $q_0 = q_0$

δ:

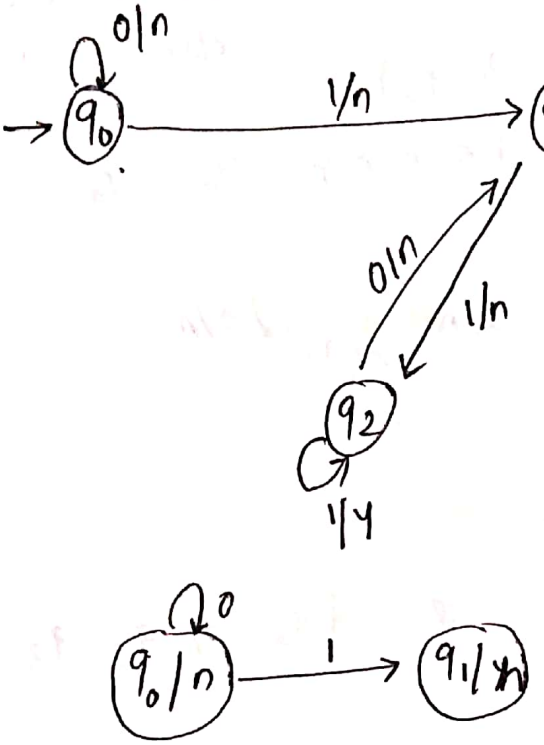


$Q = \{q_0\ q_1\ q_2\ q_3\ q_4\}$

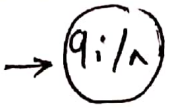
Q \ Σ	0	O/P	1	O/P
		F		F
q_0	q_1	C	q_3	C
q_1	q_2	A	q_3	C
q_2	q_2	A	q_3	C
q_3	q_1	C	q_4	B
q_4	q_1	C	q_4	B

(6) construct equivalent moore machine

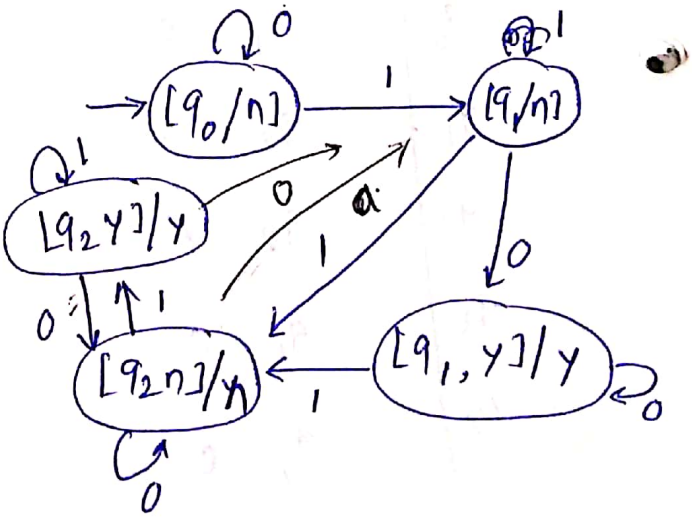
No. of states = 3×2



q	Σ 0	λ(0)	1	λ(1)
q_0	q_0	n	q_1	n
q_1	q_1	y	q_2	n
q_2	q_1	n	q_2	y

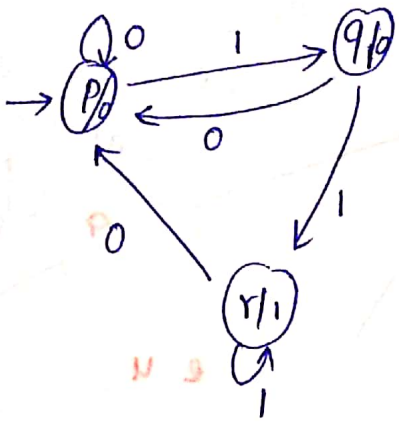


q	Σ 0	1	O/P
$[q_0, n]$	$[q_0 n]$	$[q_1 n]$	n
~~$[q_0 y]$~~			y
$[q_1, n]$	$[q_1 y]$	$[q_2 n]$	n
$[q_1, y]$	$[q_1 y]$	$[q_2 n]$	y
$[q_2 n]$	$[q_1 n]$	$[q_2 y]$	n
$[q_2, y]$	$[q_1 n]$	$[q_2 y]$	y



(7) Moore – mealy

Q \ Σ	0	1	Δ
→ p	p	q	0
q	p	r	0
r	p	r	1

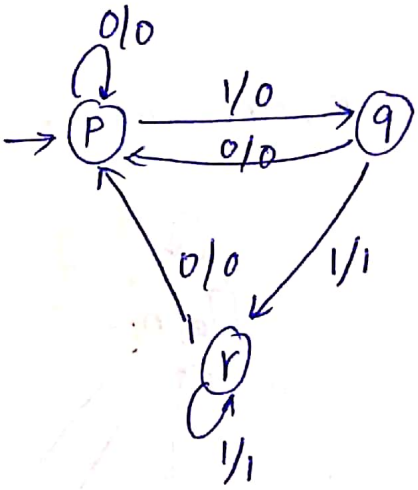


$M = (Q, \Sigma, \delta, \Delta, \lambda, q_0)$

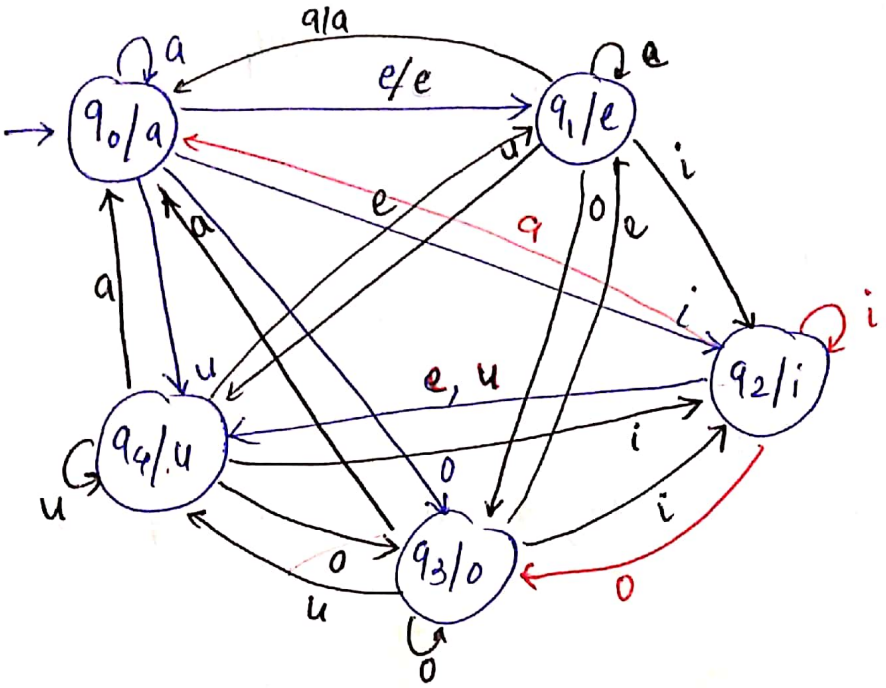
$Q = \{p, q, r\}$ $\Sigma = \{0, 1\}$ $\Delta = \{0, 1\}$ q_0 = initial

Mealy m/c

Q \ Σ	0	$\lambda(0)$	1	$\lambda(1)$
→ p	p	0	q	0
q	p	0	r	1
r	p	0	r	1

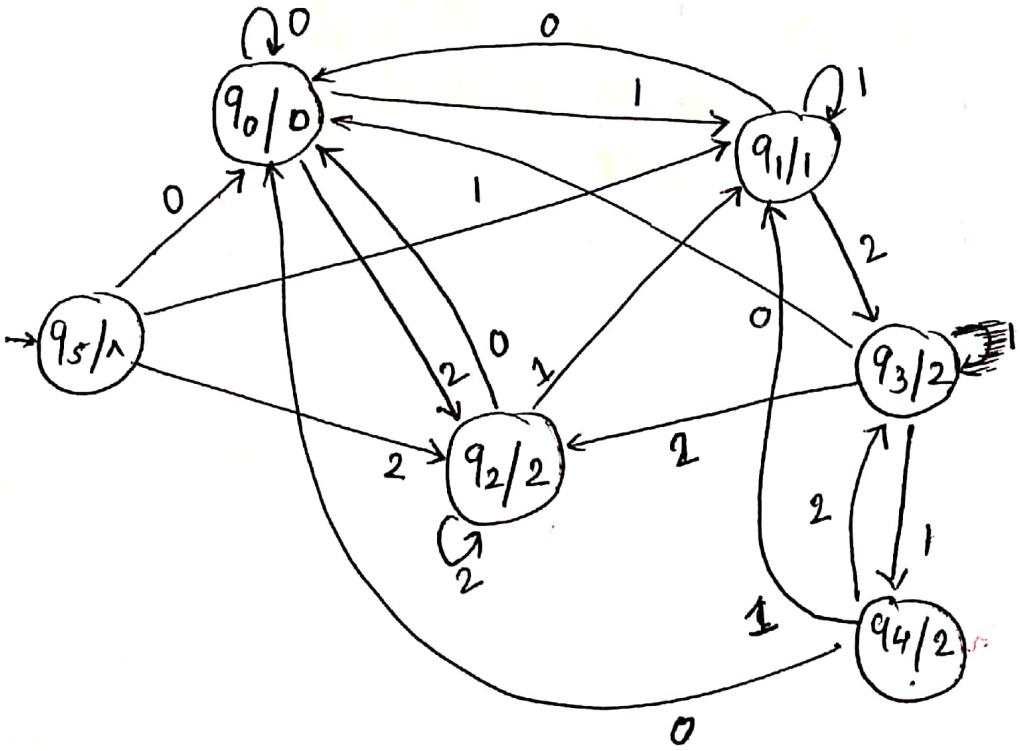


(8) aeiou → same o/p if ie → ie, ue



a

q/10 moore m/c – 121 to 122 over Σ = {0, 1, 2}

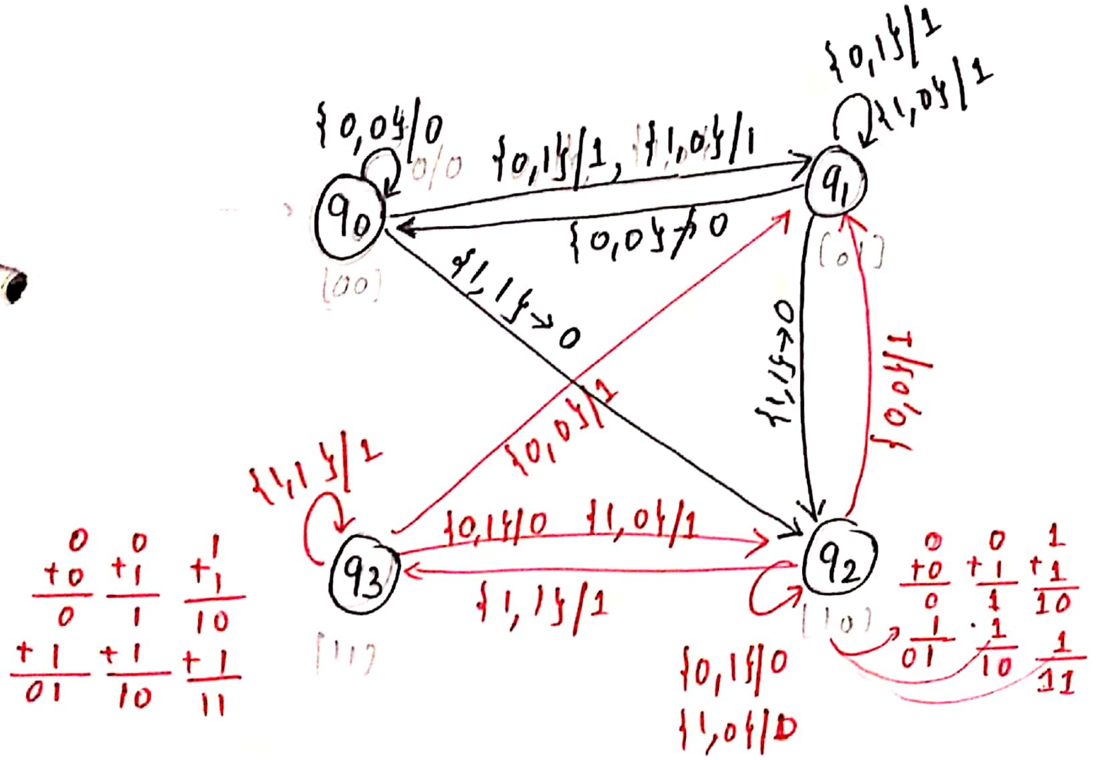


0121212212021012021212

0 1 2 2 2 2 2 1 2 0 2 1 0 1 2 0 2 1 2 2

(11) mealy m/c to add 2 bin nos.

		c	s
00	→	0	0
01	→	0	1
10	→	0	1
11		1	0
11		1	1



0101
1101

1000
0001
1