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AT   TUTORIAL NO: 4

Q1] Design Moore Machine to convert each occurence of 100 to 101.

Ans: Let $q_0 \longrightarrow$ string ending in 0

$\qquad q_1 \longrightarrow$ string ending in 1

$\qquad q_2 \longrightarrow$ string ending in '10'

$\qquad q_3 \longrightarrow$ string ending in '100'

$\qquad q_{s,0} \longrightarrow$ string ending in 'ε'

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

$\delta : Q \times \varepsilon \longrightarrow Q$

$\varepsilon = \{0, 1\}$

$\Delta = \{0, 1\}$

$\lambda : Q \times \varepsilon = \Delta$

Q	0	1	o/p
$\rightarrow q_s$	q_0	q_1	0
q_0	q_0	q_1	0
q_1	q_2	q_1	1
q_2	q_3	q_1	0
q_3	q_3	q_3	1
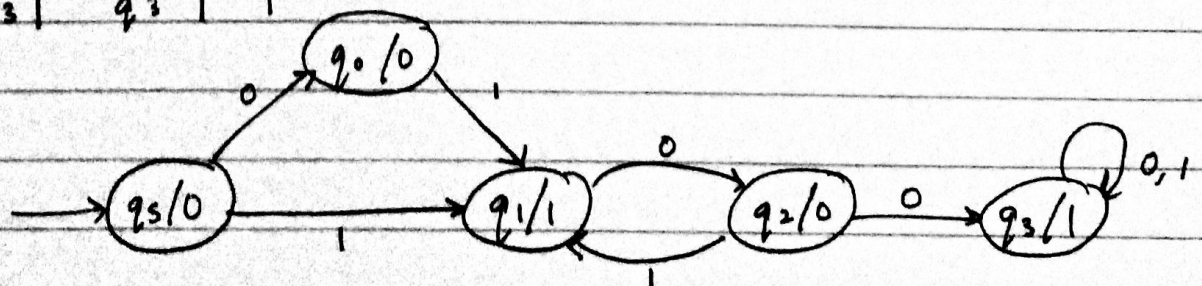
Q.2] Design a Melay Machine over the alphabet $\{0,1\}$ which outputs EVEN, ODD according to the number of 1's encountered as even or odd.

Ans: Let $q_0 \longrightarrow$ even no. of 1s

$q_1 \longrightarrow$ odd no. of 1s

$Q = \{q_0, q_1\}$

$\Delta = \{\text{EVEN}/\text{ODD}\}$

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

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

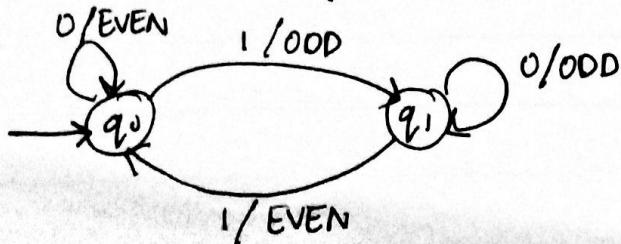$\lambda : Q \times \Sigma = \Delta$

$q_0 =$ initial state.

Moore transition Table:

Q	0	1	o/p
$\to q_0$	q_0	q_1	EVEN
q_1	q_1	q_0	ODD

Mealy Transition Table:

Q	0	1
$\to q_0$	q_0 EVEN	q_1 ODD
q_1	q_1 ODD	q_0 EVEN

Mealy Transition Diagram:

Q.3] Construct a Moore Machine equivalent to following Mealy Machine.
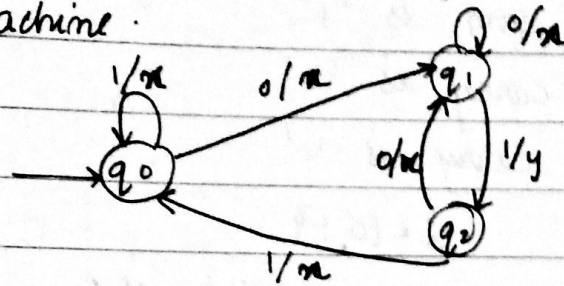
Ans. Moore Transition Table

Q	0	1	o/p
→ q_0	q_1	q_0	x
q_1	q_1	q_2	x
q_2	q_1	q_0	y

$Q = \{q_0, q_1, q_2\}$ $\Sigma = \{0, 1\}$

$\Delta = \{x, y\}$

$q_0 \rightarrow$ initial state

$\delta : Q \times \Sigma \cdot Q$

Transition Diagram:
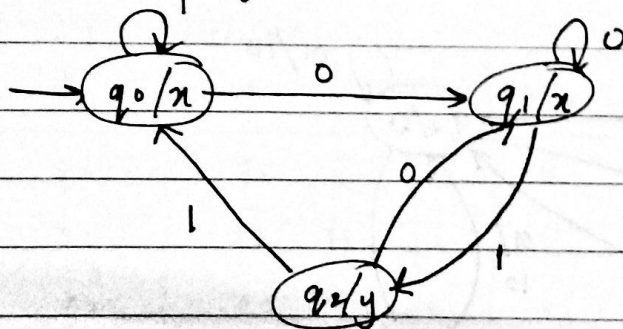
Q.4] Design a Melay Machine for binary adder.

Ans: Let $q_0 \longrightarrow$ state for sum is '0'

$\qquad q_1 \longrightarrow$ state for sum is '1'

$\qquad q_2 \longrightarrow$ state for carry is '0'

$\qquad q_3 \longrightarrow$ state for carry is '1'

$Q = \{q_0, q_1, q_2, q_3\}$ $\qquad \Sigma = \{0, 1\}$
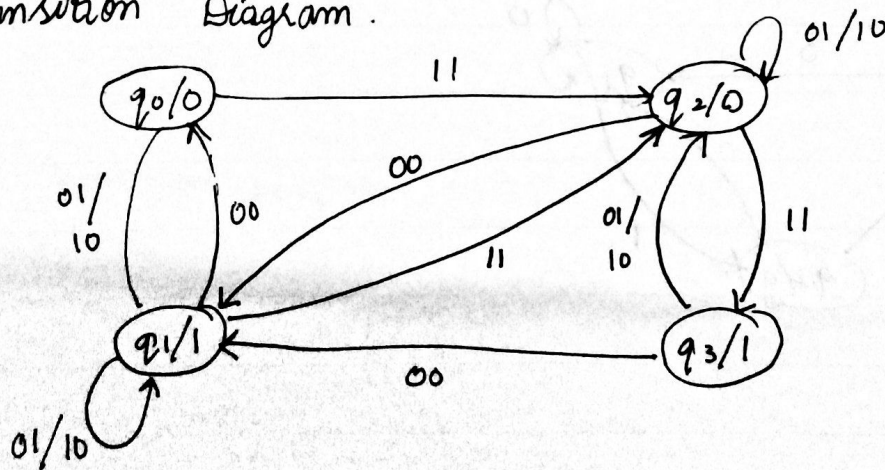
$\Delta = \{0, 1\}$ $\qquad q_0 \longrightarrow$ initial state.

$m = (Q, \Sigma, T, \delta, q_0, Z, F)$

Consider Σ as combination of 2 inputs

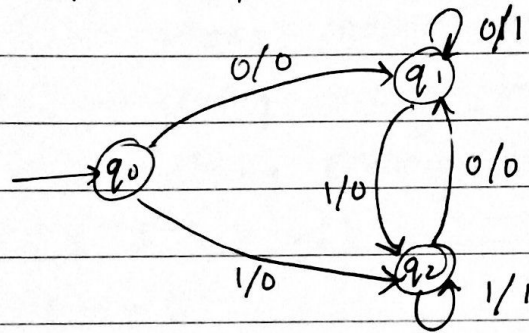| δ	00	01	10	11	o/p
q_0	q_0	q_1	q_1	q_2	0
q_1	q_0	q_1	q_1	q_2	1
q_2	q_1	q_2	q_2	q_3	0
q_3	q_1	q_2	q_2	q_3	1

Transition Diagram.

Q.5] Construct a Mealy Machine that accepts strings ending in '00' and '11'. Convert the same to Moore Machine.

Ans: Mealey Machine.

Q	0	1
→ q_0	$q_0, 0$	$q_2, 0$
q_1	$q_1, 1$	$q_2, 0$
q_2	$q_1, 0$	$q_2, 1$

Moore Machine.

Q	0	1	O/P
q_s	q_0	q_1	ε
q_0'	q_0'	q_1	0
q_0	q_0'	q_1	1
q_1	q_0	q_1'	0
q_1'	q_0	q_1'	1