⑧ * mealy m/c
moore m/c

FA with output

① FA is 5 tuple $m = (Q, \Sigma, \delta, q_0, F)$

2 types.

- DFA
  - $\delta: Q \times \Sigma \rightarrow Q$
- NFA
  - (ϵ): $\delta: Q \times (\Sigma \cup \{\epsilon\}) \rightarrow 2^Q$
  - (without ϵ): $\delta: Q \times \Sigma \rightarrow 2^Q$

② DFA/NFA acts as an acceptor/rejector.

$\rightarrow$ $q_{initial}$ ~~~ $q_0 q_1 \cdots q_n$ q_{final}

either accepts or rejects.

③ Extend the functionality DFA by generating o/p symbol for i/p symbol. & No final state. 2 types.

moore machine

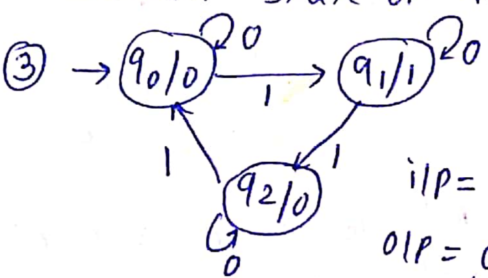
① $m = (Q\ \Sigma\ \delta\ \Delta\ \lambda\ q_0)$

Δ = output alphabet

$\delta: \Sigma \times Q \rightarrow Q \quad \lambda: Q \rightarrow \Delta$

② o/p symbol depends on the current state of m/c

③



i/p = 0110

o/p = 0 $\boxed{0100}$

extra

④ Table

Q \ Σ	0	1	o/p
→ q_0	q_0	q_1	0
q_1	q_1	q_2	1
q_2	q_2	q_0	0

mealy machine

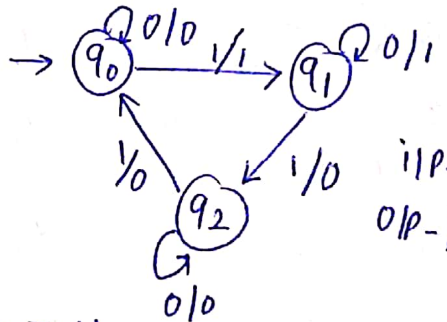
① $m = (Q\ \Sigma\ \delta\ \Delta\ \lambda\ q_0)$

Δ = output alphabet

$\delta: \Sigma \times Q \rightarrow Q \quad \lambda: \Sigma \times Q \rightarrow \Delta$

② o/p symbol depends on current state and i/p symbol.

③



i/p - 0110

o/p - $\boxed{0100}$

④ Table

Q \ Σ	0	λ(0)	1	λ(1)
→ q_0	q_0	0	q_1	1
q_1	q_1	1	q_2	0
q_2	q_2	0	q_0	0

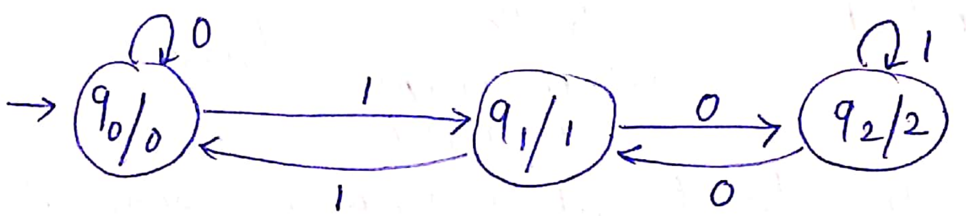
moore m/c $\xrightarrow{\text{to}}$ mealy m/c

Q- Design residue mod 3 for binary nos. & moore m/c then convert it to mealy m/c.

① $\xrightarrow{\text{def}}$ moore m/c is a type of DFA where o/p symbol is generated for every i/p symbol, and there is no dead state.

② $\xrightarrow{\text{let}}$ $m = (Q\ \Sigma\ \delta\ \Delta\ \lambda\ q_0)$ is moore m/c. for residue mod 3 for binary numbers.

0	000
1	001
2	010
0	011
1	100
2	101
0	110
1	111
2	1000



$Q \backslash \Sigma$	0	1	$\lambda(q)$
$\rightarrow q_0$	q_0	q_1	0
q_1	q_2	q_0	1
q_2	q_1	q_2	2

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

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

$\Delta = \{0, 1, 2\}$

δ & λ as per diagram

$q_0 = q_0$

③ Equivalent mealy m/c -

$\lambda'(q, 0) = \lambda(\delta(q, 0))$

$\lambda'(q_0, 0) = \lambda(\delta(q_0, 0))$

$= \lambda(q_0) = 0$

δ'

$Q \backslash \Sigma$	0	$\lambda(0)$	1	$\lambda(1)$
$\rightarrow q_0$	q_0	0	q_1	1
q_1	q_2	2	q_0	0
q_2	q_1	1	q_2	2

o/p of q_1 o/p of q_2

$m' = (Q'\ \Sigma'\ \delta'\ \Delta'\ \lambda'\ q_0')$

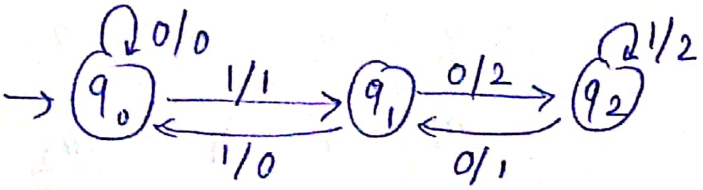
$Q' = \{q_0\ q_1\ q_2\}$

$\Sigma' = \{0, 1\}$ $\Delta' = \{0, 1, 2\}$

δ' & λ' as per diagram

$q_0' = q_0$

λ'



mealy m/c $\xrightarrow{to}$ moore m/c

Design mealy machine that scans string of 0's and 1s. If string ends with "00" o/p = A "11" then o/p is B. otherwise o/p is c.

defn

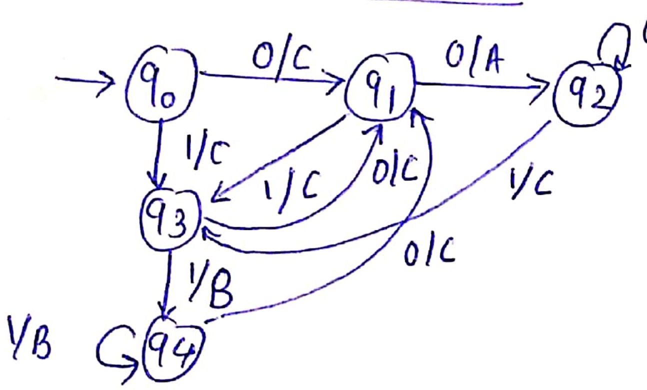
1) → mealy machine is a type of DFA where for every i/p symbol output symbol is generate there is no ~~outp~~ final state. It is a machine

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

Q = set of states. Σ = input alphabet

q_0 = Initial state. $\delta: Q \times \Sigma \to Q$ $\lambda: Q \times \Sigma \to \Delta$

② Transition diagram



Q \ Σ	0	λ(0)	1	λ(1)
→ 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

$M = (Q\ \Sigma\ \Delta\ \delta\ \lambda\ q_0)$ $Q = \{q_0, q_1, q_2, q_3, q_4\}$ $\Sigma = \{0, 1\}$

$\Delta = \{A, B, C\}$ $q_0 = q_0$

③ Equivalent moore machine - (add states)

Q \ Σ	0	1	λ
→ q_0	$[q_1 C]$	$[q_3, C]$	∧ or ε
$[q_1 C]$	$[q_2 A]$	$[q_3, C]$	C
$[q_2 A]$	$[q_2 A]$	$[q_3 C]$	A
$[q_3 C]$	$[q_1 C]$	$[q_4 B]$	C
$[q_4 B]$	$[q_1 C]$	$[q_4 B]$	B