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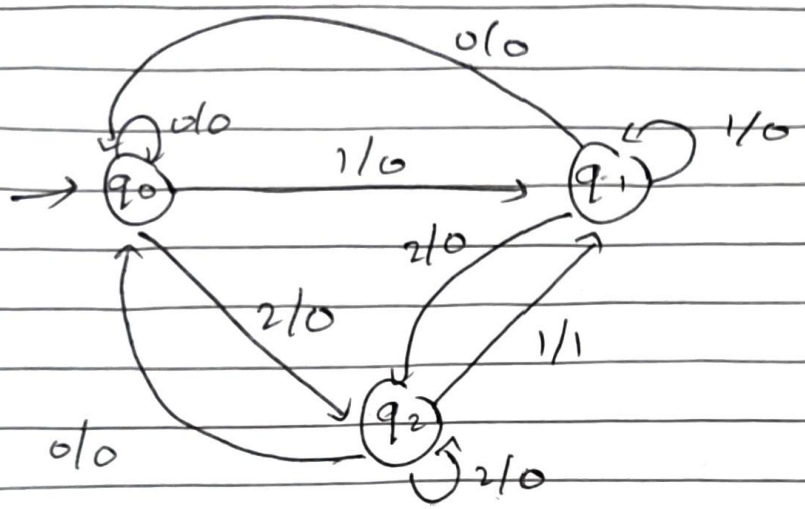
9913
TE - comps A

4/9/24 T.C.S M.W

Q.1 design a mealy machine for alphabets (0,1,2) which converts each occurrence of substring 10,21 to 0,2.

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



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

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

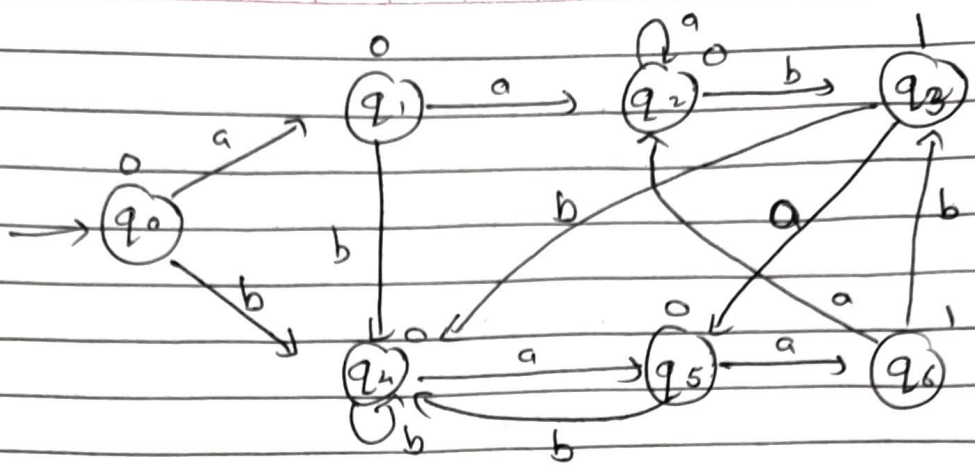
$\Delta = \{0,1,2\}$

$d : Q \times \Sigma \rightarrow \Delta$

$q_0 = q_0$

state	input 0	out	in 1	out	in 2	out
q_0	q_0	0	q_1	0	q_2	0
q_1	q_0	0	q_1	0	q_2	0
q_2	q_0	0	q_1	1	q_2	0

Q.2



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

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

$\Sigma = \{a, b\}$

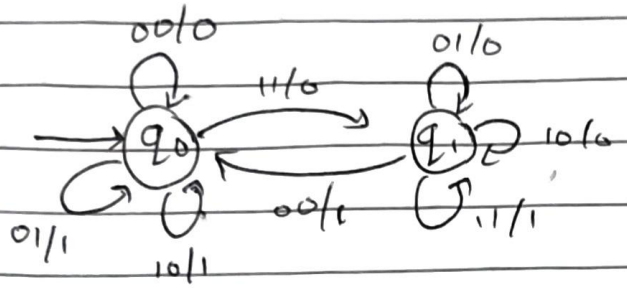
$\Delta = \{0, 1\}$

$\delta : Q \rightarrow \Delta$

$q_0 = q_0$

Q \ Σ	a	b	λ
q_0	q_1	q_4	0
q_1	q_2	q_4	0
q_2	q_2	q_3	0
q_3	q_5	q_4	1
q_4	q_5	q_4	0
q_5	q_6	q_4	0
q_6	q_2	q_3	1

Q.3 design mealy machine to add two binary numbers of equal length.



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

$Q = \{q_0, q_1\}$

~~$\Sigma = \{0, 1\}$~~ $\Sigma = \{00, 01, 10, 11\}$

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

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

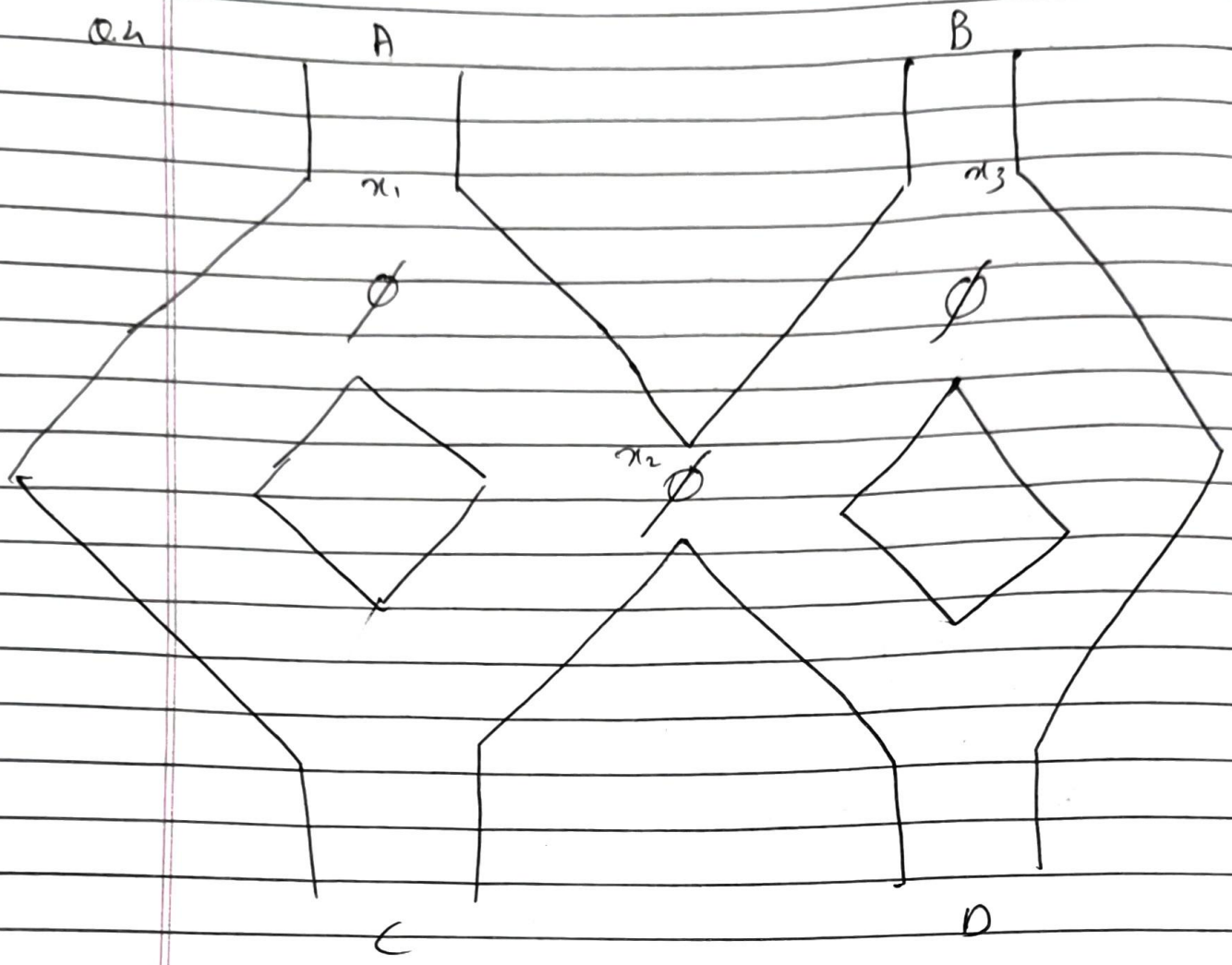
$q_0 = q_0$

~~q_0~~

q_1

	00		01		10		11	
	in	out	in	out	in	out	in	out
q_0	q_0	0	q_0	1	q_0	1	q_1	0
q_1	q_0	1	q_1	0	q_1	0	q_1	1

Q.4



$M = (Q, \Sigma, \delta, q_0, F)$

Let levers indicate the possible states
Let initial status of each lever be 0, u
changing direction, let it be ~~one~~ 1.

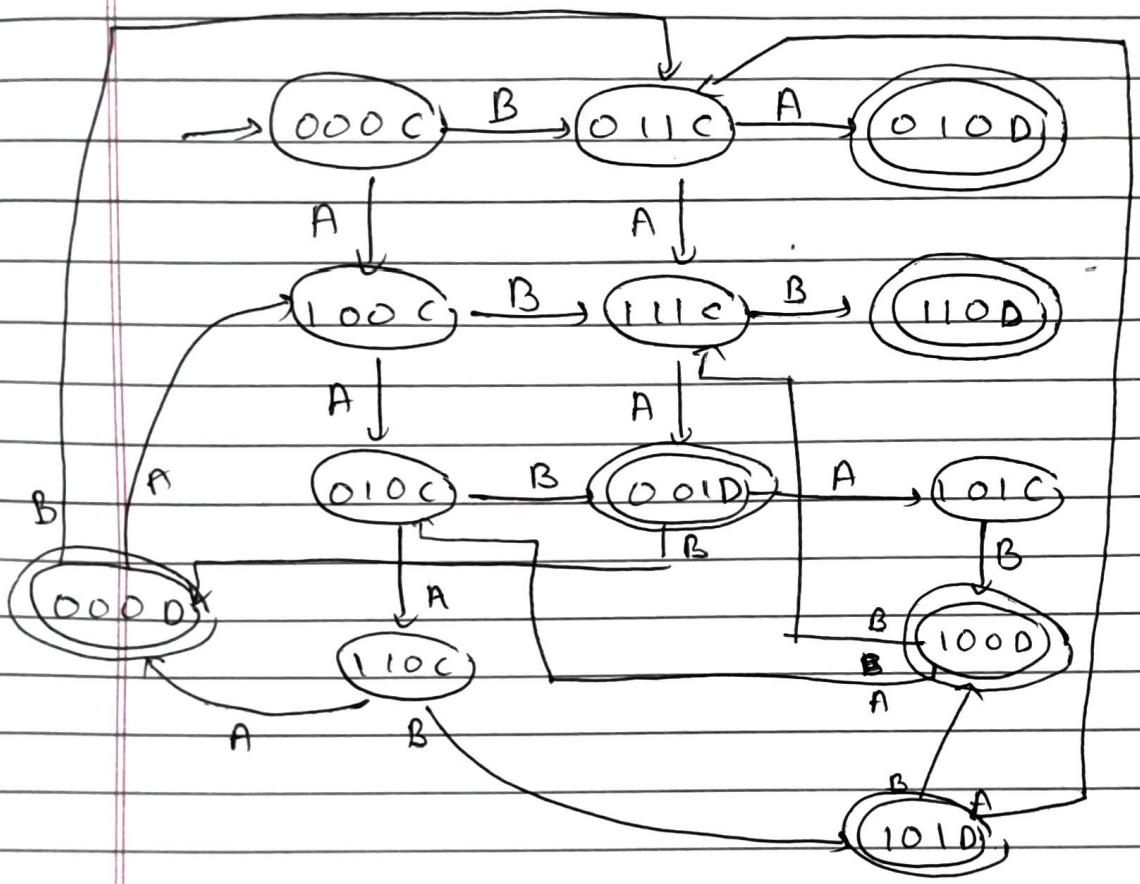
∴ initial state = 000

The state of levers will change depen
on whether we put ball in 'A' or 'B'
∴ 'A' and 'B' are our alphabets.

if ball exits at 'C' it will not be accepted
if ball exits at 'D' it will be accepted.

~~: states such as~~

∴ if ball is thrown at 'B', it will exit at 'c' and state will be '011c'.
'011' indicating position of 3 levers and 'c' indicating it exit at 'c'.



Q: {000C, 011C, 010D, 100C, 111C, 110D, 010C, 001D, 101C, 000D, 110C, 100D, 101D}

Σ = {A, B}

δ: Q × Σ → Q

q_0 = 000c

F: {010D, 110D, 001D, 100D, 101D, 000D}.

	States	A	B
→	000C	100C	011C
*	000D	100C	011C
*	001D	101C	000D
	010C	110C	001D
*	010D	110C	001D
	011C	111C	010D
	100C	010C	111C
*	100D	010C	111C
	101C	011C	100D
*	101D	011C	100D
	110C	000D	101D
*	110D	000D	101D
	111C	001D	110D