Assignment
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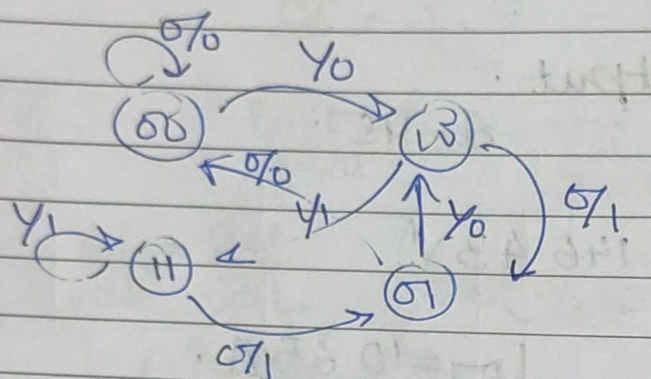
Q1.

Present State		FF i/p		Next State		o/p
Q_{1N}	Q_{0N}	X	D_1	D_0	$Q_{1(N+1)}$	$Q_{0(N+1)}$	$Q_{0(N+1)}$
0	0	0	0	0	0	0	0
0	0	1	1	0	1	0	0
0	1	0	0	0	0	0	0
0	1	1	1	0	1	0	0
1	0	0	0	1	0	1	1
1	0	1	1	1	1	1	1
1	1	0	0	1	0	1	1
1	1	1	1	1	1	1	1



2 Key loops

Q2 (a) 4 bit counter with RS flipflop. will repeat after 16 clock pulse.

16 clock pulse, state = 2.

18 clock pulse state = 4 (2 → 3 → 4).

Q2.

(b)

J_A	K_A	A	J_B	K_B	B	J_C	K_C	C
1	1	0	0	0	0	0	0	0
1	1	1	1	1	0	1	1	0
1	1	0	0	0	1	0	0	1
1	1	1	1	1	1	0	0	1
1	1	0	0	0	0	0	0	1
1	1	1	1	1	0	1	1	1
1	1	0	0	0	1	0	0	0
1	1	1	1	1	1	0	0	0
1	1	0	0	0	0	0	0	0

000 → 001 → 110 → 111 → 100 → 101 → 010 → 011 → 000

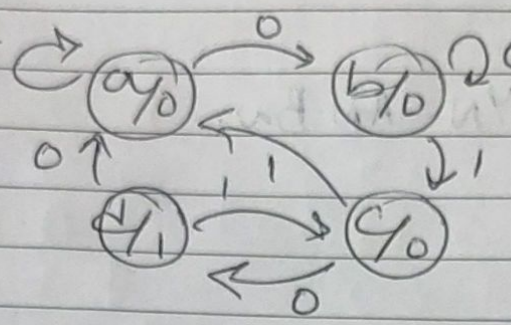
After 8 clk pulse repeat.

Q3. Moore Model → Seq. detect : 010

States a → x bit correctly decoded
b → 1 "
c → 2 "
d → 3. "

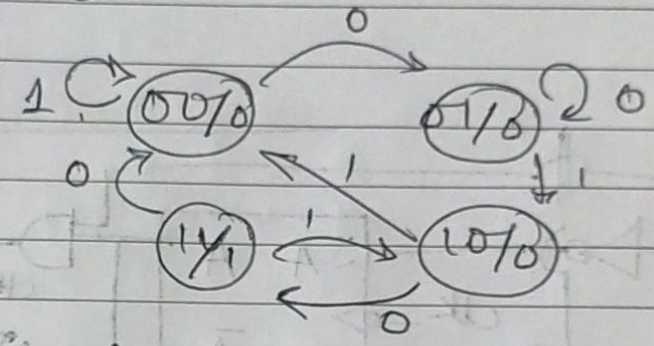
O/P = 1 in state d

State transition diagram:



State assignment

State	B	A
a	0	0
b	0	1
c	1	0
d	1	1



Present State		i/p	Next State		o/p				
B_N	A_N	X_n	B_{n+1}	A_{n+1}	Y_N	J_B	K_B	J_A	K_A
0	0	0	0	1	0	0	x	1	x
0	0	1	0	0	0	0	x	0	x
0	1	0	0	1	0	0	x	x	0
0	1	1	1	0	0	1	x	x	1
1	0	0	1	1	0	x	0	1	x
1	0	1	0	0	0	x	1	0	x
1	1	0	0	0	1	x	1	x	1
1	1	1	1	0	1	x	0	x	1

X_n \ $B_N A_N$	00	01	11	10
0	0	0	x	x
1	0	1	x	x

$J_B = X_n A_N$.

X_n \ $B_N A_N$	00	01	11	10
0	1	x	x	1
1	0	0	x	0

$J_A = \overline{X_N}$

x_n \ $B_N A_N$	00	01	11	10
0	x	x	1	0
1	x	x	0	1

$K_B = \bar{x}_n A_N + x_n \bar{A}_N$

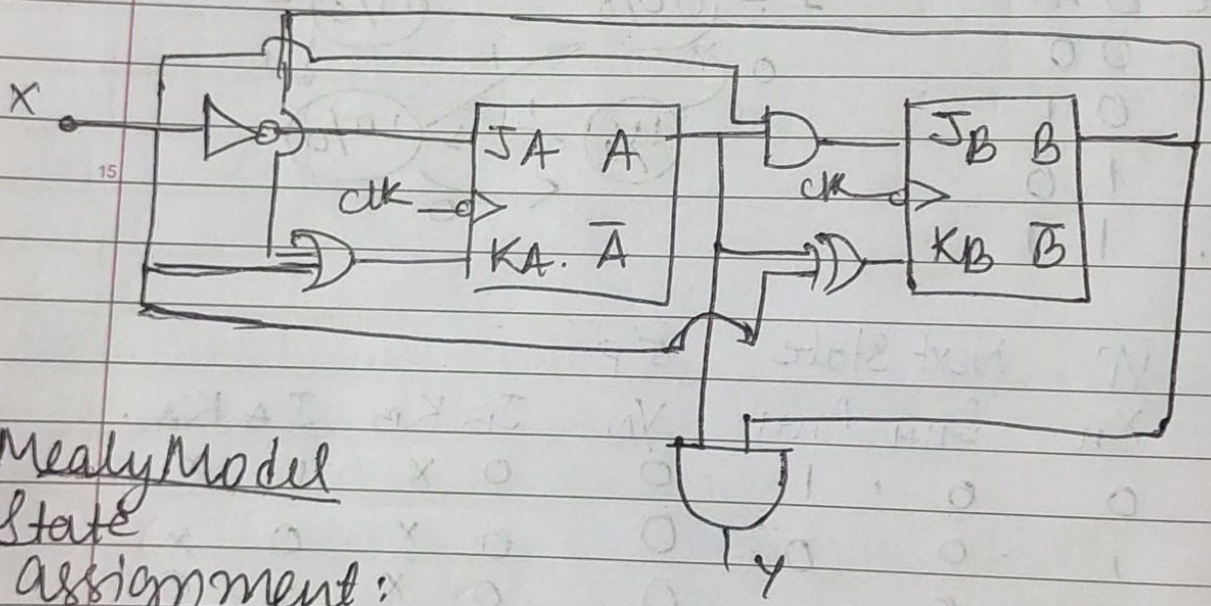
x_n \ $B_N A_N$	00	01	11	10
0	x	0	1	x
1	x	1	1	x

$K_A = x_N + B_N$

A_N \ $B_N x_n$	00	01	11	10
0	0	0		
1	0	1		

$Y_N = A_N \cdot B_N$

Circuit realization.

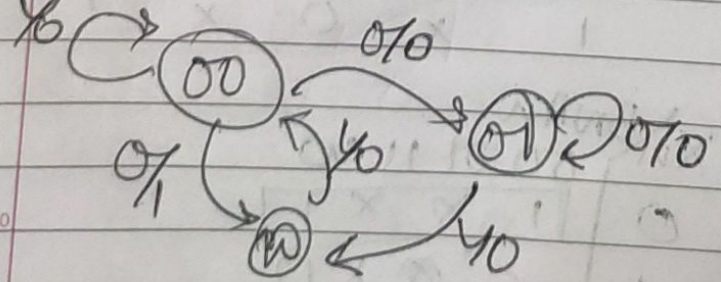


Mealy Model

State assignment:

State	B	A
a	0	0
b	0	1
c	1	0

a → x bit correctly decoded
b → 1 "
c → 2 "



Present State		i/p.	Next State		o/p.				
B_N	A_N	X	B_{N+1}	A_{N+1}	Y	J_B	K_B	J_A	K_A
0	0	0	0	1	0	0	x	1	x
0	0	1	0	0	0	0	x	0	x
0	1	0	0	1	0	0	x	x	0
0	1	1	1	0	0	1	x	x	1
1	0	0	1	0	1	x	1	0	x
1	0	1	0	0	0	x	1	0	x

X \ B_NA_N	00	01	11	10
0	0	0	x	x
1	0	1	x	0

$J_B = XA_N$

X \ B_NA_N	00	01	11	10
0	1	x	x	0
1	0	x	x	0

$J_A = \bar{X}B_N$

X \ B_NA_N	00	01	11	10
0	0	0	x	1
1	0	0	x	0

$Y = \bar{X}B_N$.

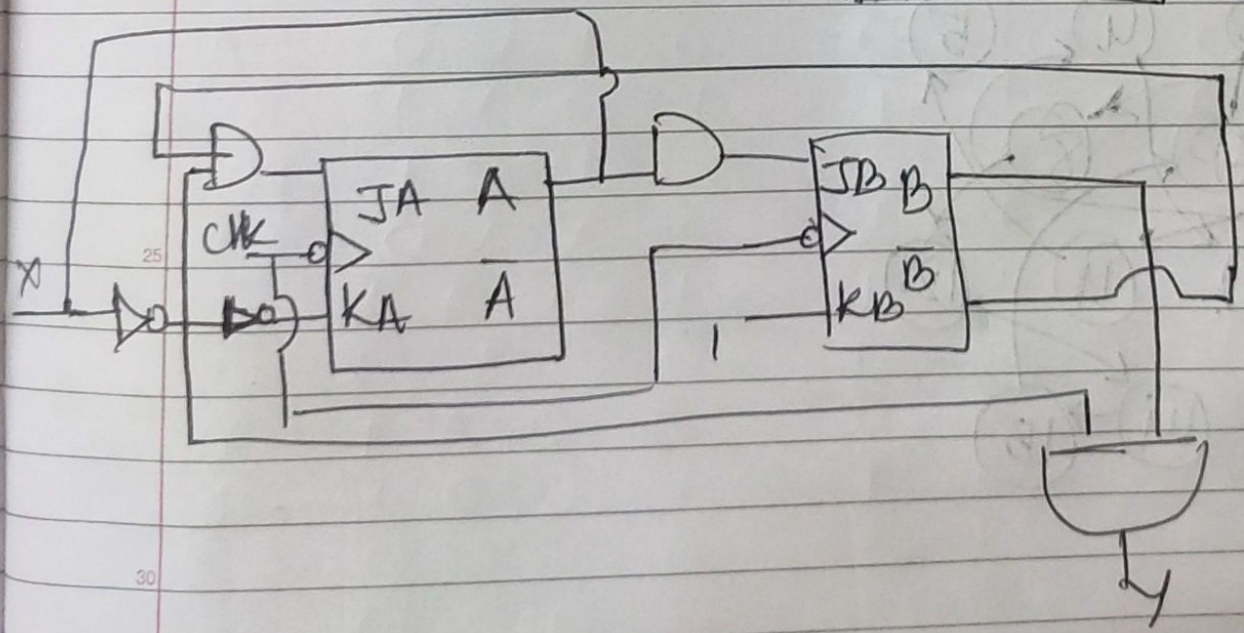
X \ B_NA_N	00	01	11	10
0	x	x	x	1
1	x	x	x	1

$K_B = 1$

X \ B_NA_N	00	01	11	10
0	x	0	x	x
1	x	1	x	x

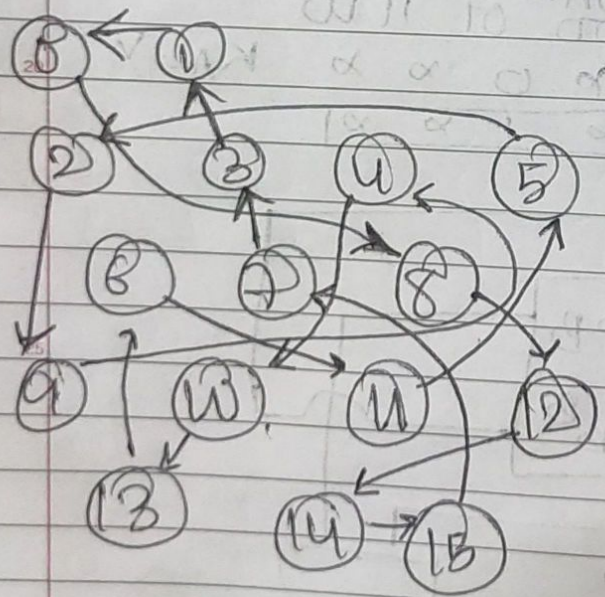
$K_A = X$.

Circuit realization.

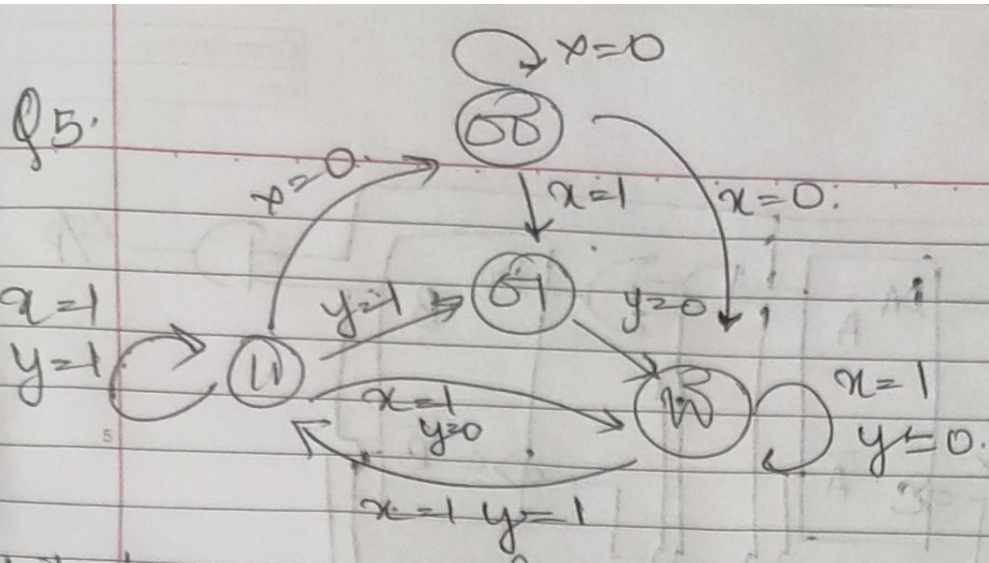


Q4. Present state | FF i/p | Next state

Q_3 Q_2 Q_1 Q_0	D_3 D_2 D_1 D_0	Q_3^+ Q_2^+ Q_1^+ Q_0^+
0 0 0 0	1 0 0 0	1 0 0 0
0 0 0 1	0 0 0 0	0 0 0 0
0 0 1 0	1 0 0 1	1 0 0 1
0 0 1 1	0 0 0 1	0 0 0 1
0 1 0 0	1 0 1 0	1 0 1 0
0 1 0 1	0 0 1 0	0 0 1 0
0 1 1 0	1 0 1 1	1 0 1 1
0 1 1 1	0 0 1 1	0 0 1 1
1 0 0 0	1 1 0 0	1 1 0 0
1 0 0 1	0 1 0 0	0 1 0 0
1 0 1 0	1 1 0 1	1 1 0 1
1 0 1 1	0 1 0 1	0 1 0 1
1 1 0 0	1 1 1 0	1 1 1 0
1 1 0 1	0 1 1 0	0 1 1 0
1 1 1 0	1 1 1 1	1 1 1 1
1 1 1 1	0 1 1 1	0 1 1 1



Q5.



Initial state i/p.				final state		o/p.		
B_N	A_N	X	Y.	B_{N+1}	A_{N+1}		D_B	D_A.
0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	0
0	0	1	0	0	1	0	0	1
0	0	1	1	0	1	0	0	1
0	1	0	0	1	0	0	1	0
0	1	0	1	1	1	0	1	1
0	1	1	0	1	0	0	1	0
0	1	1	1	1	1	0	1	1
1	0	0	0	0	0	0	0	0
1	0	0	1	0	0	0	0	0
1	0	1	0	1	0	0	1	0
1	0	1	1	1	1	0	1	1
1	1	0	0	0	0	1	0	0
1	1	0	1	0	0	1	0	0
1	1	1	0	1	0	1	1	0
1	1	1	1	1	1	1	1	1

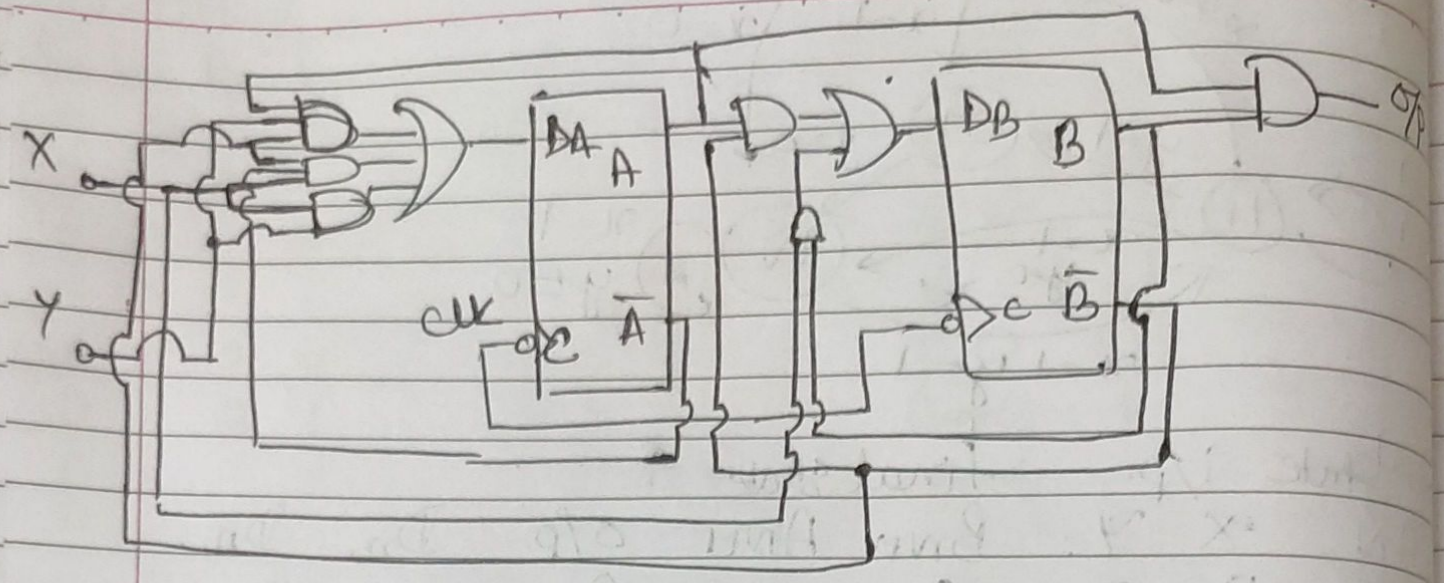
$o/p = A_N B_N$

$B_N A_N$ \ XY	00	01	11	10
00	0	0	0	0
01	1	1	1	1
11	0	0	1	1
10	0	0	1	1

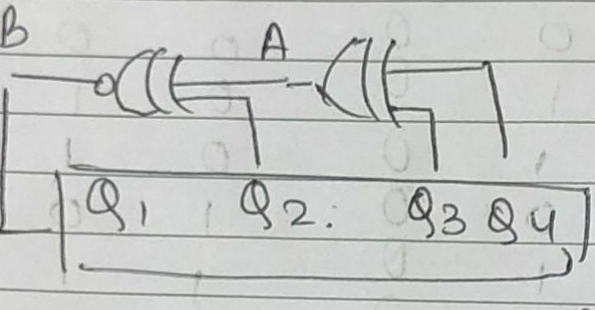
$D_B = \bar{B}_N A_N + B_N X$

$B_N A_N$ \ XY	00	01	11	10
00	0	0	1	1
01	0	1	1	0
11	0	0	1	0
10	0	0	1	0

$D_A = XY + \bar{B}_N A_N Y + B_N \bar{A}_N X$



Q6.



$B = (Q_2 \oplus A)'$.

$A = Q_3 \oplus Q_4$.

$Q_1^+ = B = (Q_2 \oplus A)'$

$Q_3^+ = Q_2$, $Q_2^+ = Q_1$

$Q_4^+ = Q_3$.

initial state = 0000

Present State						Next State			
Q_1	Q_2	Q_3	Q_4	A	B	Q_1^+	Q_2^+	Q_3^+	Q_4^+
0	0	0	0	0	1	1	0	0	0
1	0	0	0	0	1	1	1	0	0
1	1	0	0	0	0	0	1	1	0
0	1	1	0	1	1	1	0	1	1
1	0	1	1	0	1	1	1	0	1
1	1	0	1	1	1	1	1	1	0
1	1	1	0	1	1	1	1	1	1
1	1	1	1	0	0	0	1	1	1
0	1	1	1	0	0	0	0	1	1
0	0	1	1	0	1	1	0	0	1
1	0	0	1	1	0	0	1	0	0
0	1	0	0	0	0	0	0	1	0
0	0	1	0	1	0	0	0	0	1
0	0	0	1	1	0	0	0	0	0
0	0	0	0						

After 15 clk pluse, same state will repeat again