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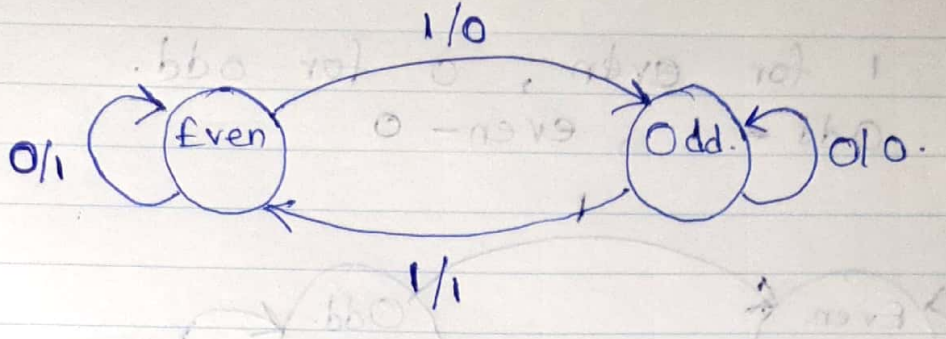
Nawarathna K.G.I.S.

① Mealy Model.



Output : is 1 for even, 0 for Odd.
States : Odd - 1 ; Even - 0

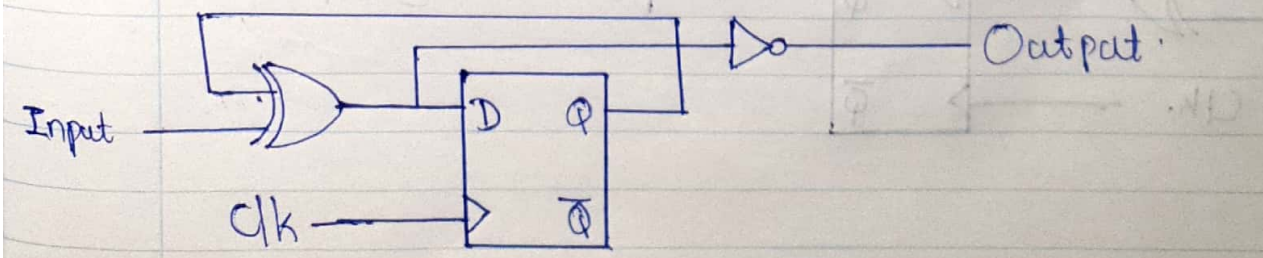
State Table

Present State	Input	Next State	Present Output
0	0	0	1
0	1	1	0
1	0	1	0
1	1	0	1

D flip flops are used. (flip flop input = Next state).

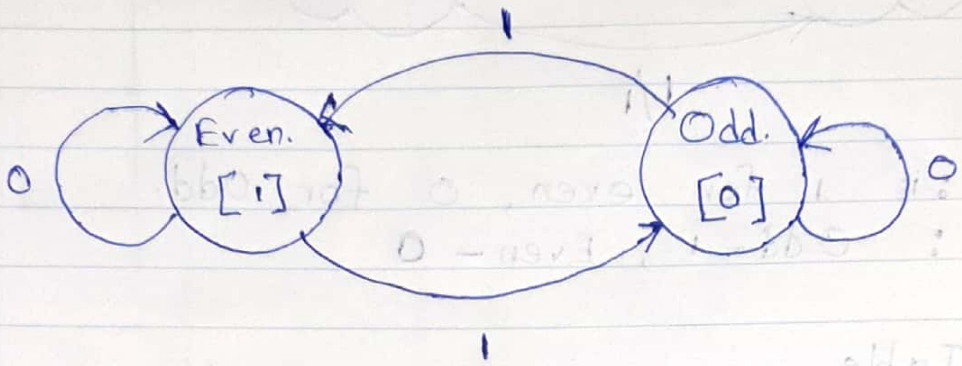
$$\text{Flip flop input} = (\text{Present State}) \text{ XOR } (\text{Input})$$

$$\text{Flip flop Output} = [(\text{Present State}) \text{ XOR } (\text{Input})]'$$



- Moore Model

Output: 1 for even, 0 for odd.
States: Odd - 1, even - 0

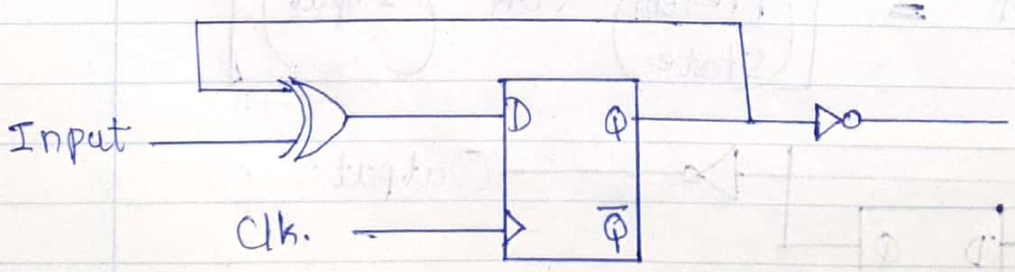


Present State	Input	Next State	Present Output
0	0	0	1
0	1	1	1
1	0	1	0
1	1	0	0

D flip flops are used. (Flip Flop input = Next State)

Flip Flop input = (Present state) XOR (Input)

Flip Flop output = (Present State)'

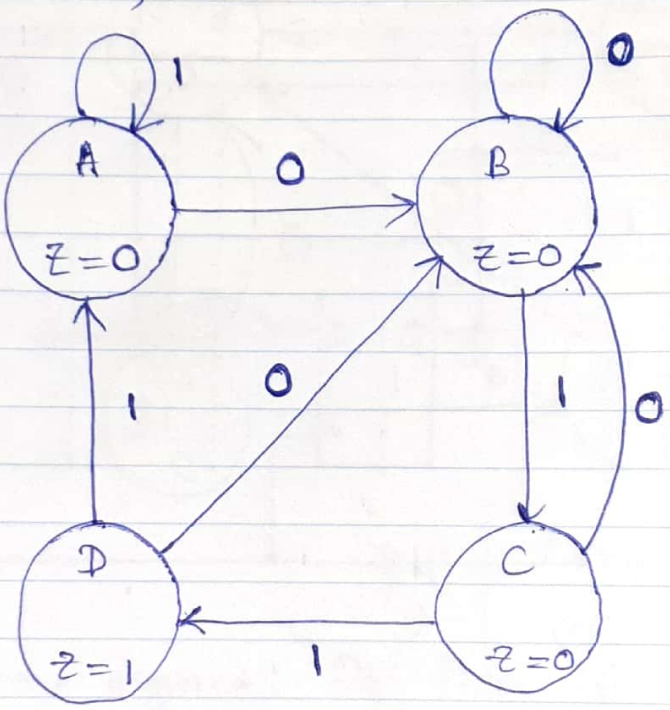


(2). Output $z = 1$ if '011' detected.
Output $z = 0$ if otherwise.

A is considered as the initial state., $z = 0$.

A : _

B : 0_ , $z = 0$.
C : 01_ , $z = 0$.
D : 011 , $z = 1$



State Table.

consider,

A = 00
B = 01
C = 10.
D = 11.

Characteristic Equation of a D flip flop,

$$D = Q(t + \varepsilon).$$

State Table

Present State			Input	Next State			Output	Flip Flop Inputs	
	$Q_1(t)$	$Q_2(t)$	I		$Q_1(t+\varepsilon)$	$Q_2(t+\varepsilon)$	Z	$D_1 = Q_1(t+\varepsilon)$	$D_2 = Q_2(t+\varepsilon)$
A	0	0	0	B	0	1	0	0	1
A	0	0	1	A	0	0	0	0	0
B	0	1	0	B	0	1	0	0	1
B	0	1	1	C	1	0	0	1	0
C	1	0	0	B	0	1	0	0	1
C	1	0	1	D	1	1	0	1	1
D	1	1	0	B	0	1	1	0	1
D	1	1	1	A	0	0	1	0	0

K Map for D_1.

Q_1 \ Q_2I	00	01	11	10
0	0	0	(1)	0
1	0	(1)	0	0

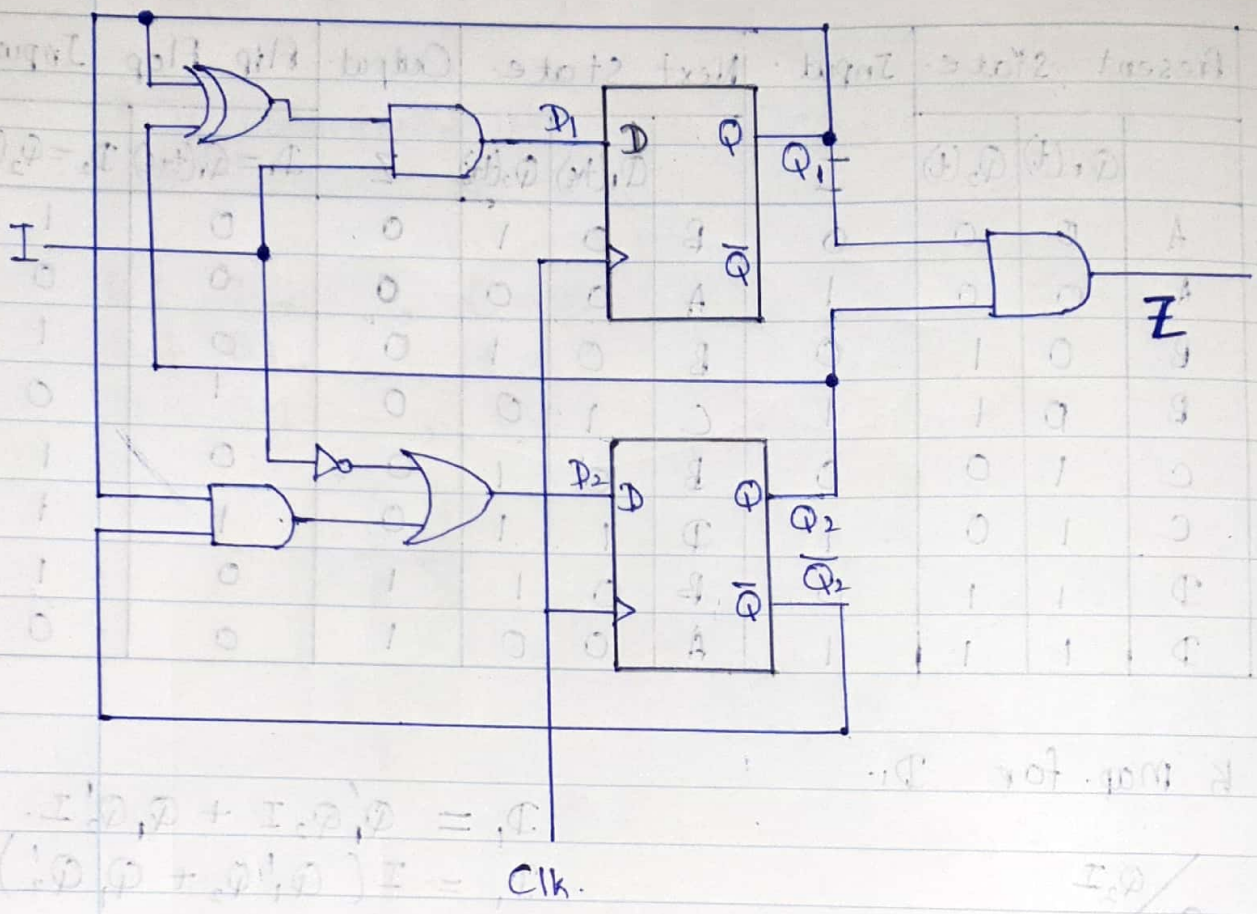
$$D_1 = Q_1' Q_2 I + Q_1 Q_2' I.$$
$$D_1 = I(Q_1' Q_2 + Q_1 Q_2')$$
$$D_1 = I(Q_1 \oplus Q_2). //$$

K Map for D_2

Q_1 \ Q_2I	00	01	11	10
0	1	0	0	1
1	1	1	0	1

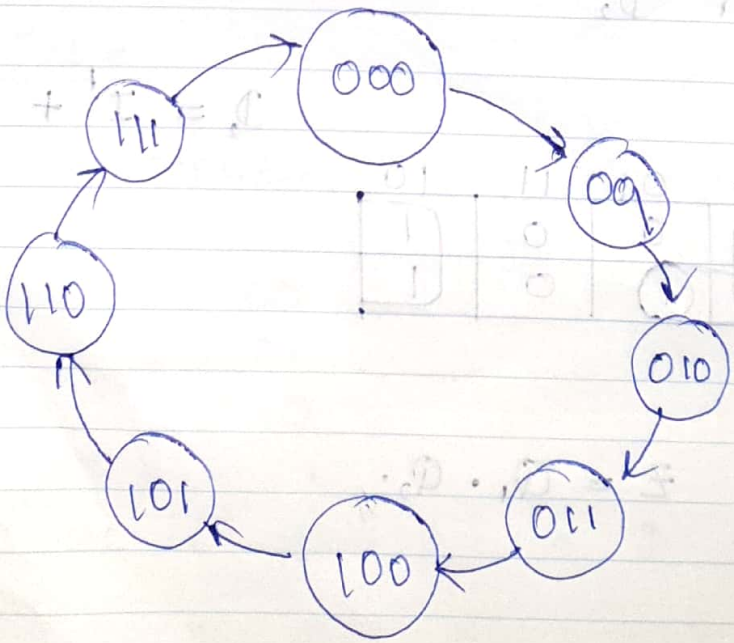
$$D_2 = I' + Q_1 Q_2' //$$

$$Z = Q_1 \cdot Q_2. //$$



All ~~of~~ D flip flops are positive edge triggered.

③ State Machine.



③ Since ~~they~~ ~~it~~ there are 3 bits, 3 D flip flops has to be used.

Characteristic Equation (D flip flops): $Q(t+\varepsilon) = D$

Present state.			Next state.			Flip Flop Inputs.		
$Q_C(t)$	$Q_B(t)$	$Q_A(t)$	$Q_C(t+\varepsilon)$	$Q_B(t+\varepsilon)$	$Q_A(t+\varepsilon)$	D_C	D_B	D_A
0	0	0	0	0	1	0	0	1
0	0	1	0	1	0	0	1	0
0	1	0	0	1	1	0	1	1
0	1	1	1	0	0	1	0	0
1	0	0	1	0	1	1	0	1
1	0	1	1	1	0	1	1	0
1	1	0	1	1	1	1	1	1
1	1	1	0	0	0	0	0	0

K Map for the D_C.

Q_C \ Q_BQ_A	00	01	11	10
0	0	0	(1)	0
1	(1)	1	0	(1)

$D_C = Q_B'Q_C + Q_A'Q_C + Q_C'Q_AQ_B.$

$D_C = Q_C(Q_A' + Q_B') + Q_C'(Q_A \cdot Q_B)$

$D_C = Q_C(Q_A \cdot Q_B)' + Q_C'(Q_A \cdot Q_B).$

$D_C = Q_C \oplus (Q_A \cdot Q_B)$ //

K Map for the D_B

Q_C \ Q_BQ_A	00	01	11	10
0	0	(1)	0	(1)
1	0	(1)	0	(1)

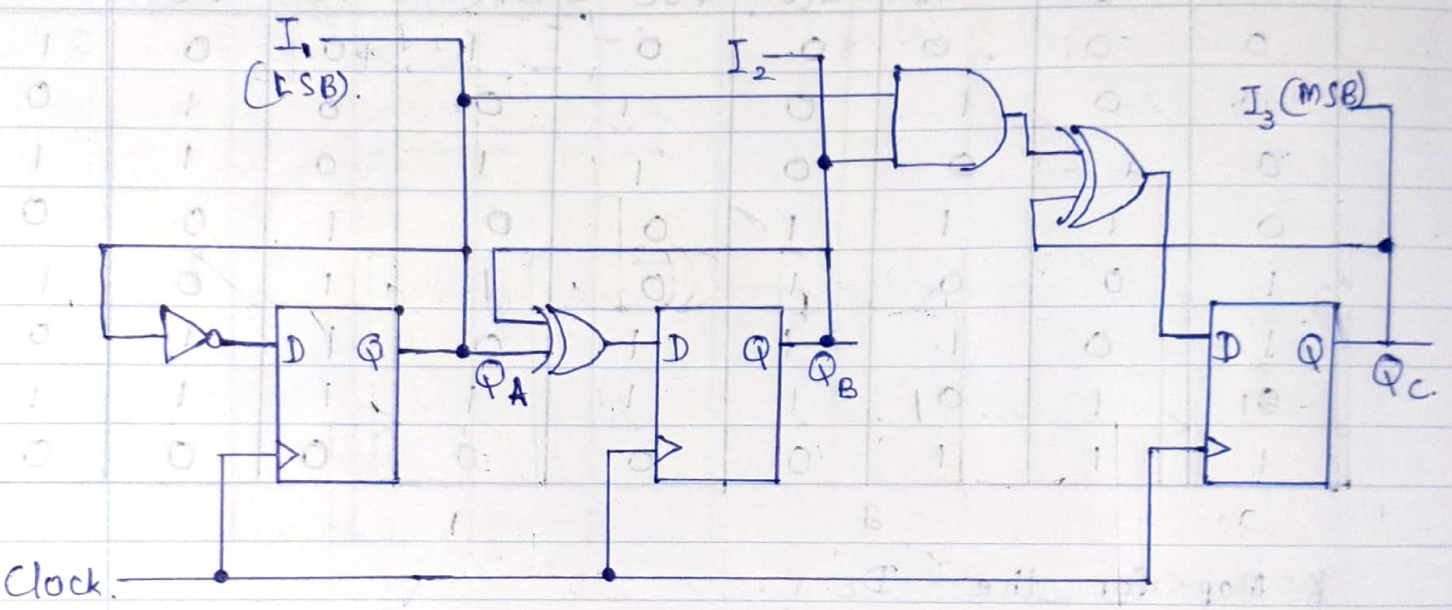
$D_B = Q_B'Q_A + Q_BQ_A'$

$D_B = Q_A \oplus Q_B$ //

K Map for D_A.

Q_C \ $Q_B Q_A$	00	01	11	10
0	1	0	0	1
1	1	0	0	1

$D_A = Q'_A$ //



Positive edge triggered flip flops are used here.