STLD Assignment 5:-

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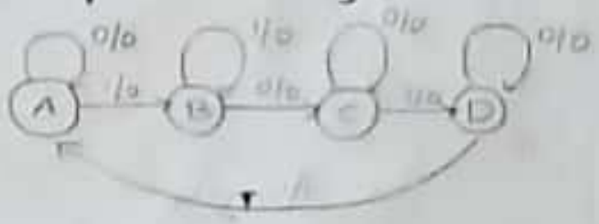
1) Design a sequence detector to detect the sequence 011 for mealy type using D-flip-flop

Ans: Now we are designing it by using non-overlapping sequences Given Sequence is 1011; the state diagram for this sequence using mealy



b) State table

PS	NS, z	
	x=0	x=1
A	A, 0	B, 0
B	C, 0	B, 0
C	C, 0	D, 0
D	D, 0	A, 1

Let A → 00, B → 01, C → 10, D → 11

draw the transition of o/p table

c) Transition & o/p table

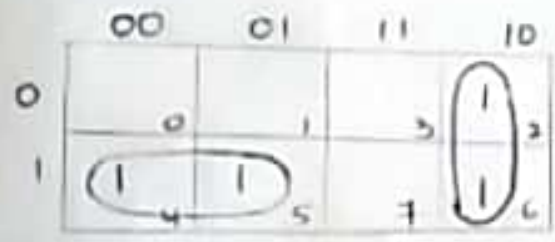
PS	NS		o/p(z)	
	x=0	x=1	x=0	x=1
A → 00	00	01	0	0
B → 01	10	01	0	0
C → 10	10	11	0	0
D → 11	11	00	0	1

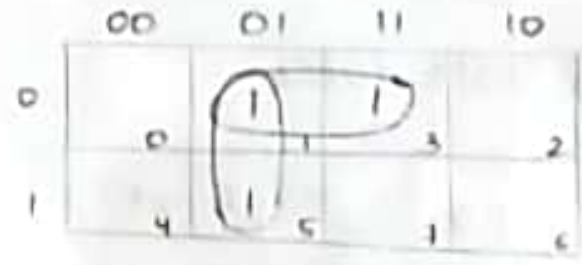
D) Excitation table

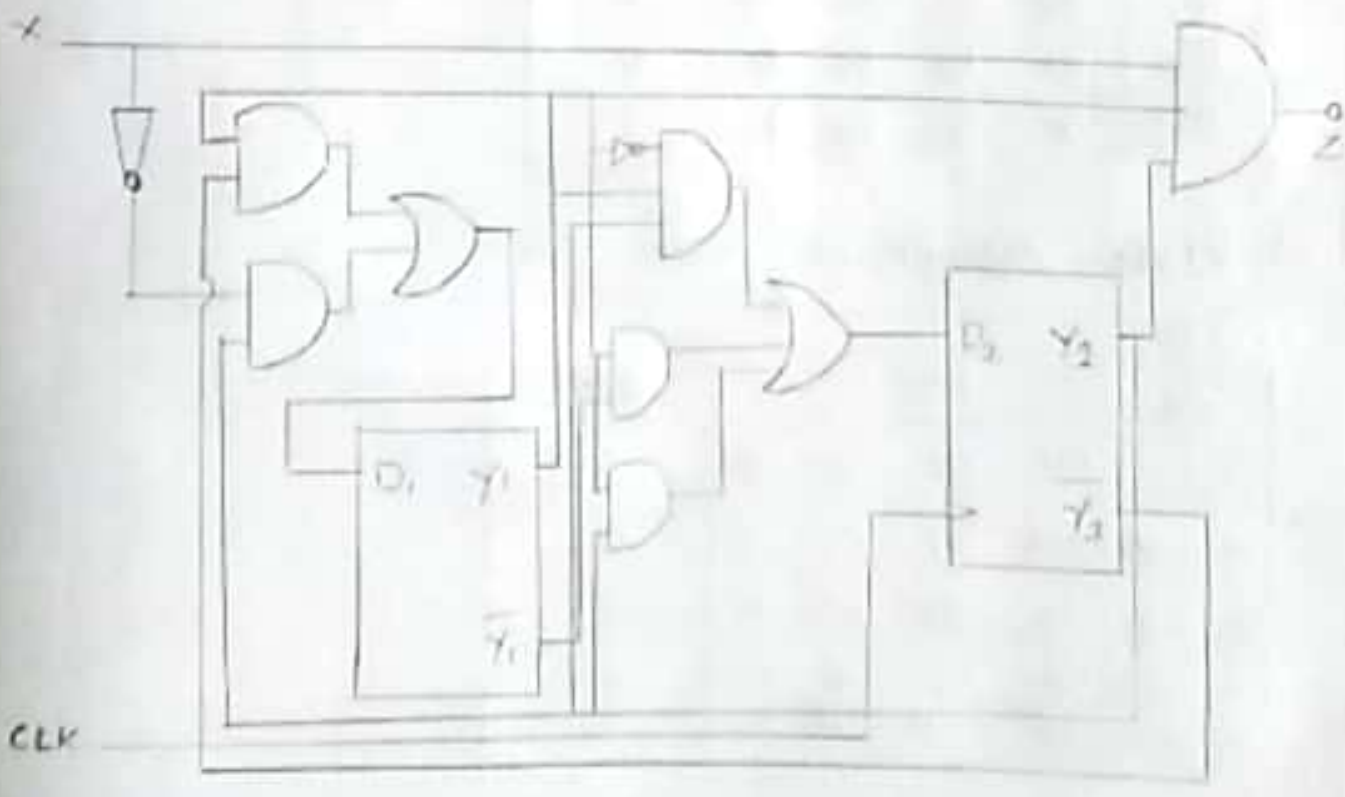
PS		I/P	NS		Ip to FF's		o/p
Y_1	Y_2	x	Y_1	Y_2	D_1	D_2	y
0	0	0	0	0	0	0	0
0	0	1	0	1	0	1	0
0	1	0	1	0	1	0	0
0	1	1	0	1	0	1	0
1	0	0	1	0	1	0	0
1	0	1	1	1	1	1	0
1	1	0	1	1	1	1	0
1	1	1	0	0	0	0	1

From excitation table $D_1 = \sum m(2,4,5,6)$ & $D_2 = \sum m(1,3,5,6)$

By using 3 variable k map



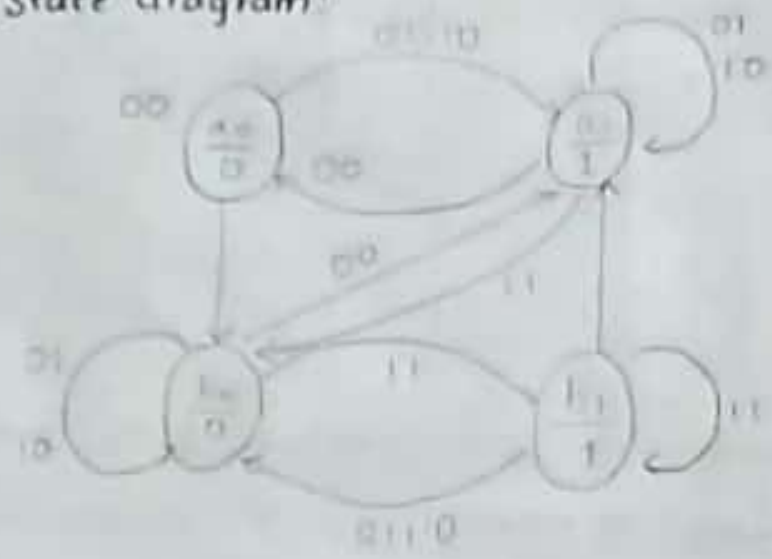




2) Design a Binary Serial adder for Moore type

Ans In a Moore type machine the o/p depends only on the present state of the machine it requires more than 2 states

a) State diagram:



b) State table

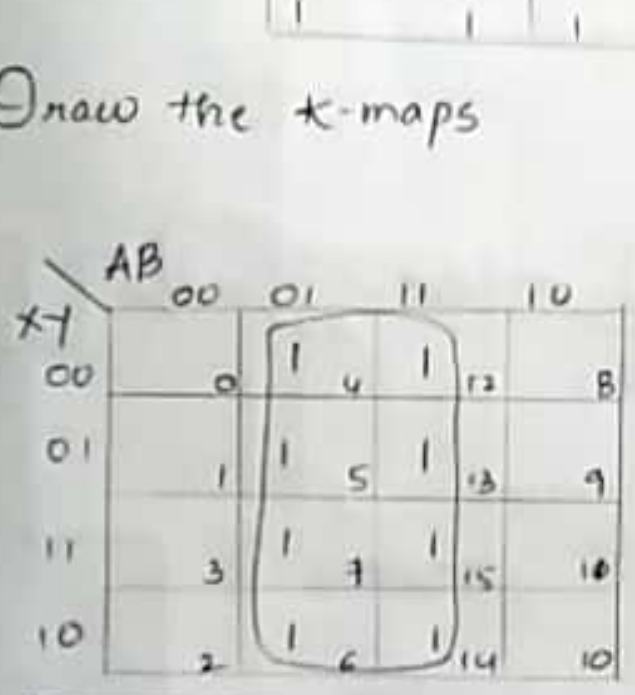
FS	NS (Input)				O/P (sum)
	00	01	10	11	
a_0	a_0	a_1	a_1	b_0	0
a_1	a_0	a_1	a_1	b_0	1
b_0	a_1	b_0	b_0	b_1	0
b_1	a_1	b_0	b_0	b_1	1

c) State - Assignment table

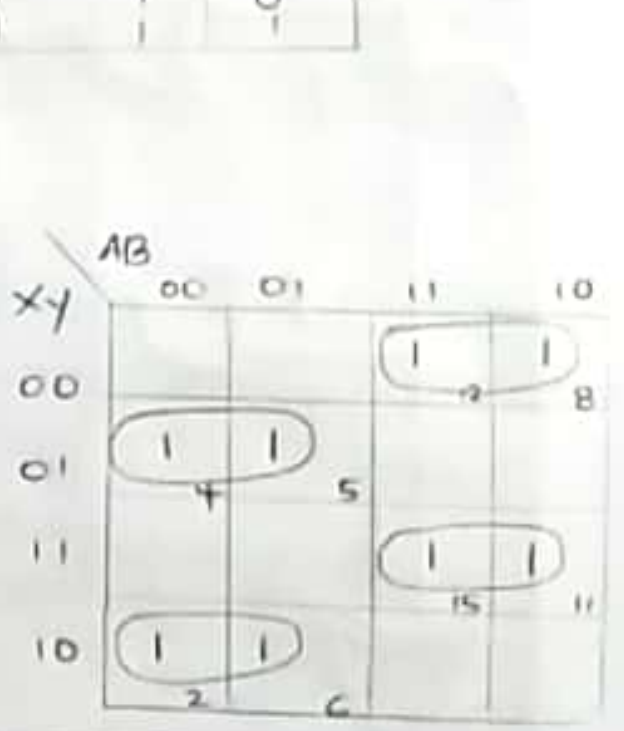
PS	Ns				O/P
	00	01	10	11	S
$a_0 \rightarrow 00$	00	01	01	10	0
$a_1 \rightarrow 01$	00	01	01	10	1
$b_0 \rightarrow 10$	01	10	10	11	0
$b_1 \rightarrow 11$	01	10	10	11	1

Input		P S		N S		output
x	y	A	B	$[D_A D_B]$ A⁺	B⁺	(sum)
0	0	0	0	0	0	0
0	0	0	1	0	0	1
0	0	1	0	0	1	0
0	0	1	1	0	1	1
0	1	0	0	0	1	0
0	1	0	1	0	1	1
0	1	1	0	1	0	0
0	1	1	1	1	0	1
1	0	0	0	0	1	0
1	0	0	1	0	1	1
1	0	1	0	1	0	0
1	0	1	1	1	0	1
1	1	0	0	1	0	0
1	1	0	1	1	0	1
1	1	1	0	1	1	0
1	1	1	1	1	1	1

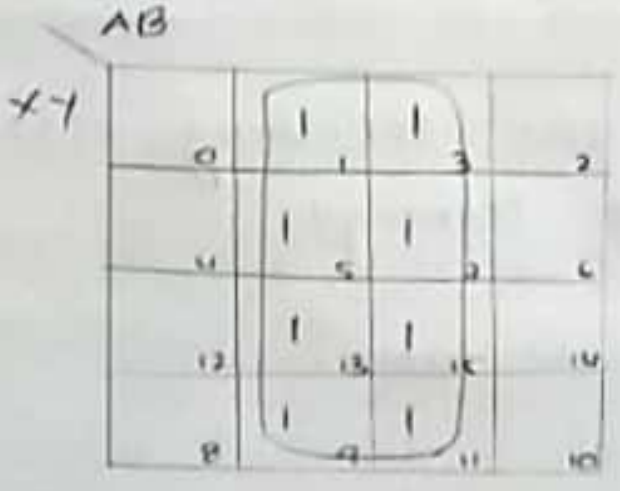
Draw the k-maps



$$D_A = xy + yA + xA$$



$$D_B = \bar{x}y\bar{A} + \bar{x}\bar{y}A + xyA + x\bar{y}\bar{A}$$



Sum = B

Now Sum = B

$D_A = xy + yA + xA$

$D_B = \bar{x}\bar{y}A + \bar{x}y\bar{A} + xyA + x\bar{y}\bar{A}$

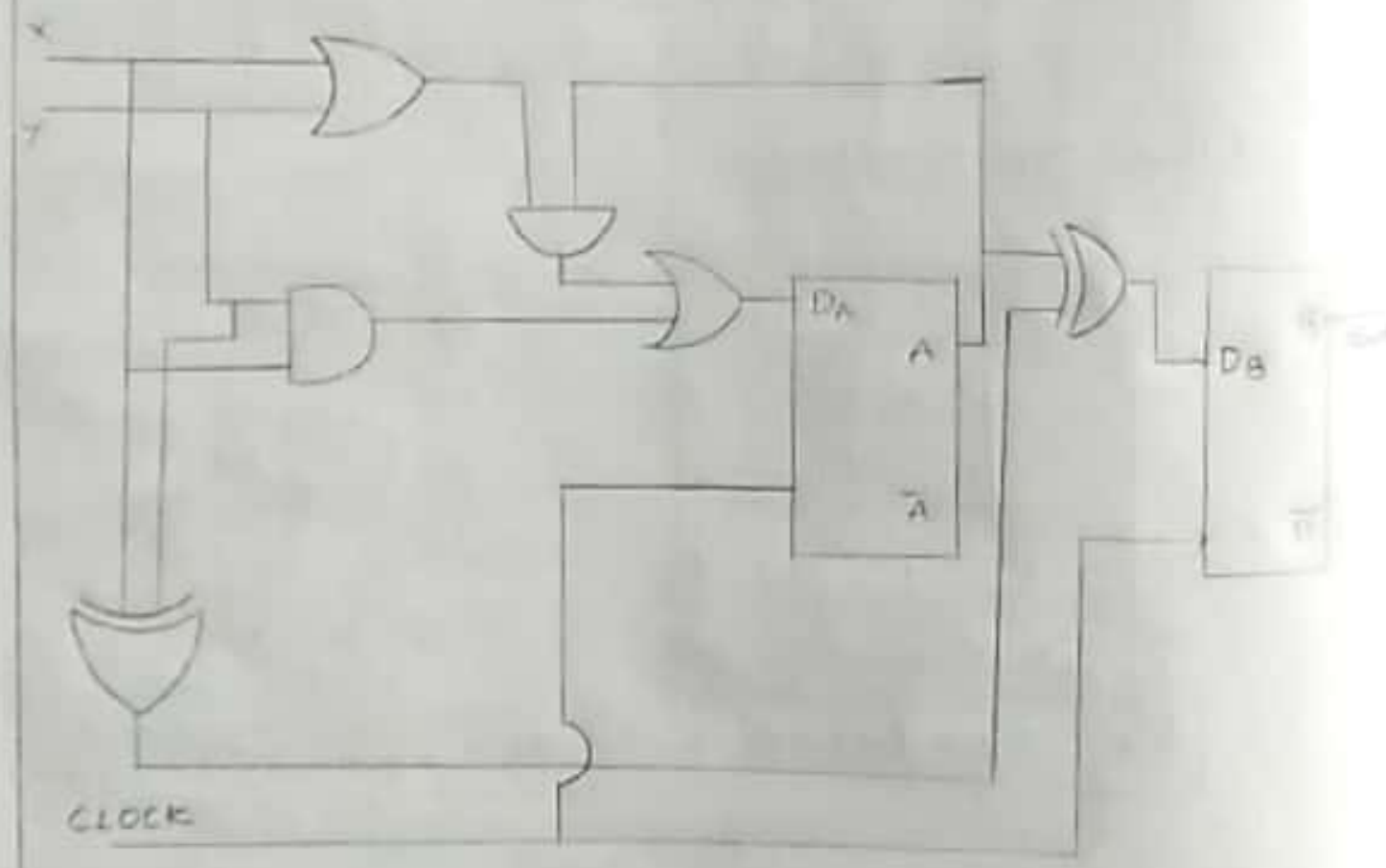
$= (\bar{x}y + x\bar{y})\bar{A} + (\bar{x}\bar{y} + xy)A$

$= (\bar{x}y + x\bar{y})\bar{A} + \overline{(\bar{x}y + x\bar{y})}A$

$= x \oplus y \oplus A$

Here, D_B is sum output of full adder & D_A is carry out full adder

logic Diagram



3) Reduce the following state table using partition technique

Ans Given state table,

PS	NS, Z	
	X=0	X=1
A	F,0	B,0
B	D,0	C,0
C	F,0	E,0
D	G,1	A,0
E	D,0	C,0
F	F,1	B,1
G	G,0	H,0
H	G,1	A,0

Now rearranging the table having same o/p's into groups

PS	NS, Z	
	X=0	X=1
A	F,0	B,0
B	D,0	C,0
C	F,0	E,0
E	D,0	C,0
G	G,0	H,0
D	G,1	A,0
H	G,1	A,0
F	F,1	B,1

Now P_1 - (A,B,C,E,G)(D,H)(F)

2) The 1's Successor of (A,B,C,E,G) → (B,C,E,C,H)

They are in different blocks so Split (A,B,C,G,E) into (A,B,C,E) & (G)

The 0's Successor of (A,B,C,E,G) → (F,D,F,D,G) are in different blocks so partition of (A,B,C,E,G) into (A,C) , (B,E) & (G)

Now P_2 - (A,C)(B,E)(G)(D,H)(F)

3) The D- Successor of (A,1) → (F,F) & 1- Successor of (A,C) → (B,E) since they are in same block of P_2

4) The 0- Successor of (B,E) ⟶ (D,D) & 1- Successor of (D,H) ⟶ (A,A) are also in same block of P_2

5) So, no further partitioning is possible

Now, P_3 = (A,C) (B,F) (G) (D,H) (F)

So, A=C, B=F, & D=H

So, C, E, H can be replaced by A,B,D Then the minimized state table is

PS	NS, Z	
	X=0	X=1
A	F,0	B,0
B	D,0	A,0
D	G,0	A,0
F	F,0	B,1
G	G,0	D,0

Reduced state table