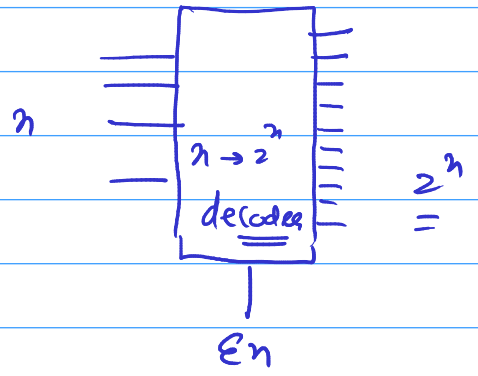
07/04/22

Lecture # 5

Combinational Logic Ckts :→

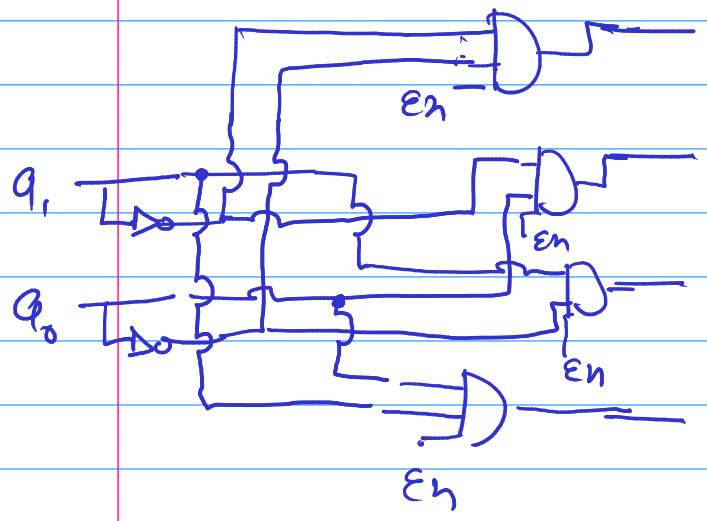
$$o/p = f(i/p_s)$$



E_n	$q_1 q_0$	D_3	D_2	D_1	D_0
1	00	0	0	0	1
1	01	0	0	1	0
1	10	0	1	0	0
1	11	1	0	0	0
0	xx	0	0	0	0

$E_n = 0$

$E_n = 1$

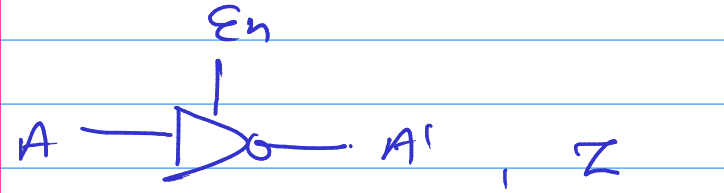


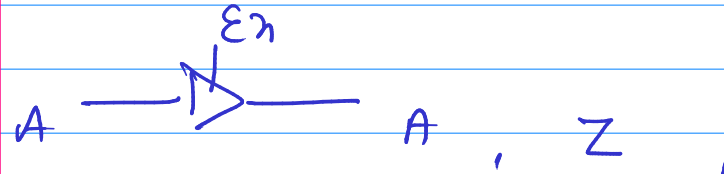
$D_0 = (q_1' q_0') \cdot E_n =$

$D_1 = (q_1' q_0) \cdot E_n$

$D_2 = (q_1 q_0') \cdot E_n$

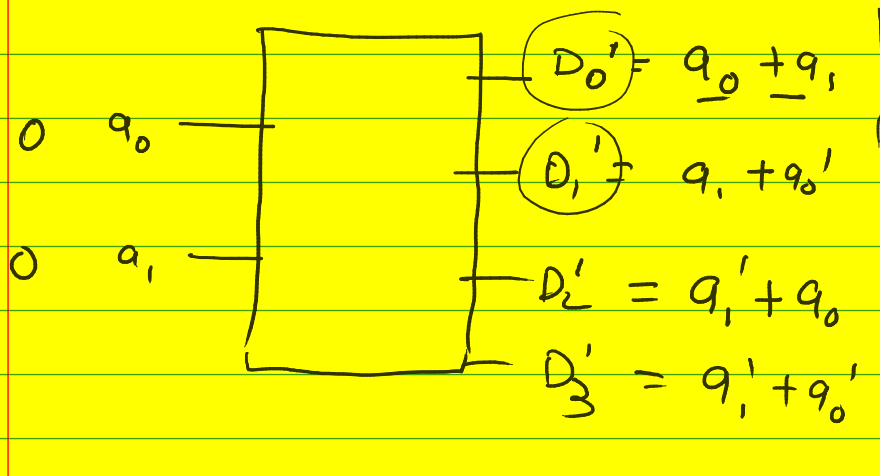
$D_3 = (q_1 q_0) \cdot E_n$.





$\overline{AB} = [A' + B']$

$A + B = [A' \cdot B']'$



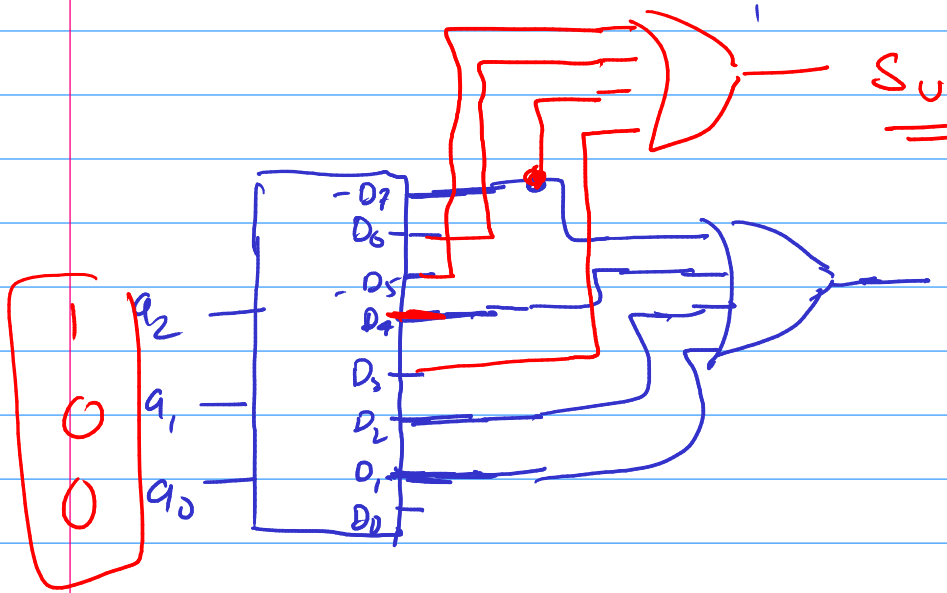
$q_1' q_0' = [q_1 + q_0]'$

$q_1' q_0 = [q_1 + q_0']'$

q_1	q_0	D_3	D_2	D_1	D_0
0	0	1	1	1	0
0	1	1	1	0	1
1	0	1	0	1	1
1	1	0	1	1	1

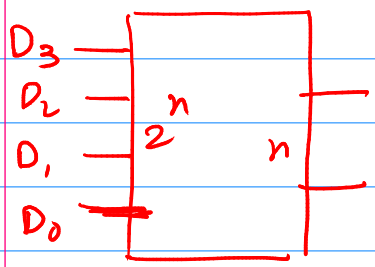
Sum $= S_0 = q_0 \oplus q_1 \oplus q_2$

Carry $= S_1 = q_0 q_1 + q_1 q_2 + q_2 q_0'$



$q_2 q_1 q_0$	
001	1
010	2
100	4
111	7

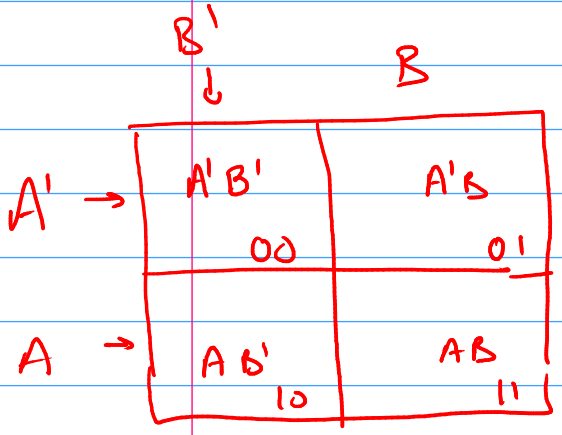
q_2	q_1	q_0	→	S_2	S_1	S_0
0	0	0		0	0	1 (1)
0	0	1	= $q_2' q_1' q_0$ ✓	1 ✓	0	0 (0)
0	1	0	$q_2' q_1 q_0'$ ✓	1 ✓	1	1 (3)
0	1	1		0	0	0 (2)
1	0	0	$q_2 q_1' q_0'$ ✓	1 ✓	0	1 (5)
1	0	1		0	1	0 (4)
1	1	0		0	1	1 (6)
1	1	1	$q_2 q_1 q_0$ ✓	1 ✓	1	1 (7)

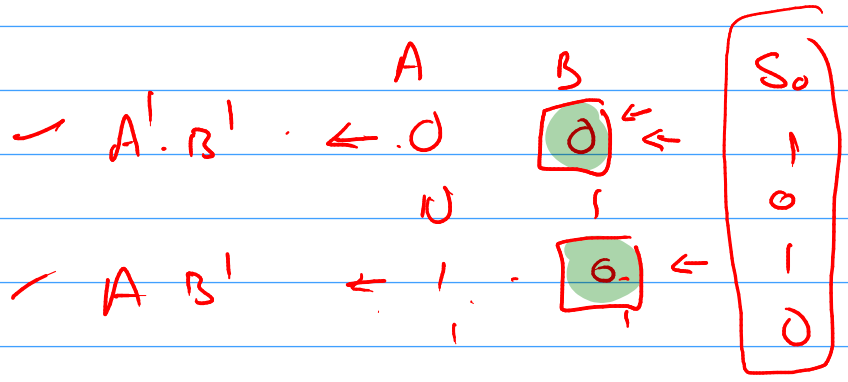


D_3	D_2	D_1	D_0	q_1	q_0
0	0	0	1	0	0
0	0	1	0	0	1
0	1	0	0	1	0
1	0	0	0	1	1

En	D_3	D_2	D_1	D_0	q_1	q_0	V
1	1	X	X	X	1	1	1
1	0	1	X	X	1	0	1
1	0	0	1	X	0	1	1
1	0	0	0	1	0	0	1
0	X	X	X	X	0	0	0 ←

K MAP

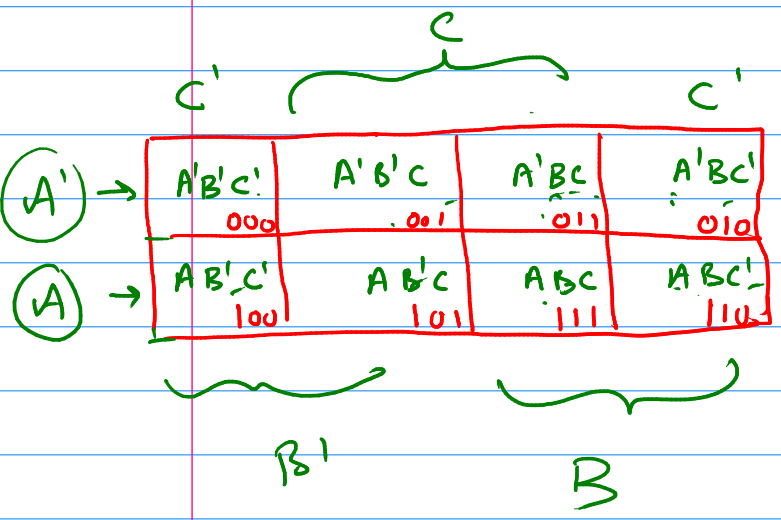


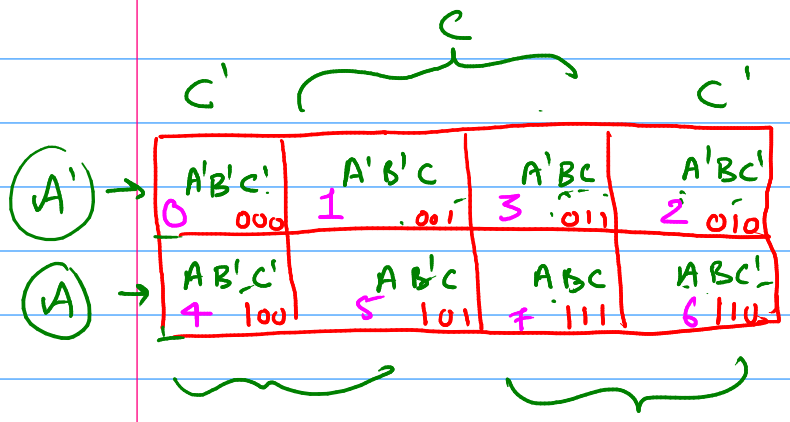


$$A'B' + AB' = S_0$$

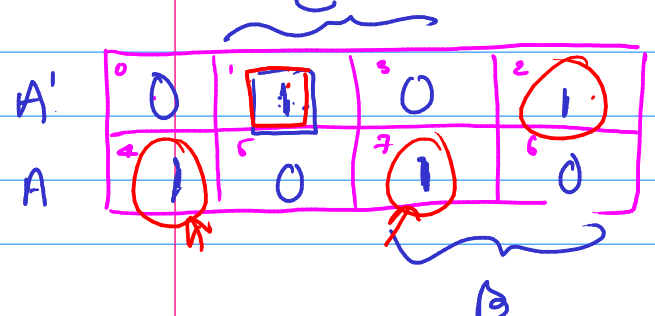
$$B'(A' + A) = S_0$$

$$B' \cdot 1 = S_0$$

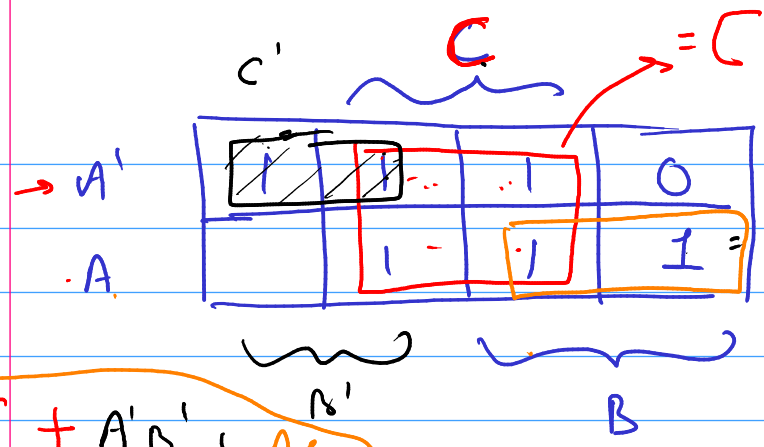




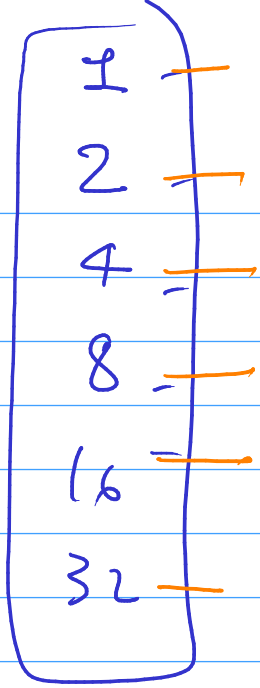
	A	B	C	C_Y	S_0
0	0	0	0	0	0
1	0	0	1	0	1
2	0	1	0	0	1
3	0	1	1	1	0
4	1	0	0	0	1
5	1	0	1	1	0
6	1	1	0	1	0
7	1	1	1	1	1



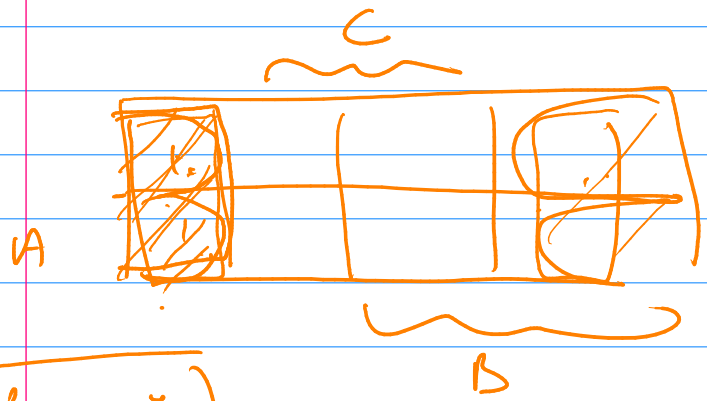
$$S_0 = A'B'C + A'BC' + AB'C' + ABC = A \oplus B \oplus C$$



$Y = C + A'B' + AB$



(1) → The pair must carry may no. of 1's



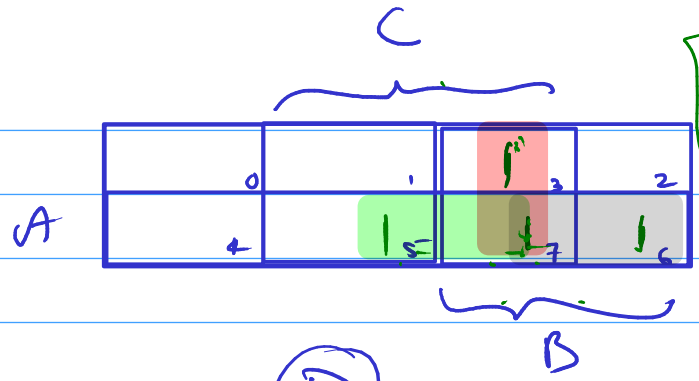
$Y = 1$

$C'B' + C'B$

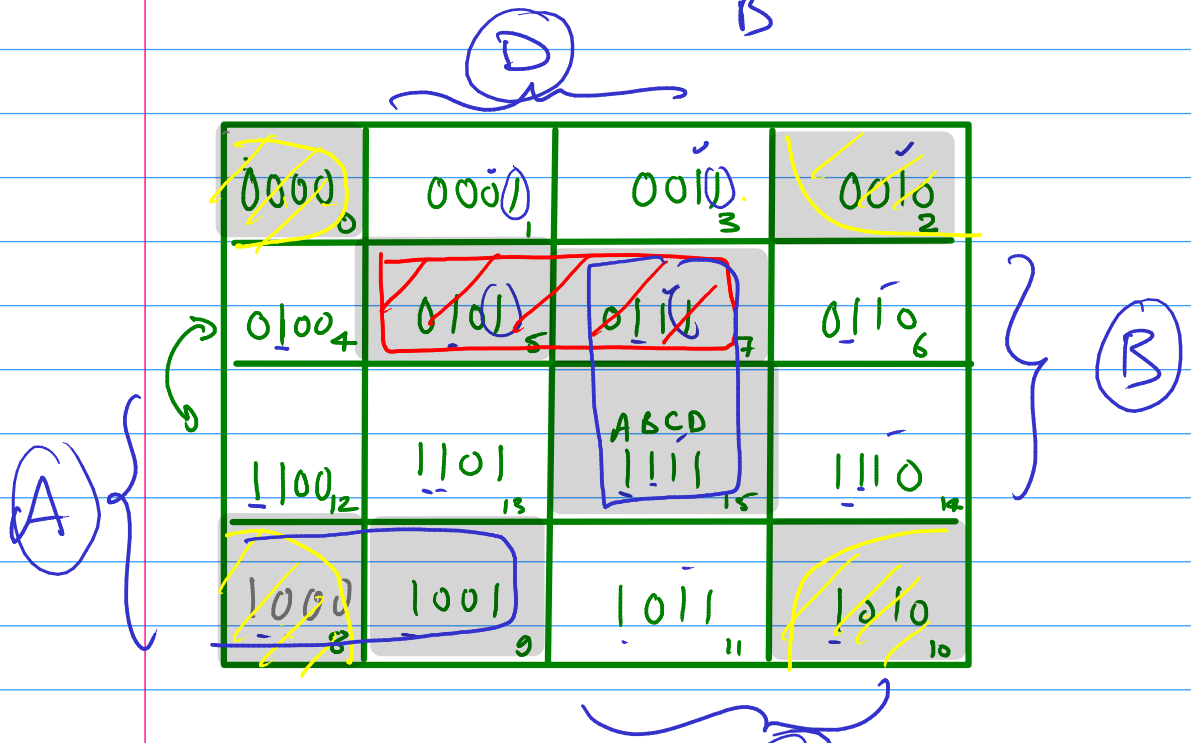
$C'[B' + B]$

C

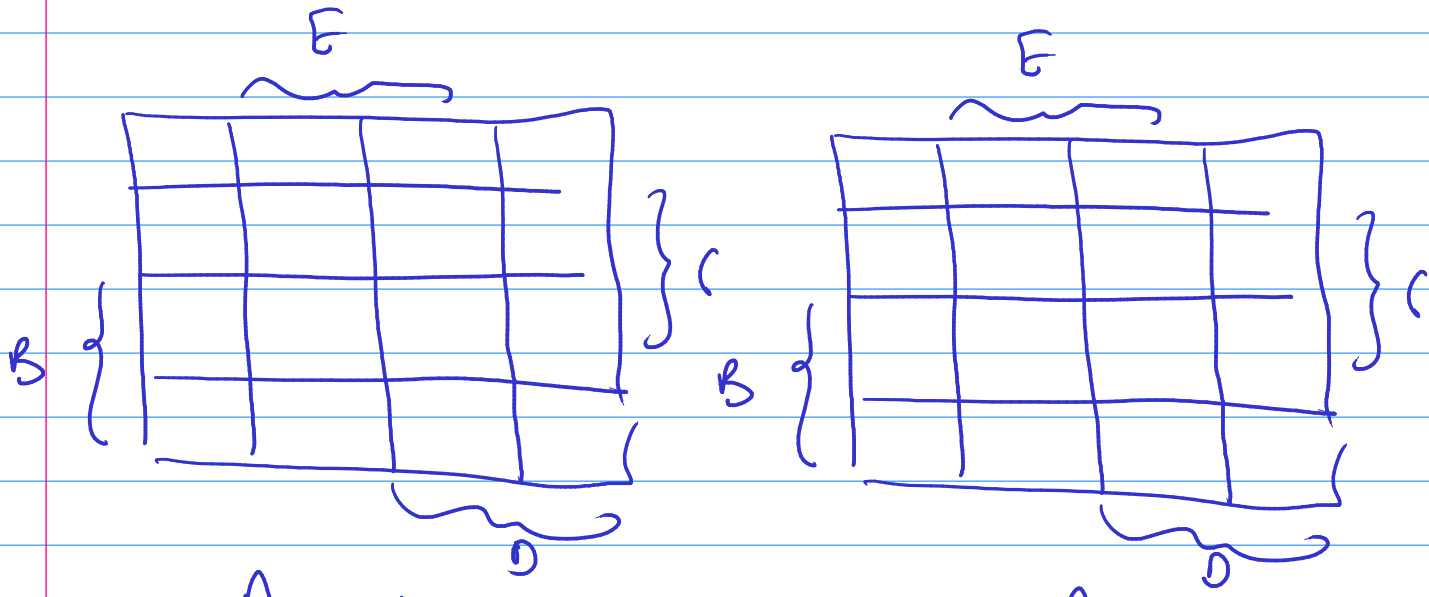
$$CY = AB + BC + CA$$

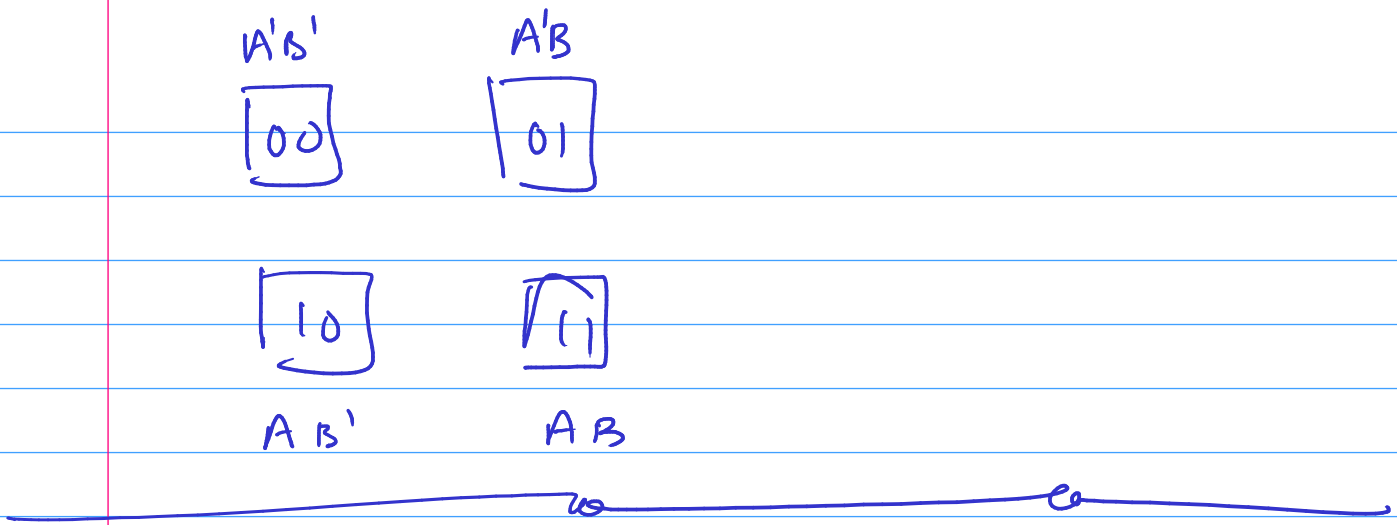


$Y = BC + AB + AC$



$Y = B'D' + BA'D + BCD + AB'C'$




A'B'
A'B
00
01
10
11
AB'
AB