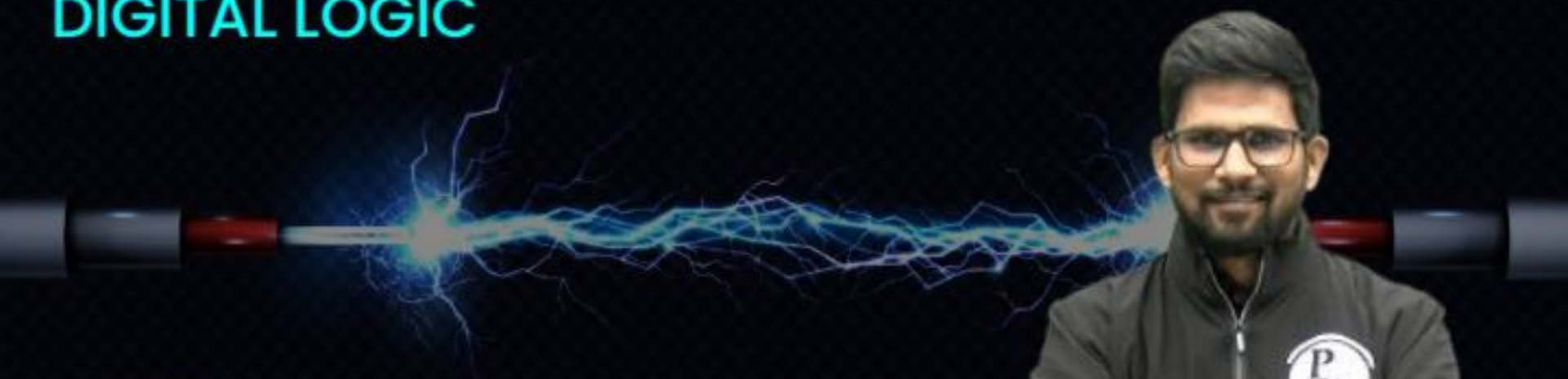
COMPUTER SCIENCE & IT

DIGITAL LOGIC



Lecture No. 04

Combinational Circuit

By- Chandan Gupta Sir

- Look ahead carry adder
- H.S. , F.S.

K-Map

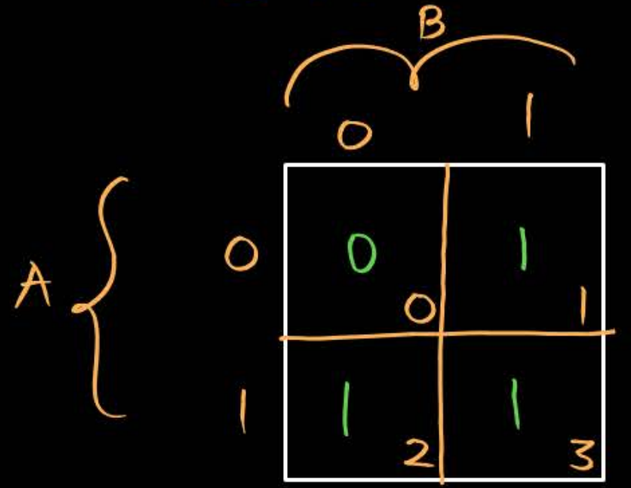
K-Map

Used for Entries :

- '0'
- '1'
- X ⟶ don't care
- Variable

2-variable ⟶ 4 terms

0 — 3



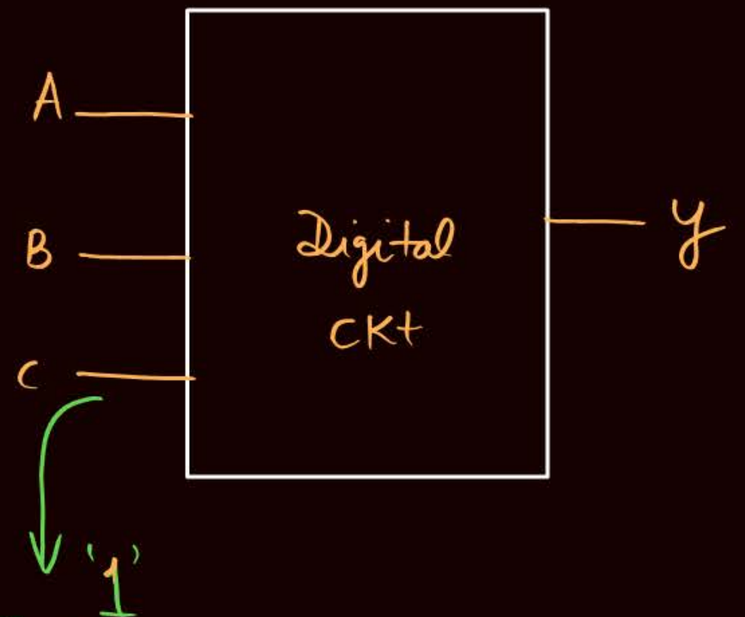
$f(A,B)$

$f(A,B) = \Sigma(1,2,3)$

What is don't care 'X' →

	A	B	C	y
0	0	0	0	X
	0	0	1	0
2	0	1	0	X
	0	1	1	0
4	1	0	0	X
	1	0	1	1
6	1	1	0	X
	1	1	1	1

$y(A,B,C) = \sum(5,7) + d\sum(0,2,4,6)$

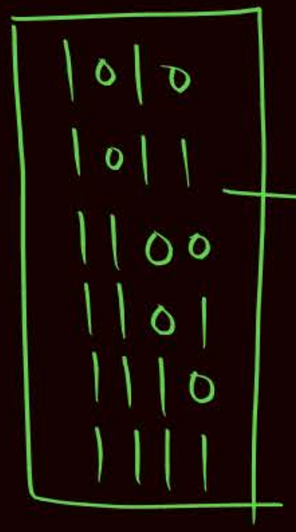


ABC > 3

0 – 9

$(126)_{10} = (11111110)_2 = (0001\ 0010\ 0110)_{BCD}$

	8 4 2 1
	$2^3\ 2^2\ 2^1\ 2^0$
0 —	0000
1 —	0001
2 →	0010
3 →	0011
4 →	0100
5 →	0101
6 →	0110
7 →	0111
8 —	1000
9 —	1001



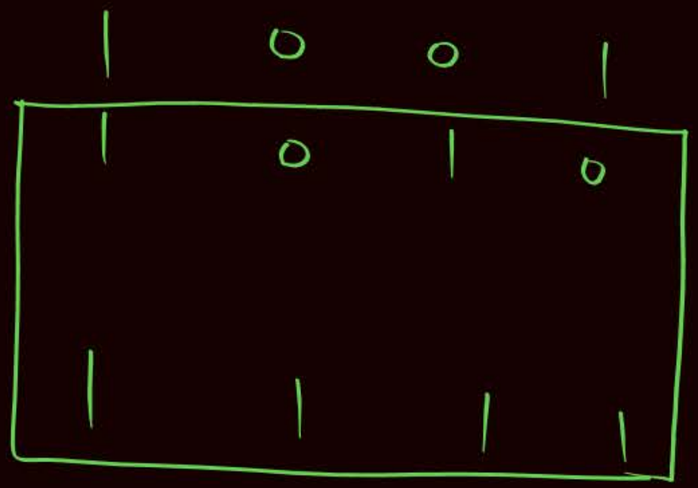
→ Invalid BCD Codes

O/P is '1' when i/p is divisible by '2'.

$(25)_{10} = (11001)_2$

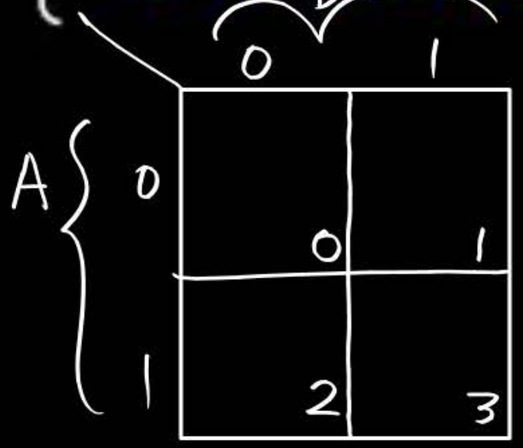
$= (0010\ 0101)_{BCD}$

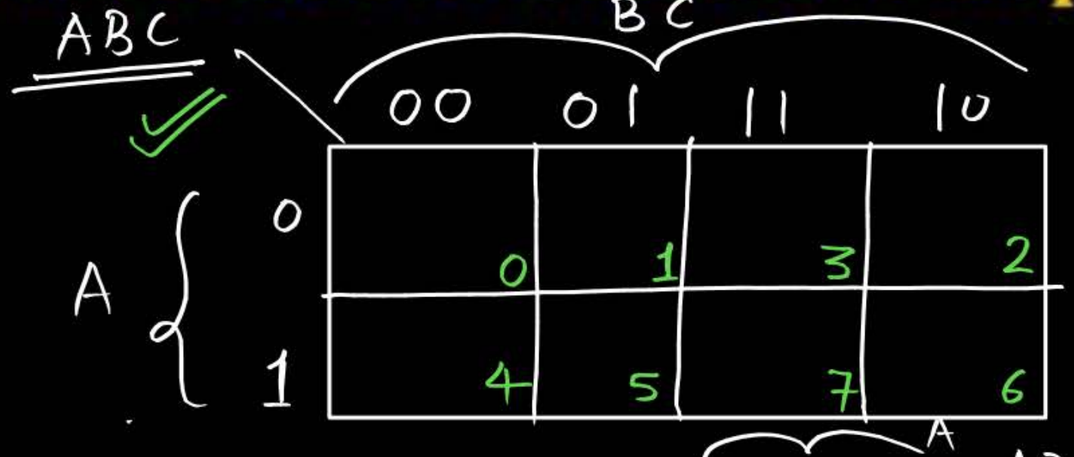
A	B	C	D	y
0	0	0	0	1
				0
				1

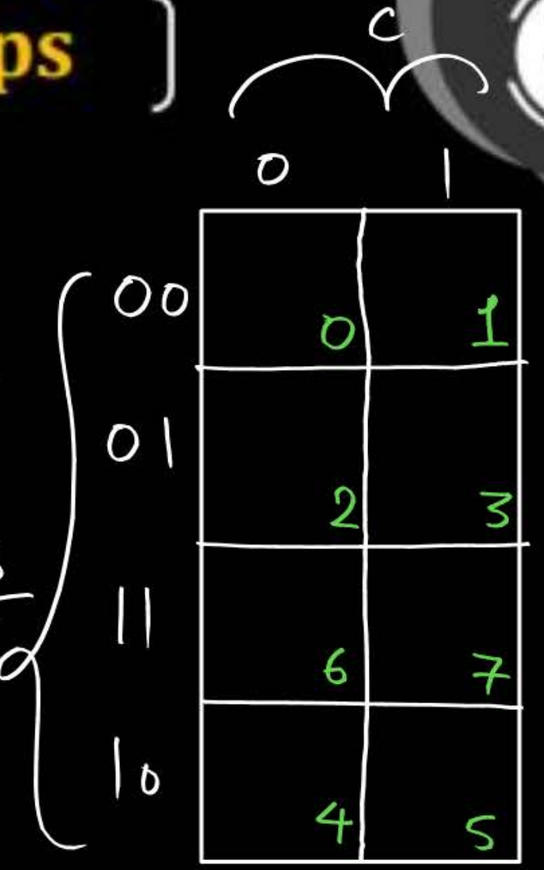


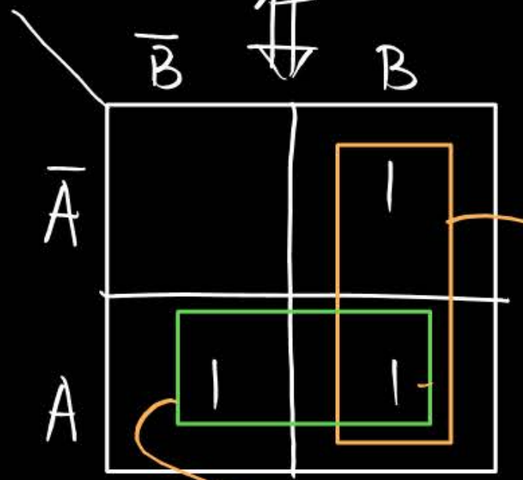
0
X
X
X
X
X
X

2-variable, 3-variable and 4-variable K-maps









$= A$

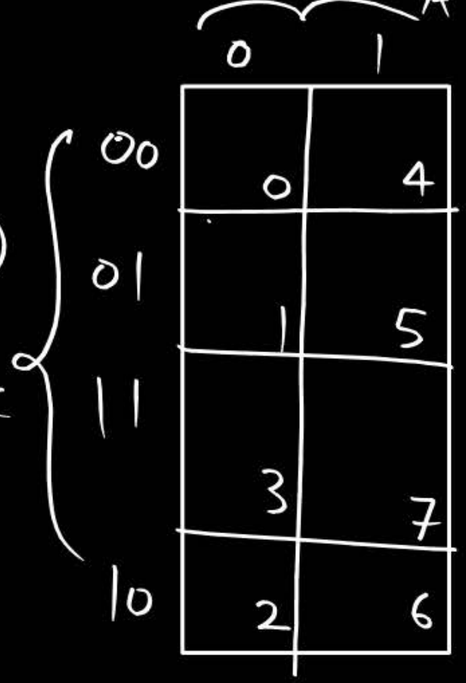
$f(A,B) = \Sigma(1,2,3)$

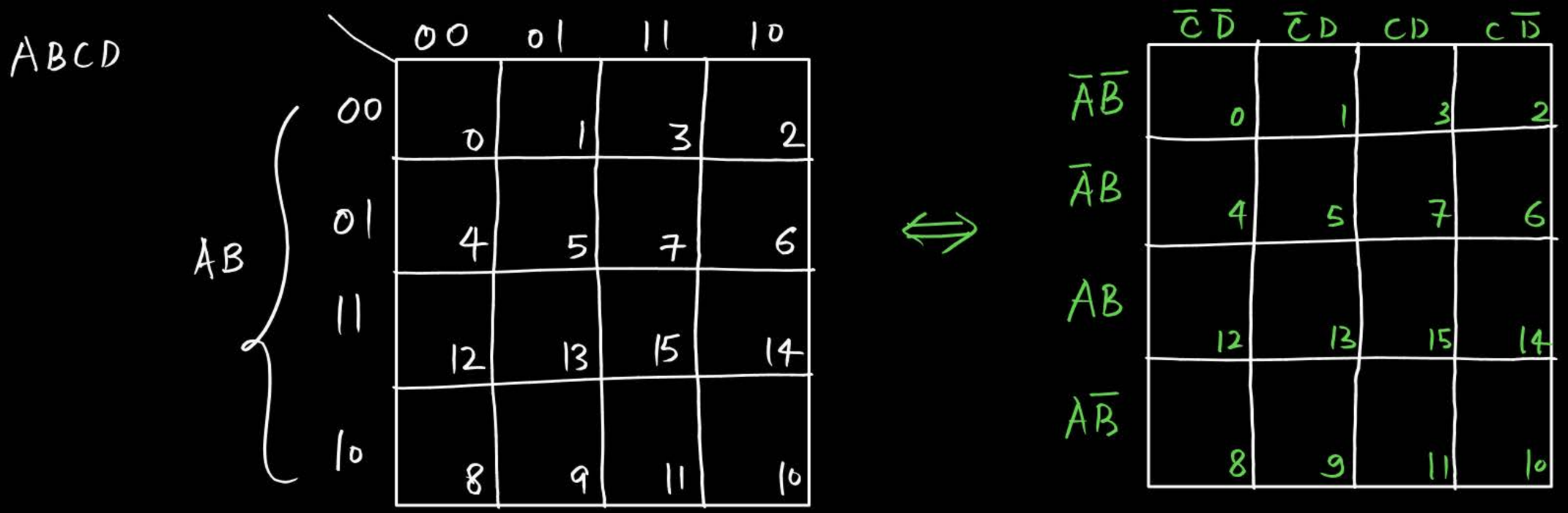
$= B + (A + B)$

$= \bar{A}B + A\bar{B} + AB$

$= B(\bar{A}+A) + A(\bar{B}+B)$

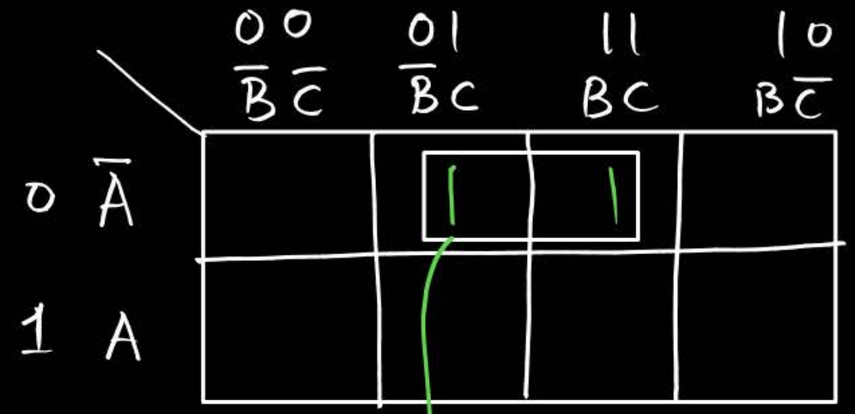
$= B + A$




ABCD
00
01
11
10
AB
00
01
11
10
0
1
3
2
4
5
7
6
12
13
15
14
8
9
11
10
⟺
C̄D̄
C̄D
CD
CD̄
ĀB̄
ĀB
AB
AB̄
0
1
3
2
4
5
7
6
12
13
15
14
8
9
11
10

UDC

- Why gray code is used in case of K-map ?



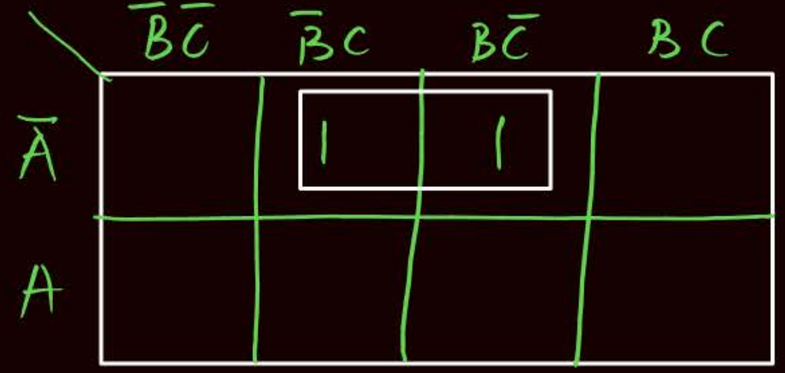
$\bar{A}\bar{B}C$
$+\bar{A}BC$
$= \bar{A}C(\bar{B}+B)$
$= \bar{A}C$

$\bar{A}C$

binary	gray
0111	0100
1000	1100

	binary	Grey
0	00	00
1	01	01
2	10	11
3	11	10

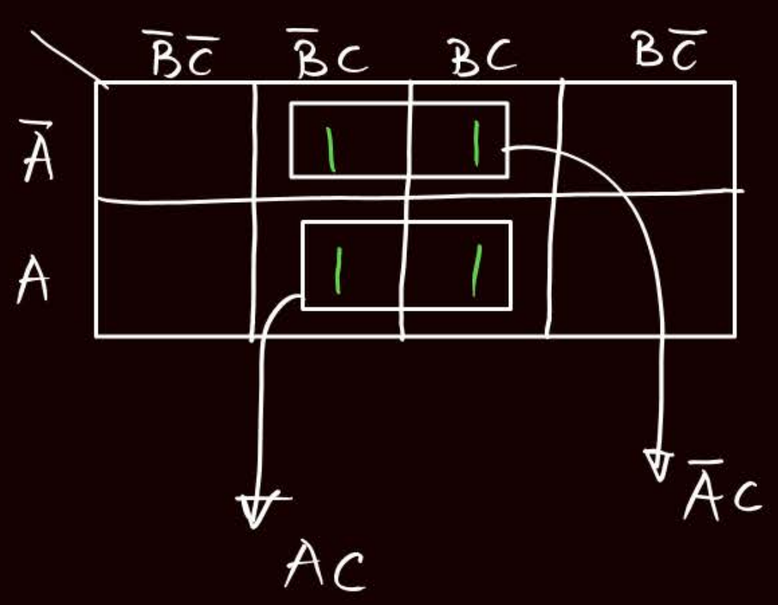
binary	Grey
1001	1101
1010	1111

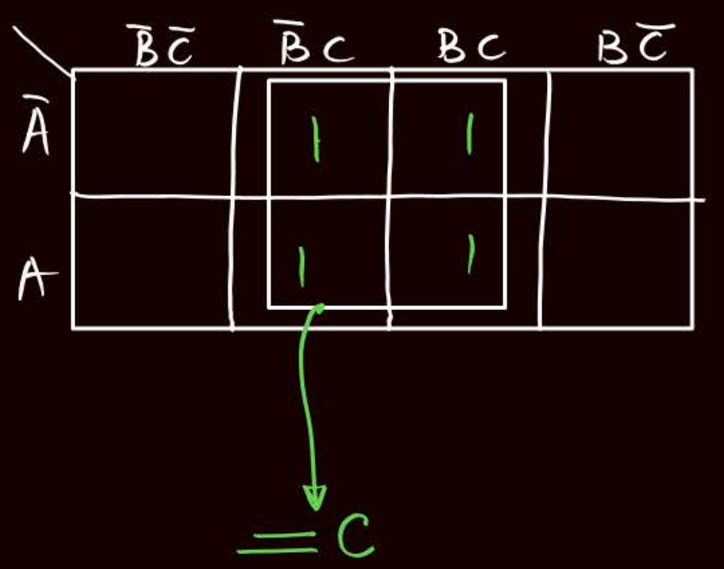


→ binary codes are used.

$\bar{A}\bar{B}C + \bar{A}B\bar{C}$

$\bar{A}[\bar{B}C + B\bar{C}]$ → no simplification possible





$$= \bar{A}C + AC$$

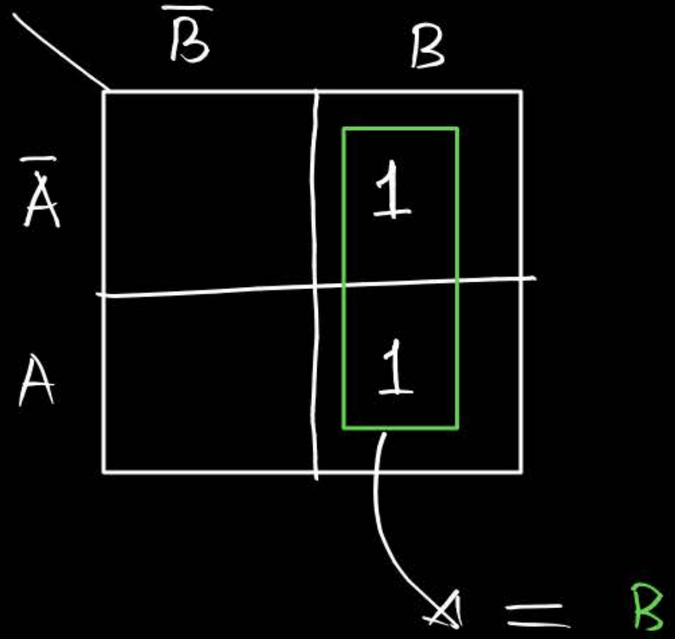
$$= C(\bar{A} + A)$$

$$= C$$

Question

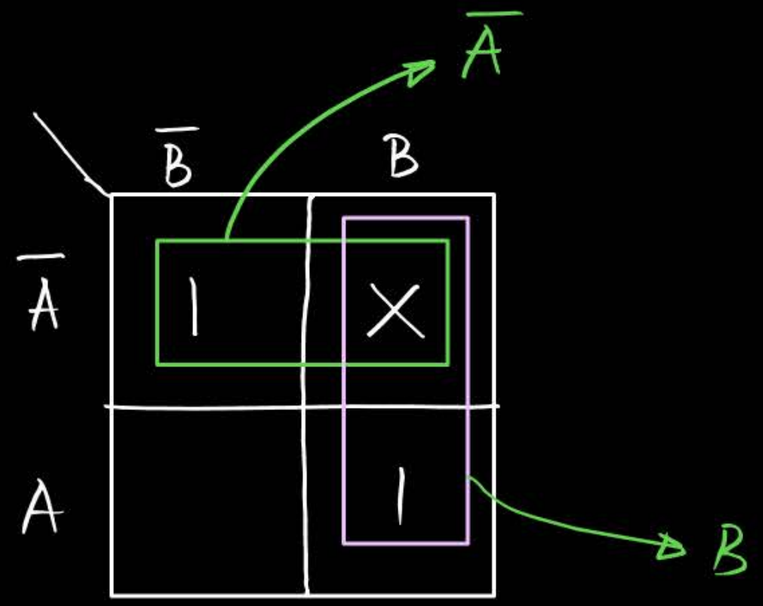
$f(A, B) = \Sigma(1, 3)$

$= B$



Question

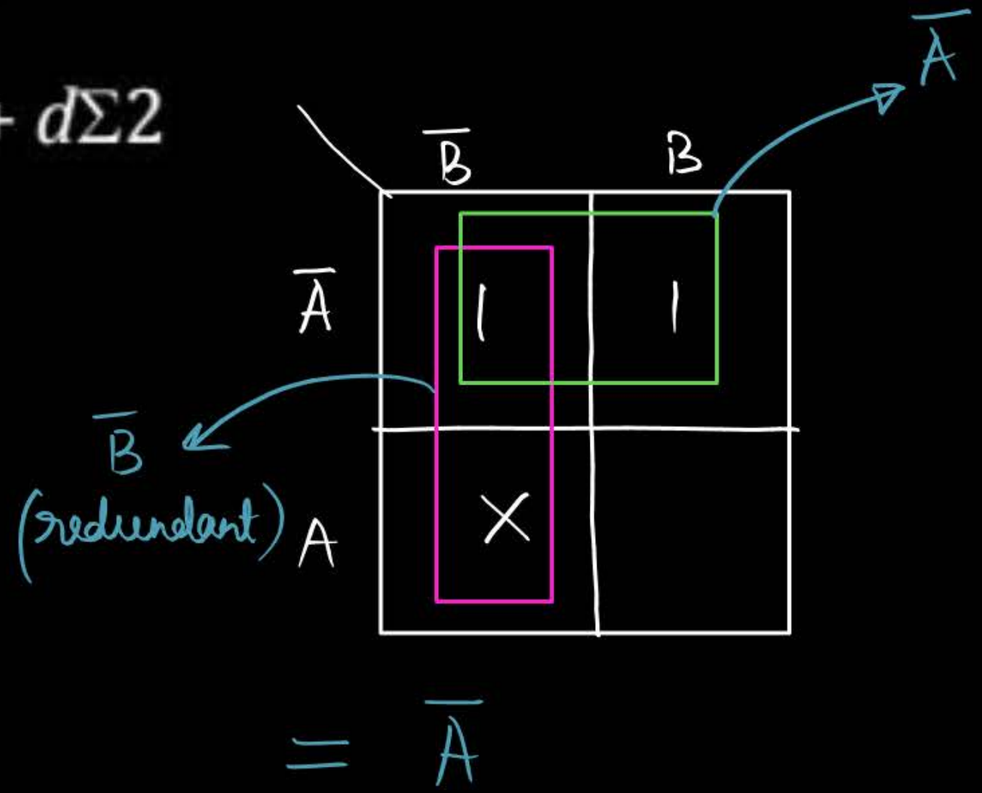
$f(A, B) = \Sigma(0, 3) + d\Sigma(1)$

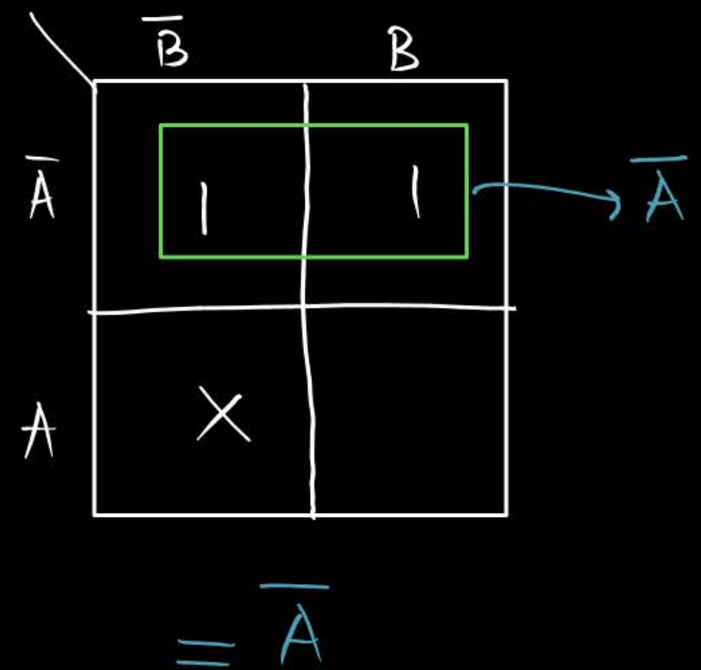


$= \bar{A} + B$

Question

$f(A, B) = \Sigma(0, 1) + d\Sigma 2$





2 Minute Summary

- K-Map

Thank you

GW

Soldiers !