



# **SNS COLLEGE OF TECHNOLOGY**

**Coimbatore-35**

**An Autonomous Institution**



Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++'(III Cycle) Grade  
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

## **DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

### **23ECB201- DIGITAL SYSTEM DESIGN**

II YEAR/ III SEMESTER

UNIT 1 – BOOLEAN THEOREMS AND LOGIC REDUCTION

TOPIC – K Map( Don't care condition)



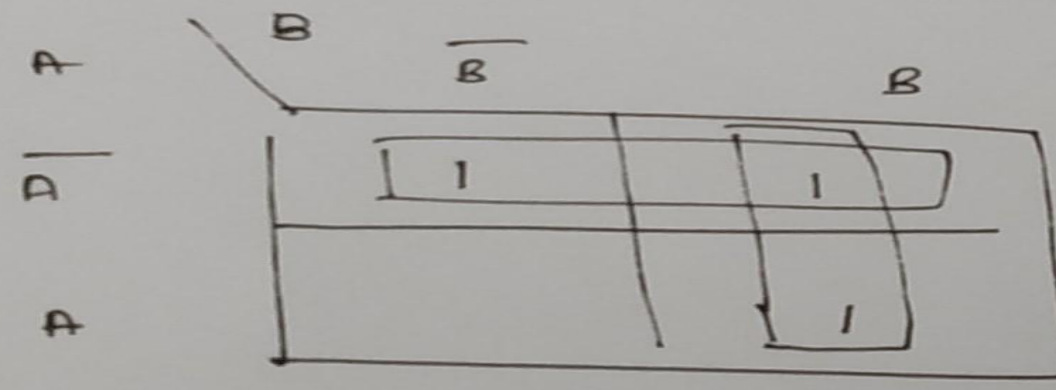
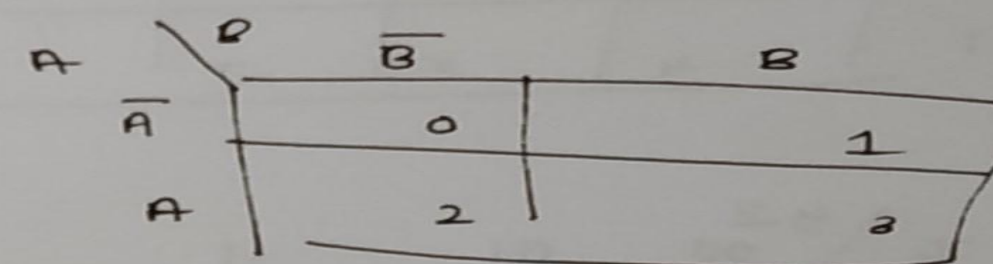
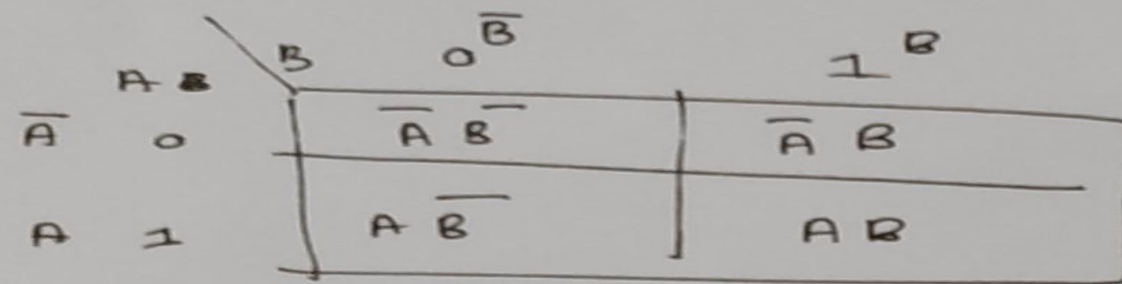
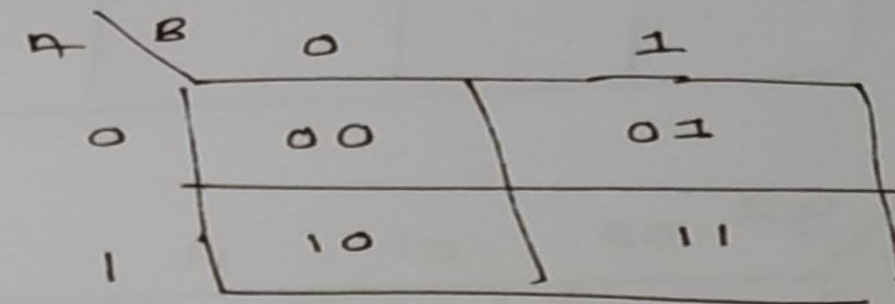
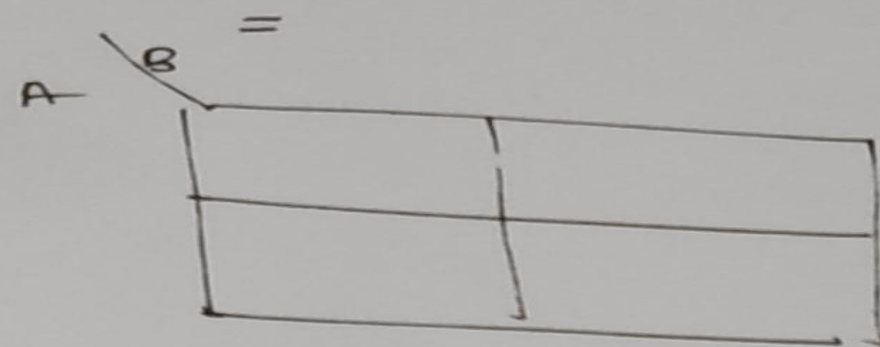
### Two variable k-map

$$1) F = \bar{A}\bar{B} + \bar{A}B + AB$$

$n$  = number of variables

$$n = 2.$$

$$\text{No of columns in k-map} = 2^n = 2^2 = 4$$



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



Three variable k-map.

$$F(x, y, z) = \sum (2, 3, 4, 5)$$

$$n = 3$$

$$\text{No. of columns} = 2^2 = 4$$

x \ yz	00	01	11	10
0				
1				

x \ yz	00	01	11	10
0	0	1	3	2
1	4	5	7	6

x \ yz	00	01	11	10
0			1	1
1	1	1		

Annotations:  $\overline{x}y$  points to the group of 1s in the top row (x=0).  $x\overline{y}$  points to the group of 1s in the bottom row (x=1).

so

$$f(x, y, z) = \sum (2, 3, 4, 5) = \overline{x}y + x\overline{y}$$





3. Minimize the following standard pos expression using k-map.

$$Y = \prod M(0, 2, 3, 5, 7)$$

Sol:-  
 $n = 3, 2^3 = 8$

x	yz	00	01	11	10
0		0	1	3	2
1		4	5	7	6

x	yz	00	01	11	10
0		0	1	3	2
1		4	5	7	6

Group 1

x	yz	yz	y $\bar{z}$	$\bar{y}z$	$\bar{y}\bar{z}$
0		0	1	3	2
1		4	5	7	6

Group 2

x	yz	yz	y $\bar{z}$	$\bar{y}z$	$\bar{y}\bar{z}$
0		0	1	3	2
1		4	5	7	6

Group 3

$$Y = (x + z) \cdot (\bar{y} + \bar{z}) \cdot (\bar{x} + \bar{z})$$



# KARNAUGH MAP



4. Simplify the expression  $Y = \sum m(7, 9, 10, 11, 12, 13, 14, 15)$ , using the K-map method.

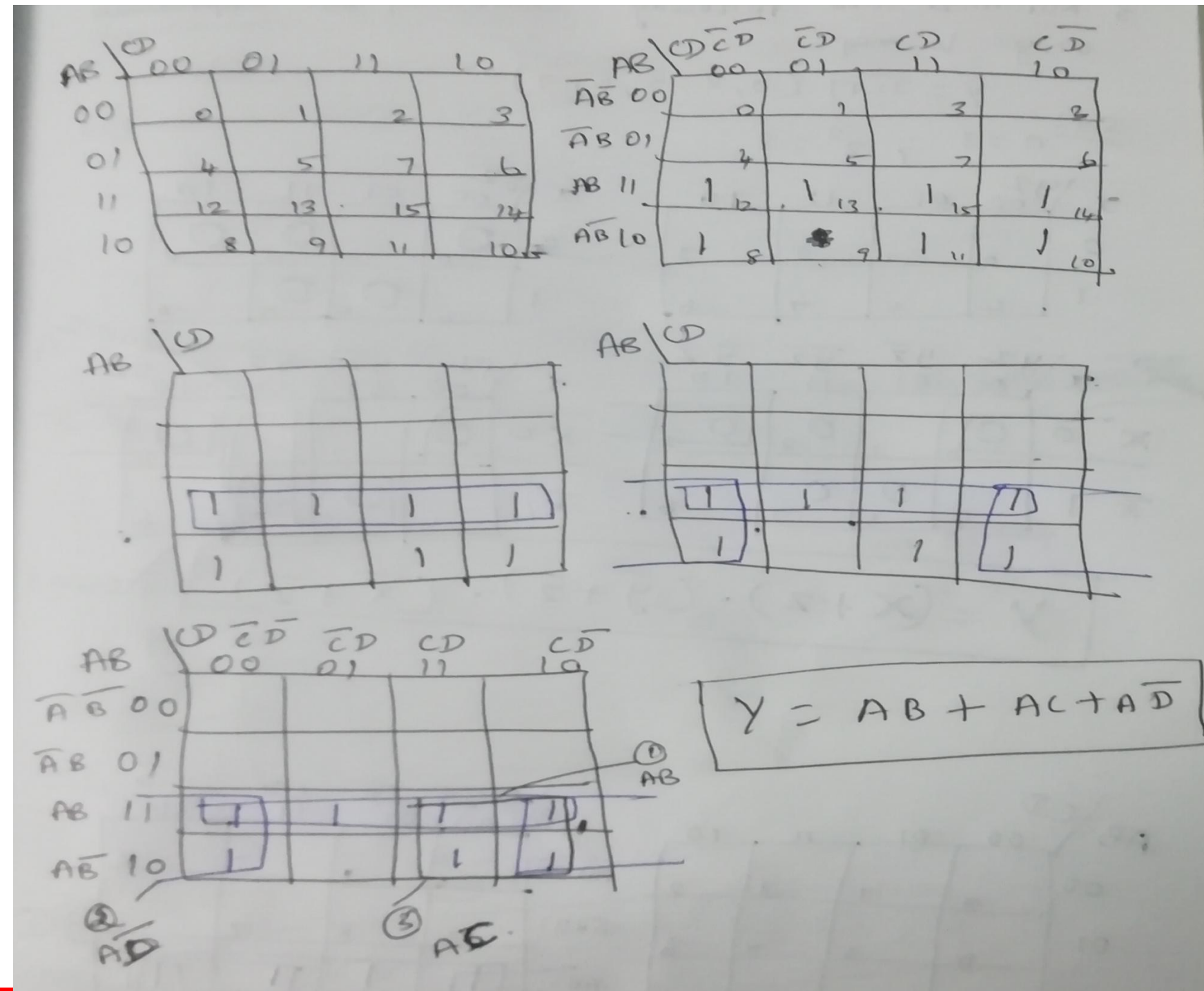
$Y = AB + AC + AD + BCD$





## KARNAUGH MAP - Simplifications

5. Plot the logical expression  $ABCD + AB'C'D' + AB'C + AB$  on a 4 variable K-map and obtain the simplified expression from the K-map.





## Don't Care Conditions

- Don't Care conditions allow us to replace the empty cell of a K-Map to form a grouping of the variables.
- While forming groups of cells, we can consider a “Don't Care” cell as either 1 or 0 or we can simply ignore that cell.
- Don't Care condition can help us to form a larger group of cells.



# Don't Care Conditions

Don't Care Conditions:-

It is represented as 'X' may be assumed to be 0 or 1 as per the requirement for simplification.

Problem:-

Simplify the Boolean expression using K-map.

$$Y = \sum m(1, 3, 7, 11, 15) + d(0, 2, 5)$$

|  
minterms

↳ don't care

AB \ CD	00	01	11	10
00	X	1	1	X
01	4	X	1	6
11	12	13	1	14
10	8	9	1	15

don't care treated as '1'

simplified expression

$$Y = CD + \overline{A}B$$





**THANK YOU**