



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution



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

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECB204 – LINEAR AND DIGITAL CIRCUITS

II YEAR/ III SEMESTER

UNIT 3 – GATES AND MINIMIZATION TECHNIQUES

TOPIC 7 - KARNAUGH MAP MINIMIZATION - Problems



KARNAUGH MAP - Simplifications



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

$$\begin{aligned} Y &= ABCD + \overline{A}\overline{B}\overline{C}\overline{D} + \overline{A}\overline{B}C + AB \\ &= ABCD + \overline{A}\overline{B}\overline{C}\overline{D} + \overline{A}\overline{B}C(D + \overline{D}) + AB(C + \overline{C})(D + \overline{D}) \\ &= ABCD + \overline{A}\overline{B}\overline{C}\overline{D} + \overline{A}\overline{B}CD + \overline{A}\overline{B}C\overline{D} + (ABC + \overline{A}\overline{B}\overline{C})(D + \overline{D}) \\ &= ABCD + \overline{A}\overline{B}\overline{C}\overline{D} + \overline{A}\overline{B}CD + \overline{A}\overline{B}C\overline{D} + ABCD + \overline{A}\overline{B}C\overline{D} + \overline{A}\overline{B}C\overline{D} + \overline{A}\overline{B}C\overline{D} \\ &= ABCD + \overline{A}\overline{B}\overline{C}\overline{D} + \overline{A}\overline{B}CD + \overline{A}\overline{B}C\overline{D} + \overline{A}\overline{B}C\overline{D} + \overline{A}\overline{B}C\overline{D} + \overline{A}\overline{B}C\overline{D} \\ &= m_{15} + m_8 + m_{11} + m_{10} + m_{14} + m_{13} + m_{12} \\ &= \sum_m(8,10,11,12,13,14,15) \end{aligned}$$

		AB			
		00	01	11	10
CD	00	0 0	4 0	12 1	8 1
	01	1 0	5 0	13 1	9 0
11	11	3 0	7 0	15 1	11 1
	10	2 0	6 0	14 1	10 1

$$Y = AB + AC + AD'$$



KARNAUGH MAP



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

		AB			
		00	01	11	10
CD	00	0 0	4 0	12 1	8 0
	01	1 0	5 0	13 1	9 1
	11	3 0	7 1	15 1	11 1
	10	2 0	6 0	14 1	10 1
	00	0	4	12	8

$$Y = AB + AD + AC + BCD$$

$$Y = AB + AD + AC + BCD$$

$$= A(B + D + C) + BCD$$



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

1. Simplify the Boolean function

$$F(A,B,C,D) = \sum m(1,3,7,11,15) + \sum d(0,2,5)$$

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

CD \ AB	00	01	11	10
00	d	0	0	0
01	1	d	0	0
11	1	1	1	1
10	d	0	0	0



THANK YOU