

Switching Circuit & Logic Design

Lecture 10 : Karnaugh Map for four variables

Karnaugh Map For Three Variables

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

Max and minterms for four variables

Maxterm	Minterm	A	B	C	D
$M_0 = A+B+C+D$	$m_0 = A'B'C'D'$	0	0	0	0
$M_1 = A+B+C+D'$	$m_1 = A'B'C'D$	0	0	0	1
$M_2 = A+B+C'+D$	$m_2 = A'B'CD'$	0	0	1	0
$M_3 = A+B+C'+D'$	$m_3 = A'B'CD$	0	0	1	1
$M_4 = A+B'+C+D$	$m_4 = A'BC'D'$	0	1	0	0
$M_5 = A+B'+C+D'$	$m_5 = A'BC'D$	0	1	0	1
$M_6 = A+B'+C'+D$	$m_6 = A'BCD'$	0	1	1	0
$M_7 = A+B'+C'+D'$	$m_7 = A'BCD$	0	1	1	1
$M_8 = A'+B+C+D$	$m_8 = AB'C'D'$	1	0	0	0
$M_9 = A'+B+C+D'$	$m_9 = AB'C'D$	1	0	0	1
$M_{10} = A'+B+C'+D$	$m_{10} = AB'CD'$	1	0	1	0
$M_{11} = A'+B+C'+D'$	$m_{11} = AB'CD$	1	0	1	1
$M_{12} = A'+B'+C+D$	$m_{12} = ABC'D'$	1	1	0	0
$M_{13} = A'+B'+C+D'$	$m_{13} = ABC'D$	1	1	0	1
$M_{14} = A'+B'+C'+D$	$m_{14} = ABCD'$	1	1	1	0
$M_{15} = A'+B'+C'+D'$	$m_{15} = ABCD$	1	1	1	1

Practice

$$F = A'B'CD + AB'CD' + A'BC'D + ABC'D' + ABCD'$$

Practice

$$F = (A+B+C+D) (A'+B+C'+D') (A'+B'+C'+D) (A+B'+C'+D') (A'+B'+C+D)$$

Reduce

AB\CD	00	01	11	10
00				
01				
11				
10				

Reduce

$$F = \sum_m (2,3,6,7,8,10,11,13,14)$$

Reduce

$$F = \prod_M (4, 6, 11, 14, 15)$$