

KARNAUGH MAP MINIMIZATION

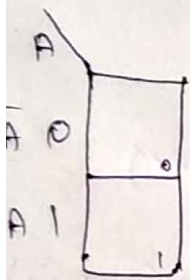
KARNAUGH MAP (K-MAP)

K-map gives us a systematic approach for simplifying a Boolean expression. This k-map method was first proposed by Veitch and modified by Karnaugh. Hence it is also known as Veitch Diagram.

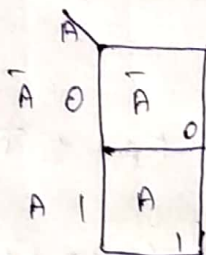
K-map contains boxes called cells. A 'n' variable K-map contains 2^n boxes.

One Variable K-map.

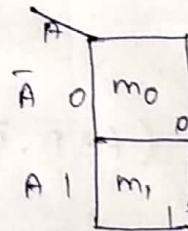
A one variable K-map contains $2^1 = 2$ cells.



One Variable k-map.

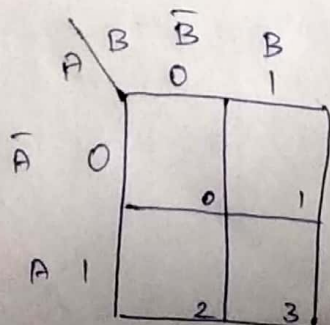


One Variable K-map for POS or Maxterms.



Two Variable K-map.

A two variable K-map contains $2^2 = 4$ cells.



	B	\bar{B}	B
A	0	1	
\bar{A}	0	$\bar{A}\bar{B}$ 0	$\bar{A}B$ 1
A	1	$A\bar{B}$ 2	AB 3

	B	\bar{B}	B
A	0	1	
\bar{A}	0	m_0 0	m_1 1
A	1	m_2 2	m_3 3

Two-variable K-map for SOP or minterms.

	B	\bar{B}	B
A	0	1	
\bar{A}	0	$A+B$ 0	$A+\bar{B}$ 1
A	1	$\bar{A}+B$ 2	$\bar{A}+\bar{B}$ 3

	B	\bar{B}	B
A	0	1	
\bar{A}	0	M_0 0	M_1 1
A	1	M_2 2	M_3 3

Two variable K-map for Pos or maxterms.

Three Variable K-map.

A 3-variable K-map contains $2^3 = 8$ cells.

	BC	$\bar{B}\bar{C}$	$\bar{B}C$	BC	$B\bar{C}$
A	00	01	11	10	
\bar{A}	0	0	1	3	2
A	1	4	5	7	6

Three variable K-map.

	BC	$\bar{B}\bar{C}$	$\bar{B}C$	$B\bar{C}$
A	00	01	11	10
\bar{A}	0	$\bar{A}\bar{B}\bar{C}$ 0	$\bar{A}\bar{B}C$ 1	$\bar{A}B\bar{C}$ 2
A	1	$A\bar{B}\bar{C}$ 4	$A\bar{B}C$ 5	$AB\bar{C}$ 6

	BC	00	01	11	10
A	0	m_0	m_1	m_3	m_2
1	m_4	m_5	m_7	m_6	

Three variable K-map for SOP or minterms.

		BC			
		00	01	11	10
A	0	$A+B+C$	$A+B+\bar{C}$	$A+\bar{B}+C$	$A+\bar{B}+\bar{C}$
	1	$\bar{A}+B+C$	$\bar{A}+B+\bar{C}$	$\bar{A}+\bar{B}+C$	$\bar{A}+\bar{B}+\bar{C}$

		BC			
		00	01	11	10
A	0	M_0	M_1	M_3	M_2
	1	M_4	M_5	M_7	M_6

Three variable k-map for POS or Maxterms.

Four Variable k-map

A 4-variable k-map contains $2^4 = 16$ cells.

		CD			
		$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
		00	01	11	10
AB	$\bar{A}\bar{B}$ 00	0	1	3	2
	$\bar{A}B$ 01	4	5	7	6
	AB 11	12	13	15	14
	$A\bar{B}$ 10	8	9	11	10