Therefore, the Boolean function of output is, f = p'qr + pq'r + pqr' + pqr. This is the canonical SoP form of output, f. We can also represent this function in following two notations.

f=m3+m5+m6+m7f=m3+m5+m6+m7

f=∑m(3,5,6,7)f=∑m(3,5,6,7)

In one equation, we represented the function as sum of respective min terms. In other equation, we used the symbol for summation of those min terms.

Canonical PoS form

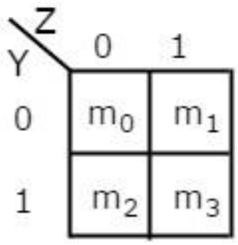
It stands for Canonical Product of Sums form. Each sum term in this form includes all literals. These total terms are just the Max terms, so to speak. As a result, the canonical PoS form is also known as the Max terms form's product.

To acquire the Boolean expression function that corresponds to that output variable, first determine the Max terms for which the output variable is zero. Then, logically AND those Max terms. This Boolean operation will take the form of a Max terms product.

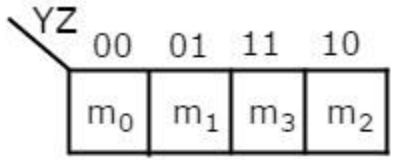
If there are other output variables, follow the same process for each of them.

Example

Consider the same truth table of previous example. Here, the output ff is '0' for four combinations of inputs. The corresponding Max terms are p + q + r, p + q + r', p + q' + r, p' +



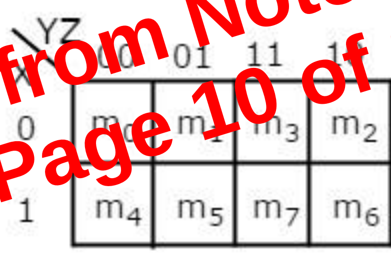
or



- There is only one possibility of grouping 4 adjacent min terms.
- The possible combinations of grouping 2 adjacent min terms are {(m_0, m_1), (m_2, m_3), (m_0, m_2) and (m_1, m_3)}.

3 Variable K-Map

The number of cells in 3 variable K-map is eight, since the number of variables is three. The following figure shows 3 variable K-Map.

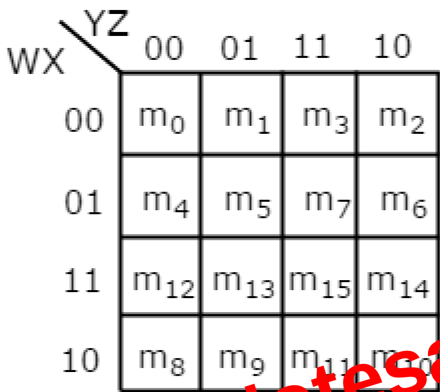


- There is only one possibility of grouping 8 adjacent min terms.
- The possible combinations of grouping 4 adjacent min terms are {(m_0, m_1, m_3, m_2), (m_4, m_5, m_7, m_6), (m_0, m_1, m_4, m_5), (m_1, m_3, m_5, m_7), (m_3, m_2, m_7, m_6) and (m_2, m_0, m_6, m_4)}.
- The possible combinations of grouping 2 adjacent min terms are {(m_0, m_1), (m_1, m_3), (m_3, m_2), (m_2, m_0), (m_4, m_5), (m_5, m_7), (m_7, m_6), (m_6, m_4), (m_0, m_4), (m_1, m_5), (m_3, m_7) and (m_2, m_6)}.

- If x=0, then 3 variable K-map becomes 2 variable K-map.

4 Variable K-Map

The number of cells in 4 variable K-map is sixteen, since the number of variables is four. The following figure shows 4 variable K-Map.



- There is only one possibility of grouping 16 adjacent min terms.
- Let R_1, R_2, R_3 and R_4 represents the min terms of first row, second row, third row and fourth row respectively. Similarly, C_1, C_2, C_3 and C_4 represents the min terms of first column, second column, third column and fourth column respectively. The possible combinations of grouping 8 adjacent min terms are {(R_1, R_2), (R_2, R_3), (R_3, R_4), (R_4, R_1), (C_1, C_2), (C_2, C_3), (C_3, C_4), (C_4, C_1)}.
- If w=0, then 4 variable K-map becomes 3 variable K-map.

GB1	2,6,10,14	-	-	1	0
	2,10,6,14	-	-	1	0
	8,9,10,11	1	0	-	-
	8,10,9,11	1	0	-	-
GB2	10,11,14,15	1	-	1	-
	10,14,11,15	1	-	1	-

The successive groups of min term pairs which are differed in only one-bit position are merged. That differed bit is represented with this symbol, '-'. In this case, there are two groups and each group contains combinations of four min terms. Here, these combinations of 4 min terms are available in two rows. So, we can remove the repeated rows. The reduced table after removing the redundant rows is shown below.

Group Name	Min terms	W	X	Y	Z
GC1	2,6,10,14	-	-	1	0
	8,9,10,11	1	0	-	-
GC2	10,11,14,15	1	-	1	-