McCLUSKEY's Tabulation Method

This method provides a mechanical procedure for Simplifying Boolean expressions in the Sum of products form. K-map method is when there are five or six variables in the expression, whereas the Mccluskey's method can be used to Simplify Boolean functions in any number of Variables. This tabulation method uses a step-by-step Procedure.

Example:- Find the minimum Sum of products for the function $f(a,b,c) = \sum(0,2,3,7)$ by using the Mccluskey's tabulation method.

soln:-

First we find the binary number representations of the given decimal numbers in $\sum$ and arrange them in column 1 after seperating them in groups according to the number of 1's.

In column 2, we write the decimal equivalents, arranging them in ascending order within each group.

col. 1	col. 2	col. 3
000	0 ✓	0,2 (2) *
010	2 ✓	2,3 (1) *
011	3 ✓	3,7 (4) *
111	7 ✓	

* prime implicants

The entry 0 in the 1st group of col. 2 is compared with the entry 2 in the 2nd group. Since the difference is $(2-0) = 2$, a power of 2, the pair of numbers 0 and 2 are placed in the 1st group in the col. 3 with the difference within brackets as 0, 2 (2). Thus the numbers in col. 2 thus paired are ticked. Similarly the numbers 2 and 3 paired and then the numbers 3 and 7 are paired.

The pair of numbers in the 1st gp in col. 3 cannot be compared with the pair of numbers in the 2nd gp, since the numbers in the brackets are not the same. Similarly the pairs of numbers in the 2nd & 3rd gps cannot be compared. The process ends.

The entries in the 2nd & 3rd columns which are not ticked are the prime implicants.

Now to eliminate the unnecessary prime implicants from the minimum sum, we form the prime implicant chart, the prime implicants are entered. In the top row of the chart, all the given decimal numbers are entered as shown in the following chart.

Prime Implicants chart

P.I's	0✓	2✓	3✓	7✓
0,2 (2)	⊕	×		
2,3 (1)		×	×	
3,7 (4)			×	⊕

Since the first prime implicant is the pair 0, 2, we make a x mark below 0 and 2 & the chart in the 1st row.

Similarly x marks are made under 2 and 3 in the 1st row and also under 3 and 7 in the 3rd row.

Columns containing only one check (x) mark are noted and encircled. The terms in the 1st column corresponding to the ⊕ mark are to be included in the minimum sum.

If we note that the terms 0, 2 (2) and 3, 7 (4) include all the given decimal numbers, we conclude that no further term in the 1st column need be included in the minimum sum.

Now the minimum sum is the sum of the irredundant prime implicants in the following sense:

Minimum $f(a, b, c) = 0(2) + 3(4)$,

   taking only the leading number in the selected terms

   $= 000 (2) + 011 (4)$ [binary equivalent]

   $= 0\not b0 + \not b11$ [∵ the bit positions corresponding to the bracketed difference numbers struck off]

   $= a'c' + bc$ //.