EE 2720

Handout # 16a

EE 2720

This handout relates to materials of handout 16.

It provides the correct definitions of product term essential prime implicant and sum term essential prime implicant. These definitions are wrong in handout 16. It also provides minimal expressions for some of the examples of handout 16.

- Definition: A product term essential prime implicant of a logic function is a prime implicant where some of its minterms are ~~covered~~ covered by only one prime implicant; (or in other words, some of its minterms are not covered by any other prime implicant)

- Definition: A sum term essential prime implicant of a logic function is a prime implicant where some of its maxterms are covered by only one prime implicant; (or in other words, some of its maxterms are not covered by any other prime implicant).

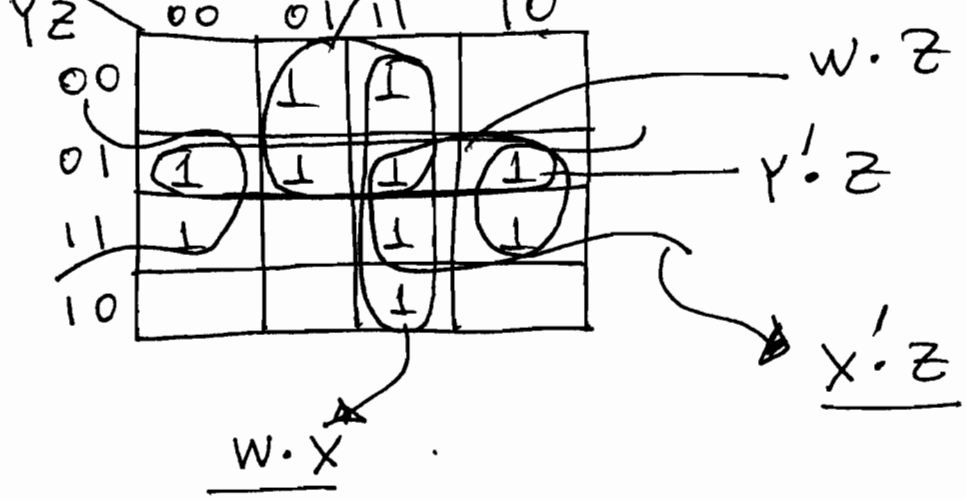
Note 1: Every product term essential prime implicant must be included in the minimal sum for the logic function. So, just include all the essential prime implicants in the minimal sum; (only the essential ones).

Note 2: Every sum term essential prime implicant must be included in the minimal product for the logic function. So, just include all the essential prime implicants in the minimal product; (only the essential ones).

Example 2, pages 2, 3 of handout #6

Find the minimal sum for

$F = \Sigma_{w,x,y,z}(1, 3, 4, 5, 9, 11, 12, 13, 14, 15)$



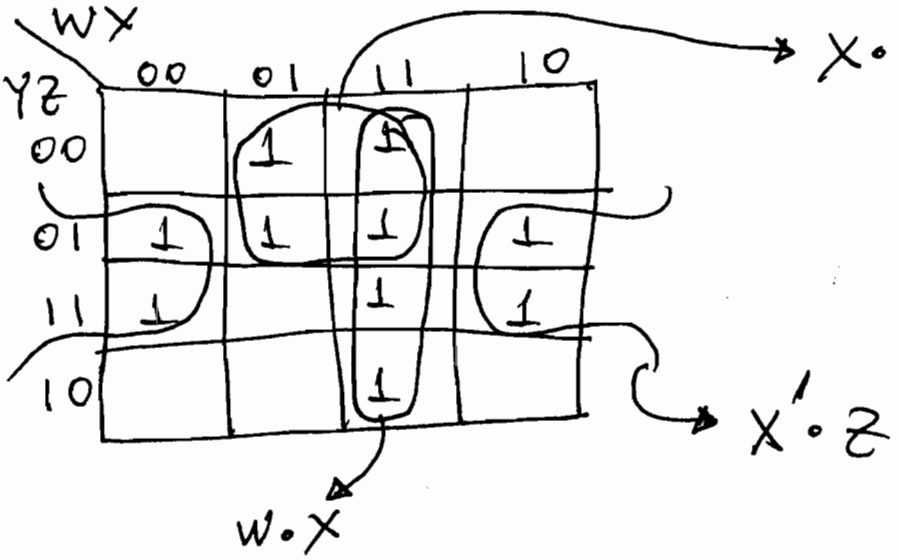
The above function F has five prime implicants. They are: $W \cdot X$, $X' \cdot Z$, $Y' \cdot Z$, $W \cdot Z$, $X \cdot Y'$. Only $W \cdot X$, $X' \cdot Z$, $X \cdot Y'$ are essential (according to the definition). Thus the minimal sum is

$$F = W \cdot X + X' \cdot Z + X \cdot Y'$$

Example 2, pages 2, 3 of handout 16, doing it with experience (without any definition).

Find the minimal sum for

$F = \Sigma_{w,x,y,z}(1, 3, 4, 5, 9, 11, 12, 13, 14, 15)$



$F = W \cdot X + X' \cdot Z + X \cdot Y'$

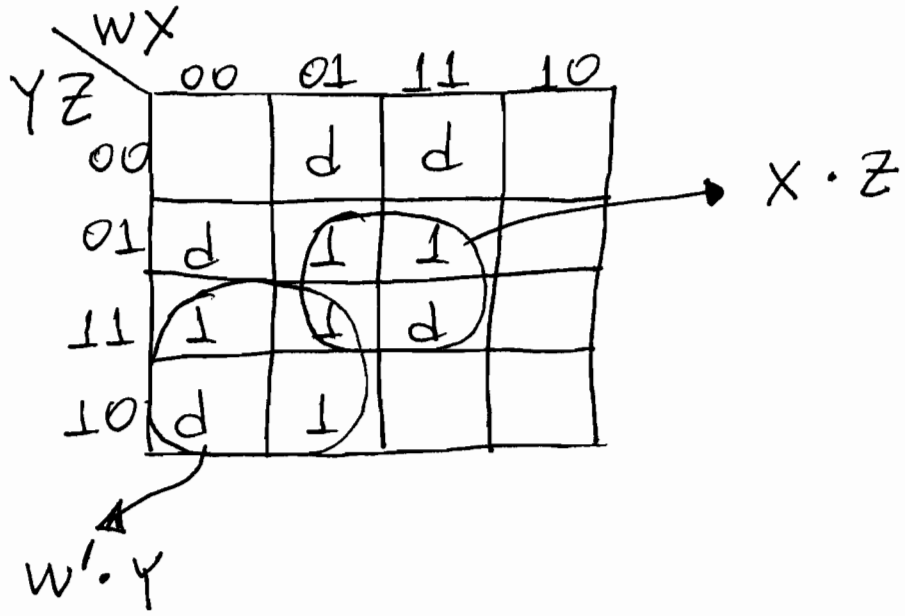
Note: In the above Karnaugh map I covered all 1's. I did not produce any redundant terms

The above F is the minimal sum.

Example 7 page 13 of handout 16, doing it with experience (without any definition).

Find the minimal sum for

$F = \Sigma w,x,y,z\,(3,5,6,7,13) + d(1,2,4,12,15)$



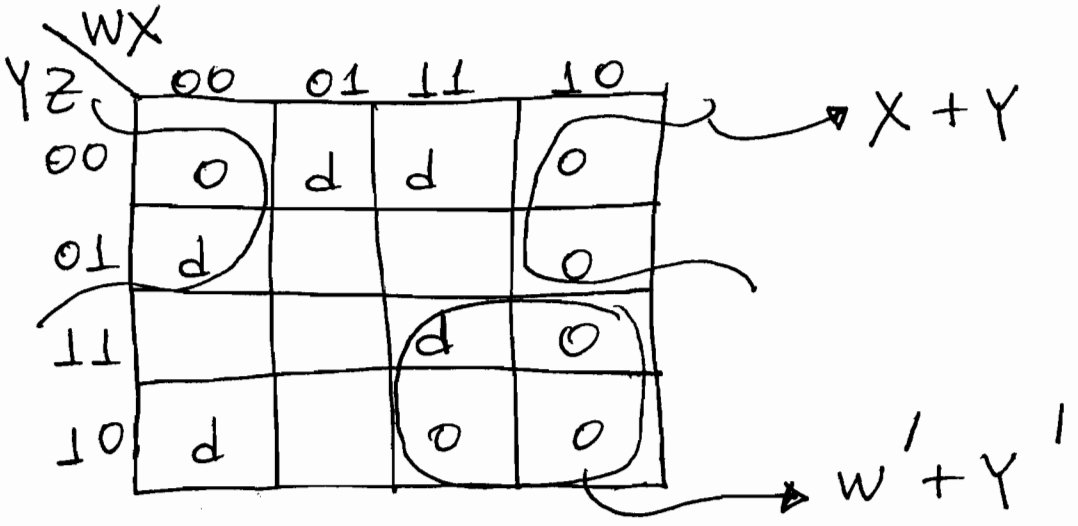
$F = W' \cdot Y + X \cdot Z$

- The above is the minimal sum.
- Note that J covered all the 1's, J didn't cover all the d's (it is not necessary) and did not produce any redundant terms.

Example 8 page 14 of handout 16, doing it with experience (without any definition).

Find the minimal product for

$F = \Sigma w, x, y, z (3, 5, 6, 7, 13) + d(1, 2, 4, 12, 15)$



$F = (X+Y) \cdot (W'+Y')$

- The above is the minimal product.
- Note that I covered all the 0's, I did not cover all the d's (it is not necessary) and did not produce any redundant terms.