FVH#538

Gljlwdo#Orjlf#Ghvljq#

Zhhn#6e#

Sulph#lpsolfdqw2Hvvhqwldo#Sulph#lpsolfdqw

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Prime Implicants

- Prime Implicants
  - Essential Prime Implicants
  - Non-essential primeIimplicants
- Product-of-Sums optimization
- Don’t cares

Implicants

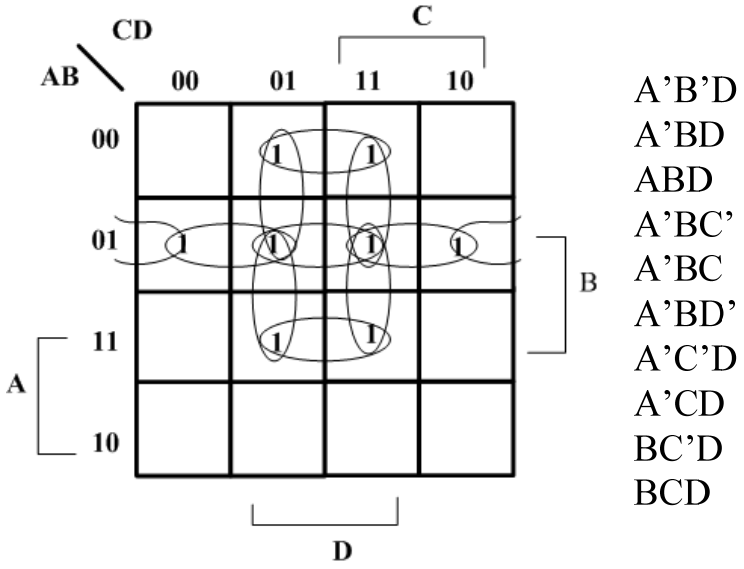
- Must cover all 1s of the function on K-map
  - Each 1 can be used multiple times in generating the terms of the expression
- When you group 1's on a K-map, generating a term, that term is an *implicant* of the function
  - Prime Implicants
  - Essential Prime Implicants

Prime Implicant

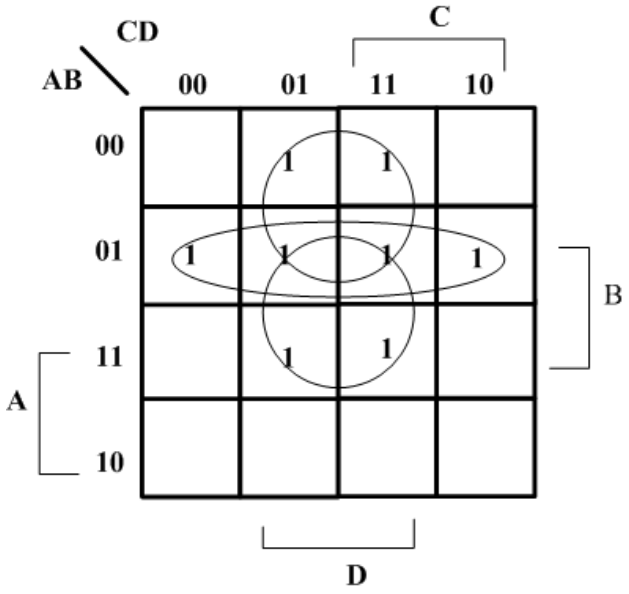
- If removal of an any literal from an implicant P results in a product term that is not an implicant of the function, then P is a prime implicant.

Implicants

- Implicants with 2 1s
- with 4 1s



A’B’D
A’BD
ABD
A’BC’
A’BC
A’BD’
A’C’D
A’CD
BC’D
BCD



A’D
A’B
BD

Some general statements on PI

- A single 1 on a map is a prime implicant if is not adjacent to any other 1 of the function.
- Two adjacent 1s on a map represent a prime implicant, provided that they are not within a rectangle of 4 or more squares containing 1s.
- Four 1’s that are an implicant are a prime implicant if they are not within a group of 8.

Essential Prime Implicant

- A prime implicant that contains a 1 that is not covered by any other prime implicant of the function is an essential prime implicant.

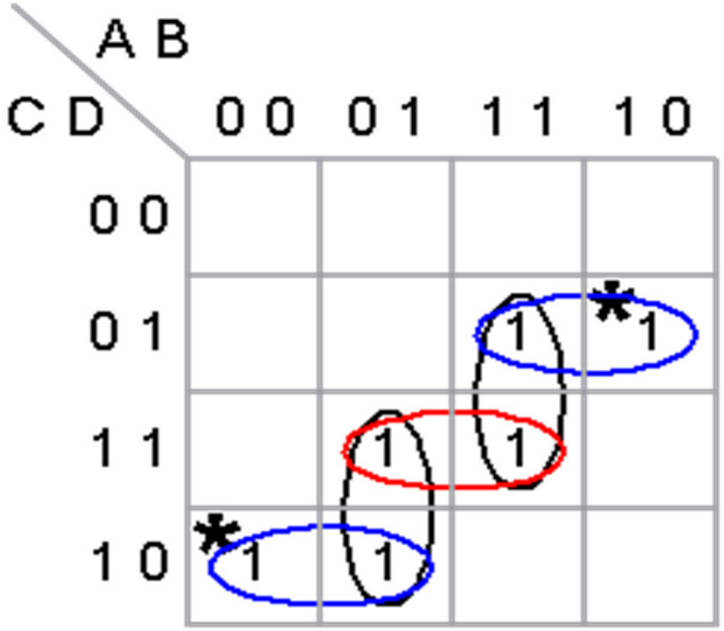
- *IT MUST BE INCLUDED IN ANY MINIMAL REPRESENTATION OF THE FUNCTION*.

Karnaugh Map Examples

In the following examples the distinguished 1-cells are marked in the upper left corner of the cell with an asterisk (*). The essential prime implicants are circled in **blue**, the prime implicants are circled in **black**, and the non-essential prime implicants included in the minimal sum are shown in **red**.

Example 1

Prime Implicants: 5
Distinguished 1-Cells: 2
Essential Prime Implicants: 2
Minimal Sums: 1



Y = A'CD' + AC'D + BCD

Example 2

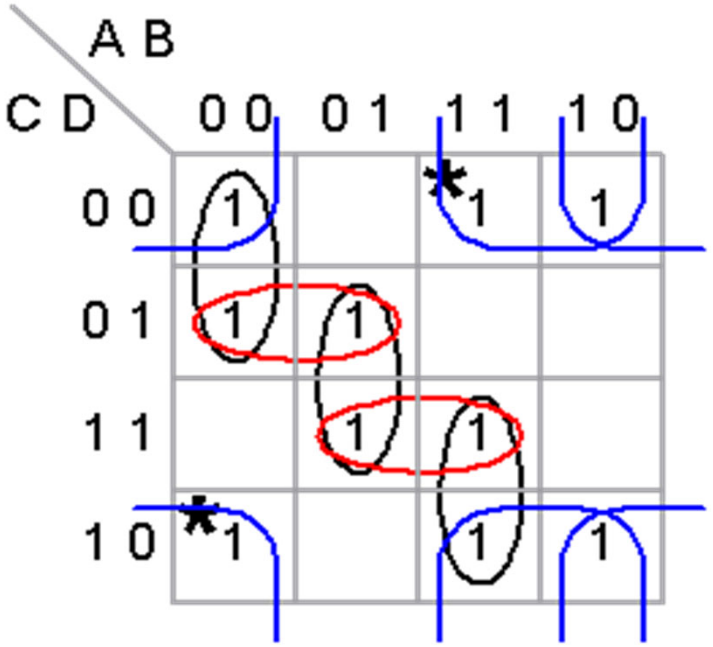
Prime Implicants: 7

Distinguished 1-Cells: 2

Essential Prime Implicants: 2

Minimal Sums: 1

Y = B'D' + AD' + A'C'D + BCD



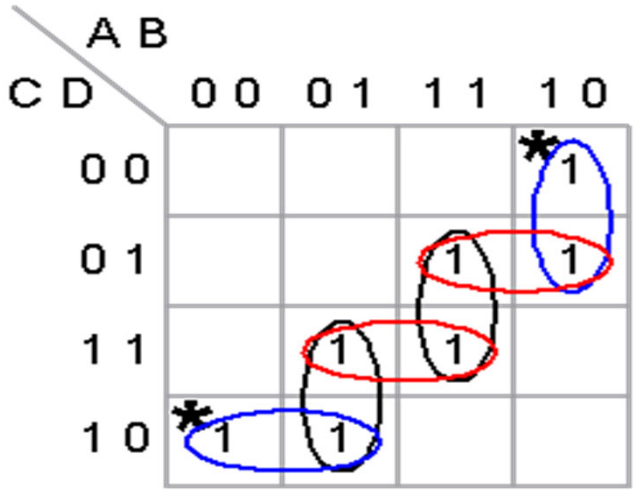
Example 3

Prime Implicants: 6

Distinguished 1-Cells: 2

Essential Prime Implicants: 2

Minimal Sums: 3



Y = AB'C' + A'CD' + AC'D + BCD

Y = AB'C' + A'CD' + ABD + A'BC

= AB'C' + A'CD' + ABD + BCD

Example 4

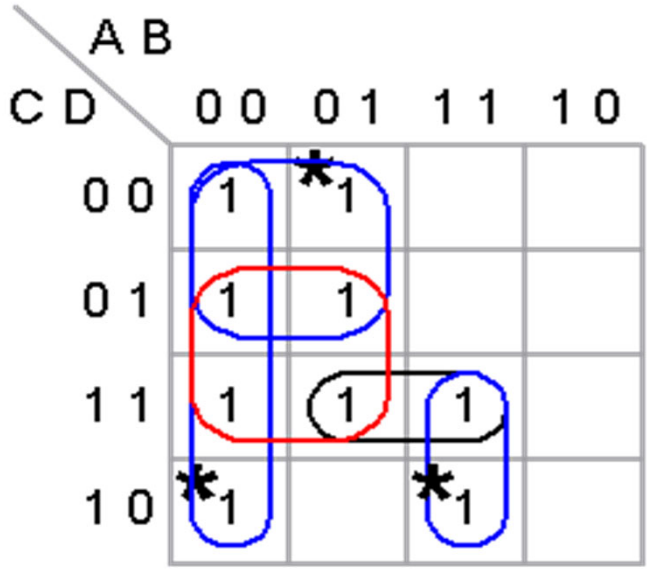
Prime Implicants: 5

Distinguished 1-Cells: 3

Essential Prime Implicants: 3

Minimal Sums: 1

Y = A'B' + A'C' + ABC + A'D



Example 5

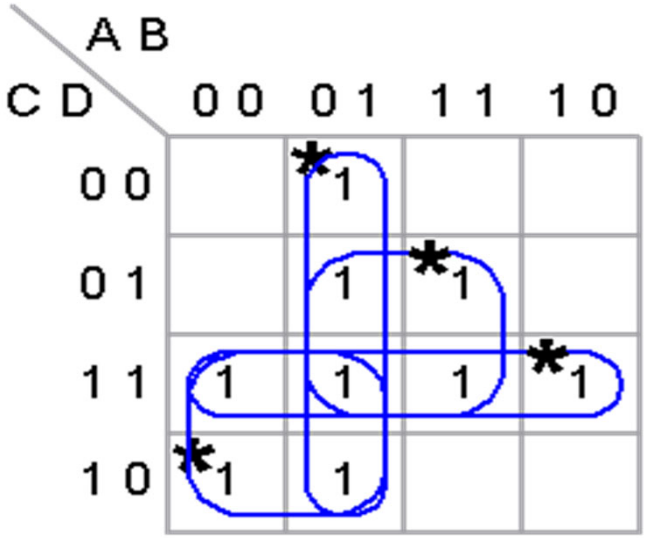
Prime Implicants: 4

Distinguished 1-Cells: 4

Essential Prime Implicants: 4

Minimal Sums: 1

Y= A'C + A'B + BD + CD



Prime Implicants: 8
Distinguished 1-Cells: 0
Essential Prime Implicants: 0
Minimal Sums: 2

Y = A'B'C + A'BD + ABC' + AB'D

Y = B'CD' + A'CD + BC'D + AC'D