

Mon Oct 7 2019

Set 5, Slide 27

(1) A or  $\bar{A}$ ? Neither  
 B or  $\bar{B}$ ?  $\bar{B}$   
 C or  $\bar{C}$ ? Neither  
 D or  $\bar{D}$ ?  $\bar{D}$   
 Answer:  $\bar{B}\bar{D}$

(2) A or  $\bar{A}$ ?  $\bar{A}$   
 B or  $\bar{B}$ ? Neither  
 C or  $\bar{C}$ ? C  
 Answer:  $\bar{A}C$

(3) A or  $\bar{A}$ ? Neither  
 B or  $\bar{B}$ ? Neither  
 C or  $\bar{C}$ ? Neither  
 D or  $\bar{D}$ ?  $\bar{D}$   
 Answer:  $\bar{D}$

Slide 32

Implicants of NAND(A, B)

From first SOP expression:  $\bar{A}\bar{B}$ ,  $\bar{A}B$ ,  $A\bar{B}$

New in 2nd " " :  $\bar{A}$

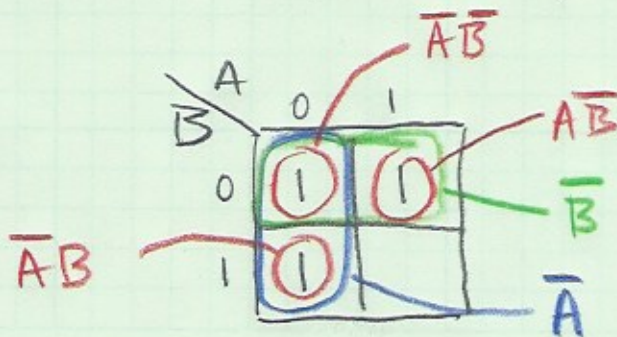
New in 3rd " " :  $\bar{B}$

New in 4th " " : none

The implicants are  $\bar{A}\bar{B}$ ,  $\bar{A}B$ ,  $A\bar{B}$ ,  $\bar{A}$ ,  $\bar{B}$

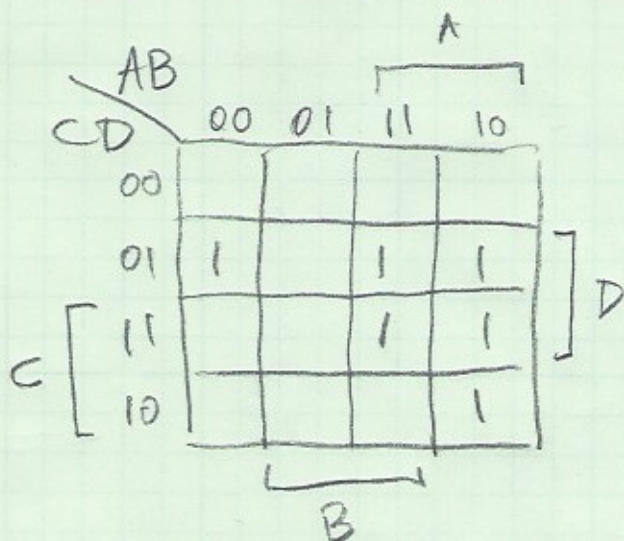
Slide 33

Example 1



Example 2  
K-map

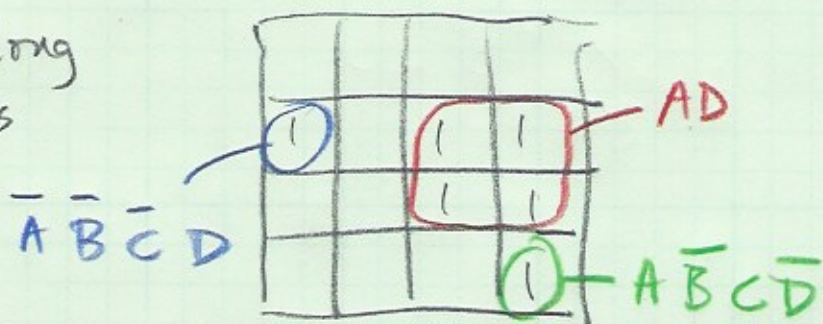
ENEL 353  
Oct 7 2019  
2 of 4



We'll find examples of implicants, not all of the implicants.

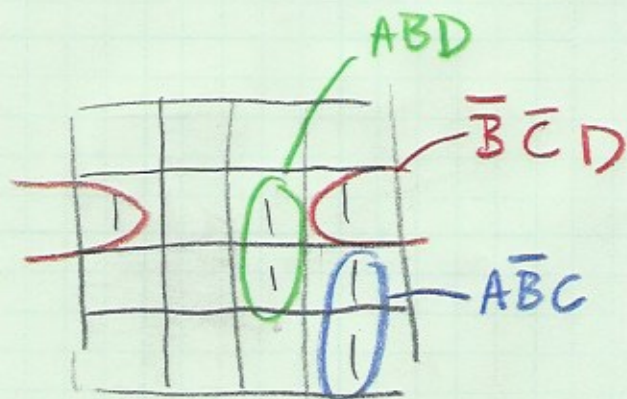
A group of 4 along with 2 minterms

$$F = AD + \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}C\bar{D}$$



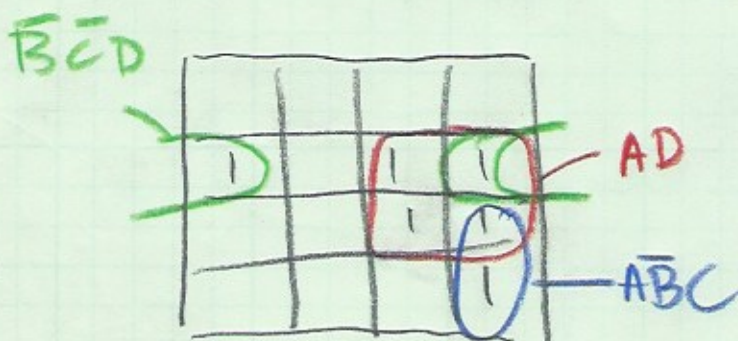
3 groups of 2

$$F = \bar{B}\bar{C}\bar{D} + ABD + A\bar{B}C$$

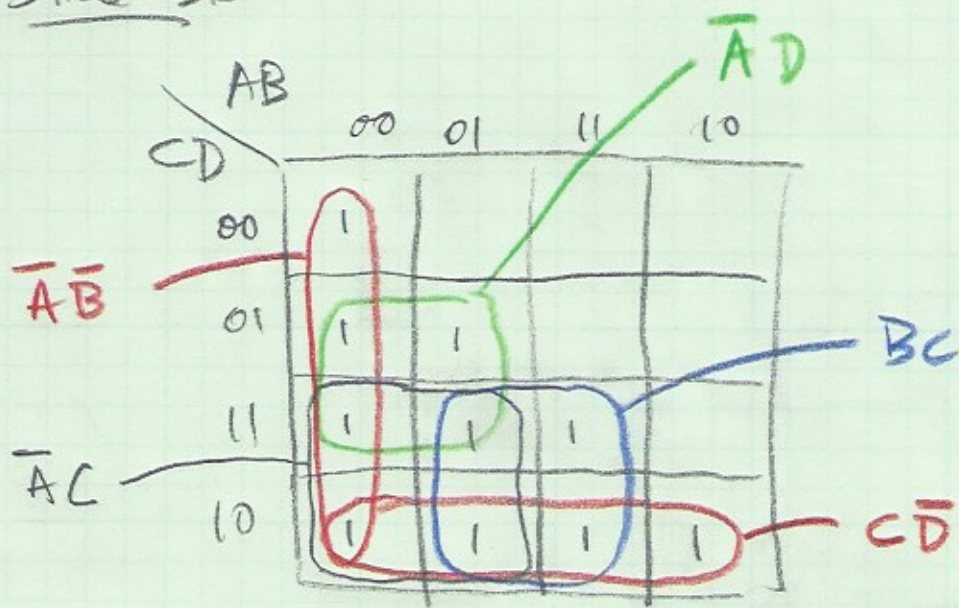


1 group of 4,  
2 groups of 2

$$F = AD + A\bar{B}C + \bar{B}\bar{C}D$$



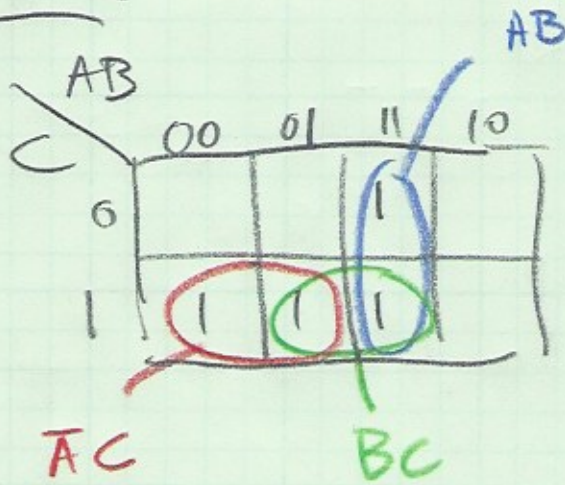
Slide 36



ENEL 353  
Oct 7 2019  
3 of 4

Prime implicants:  $\bar{A}C, \bar{A}\bar{B}, C\bar{D}, \bar{A}D, BC$

Slide 38



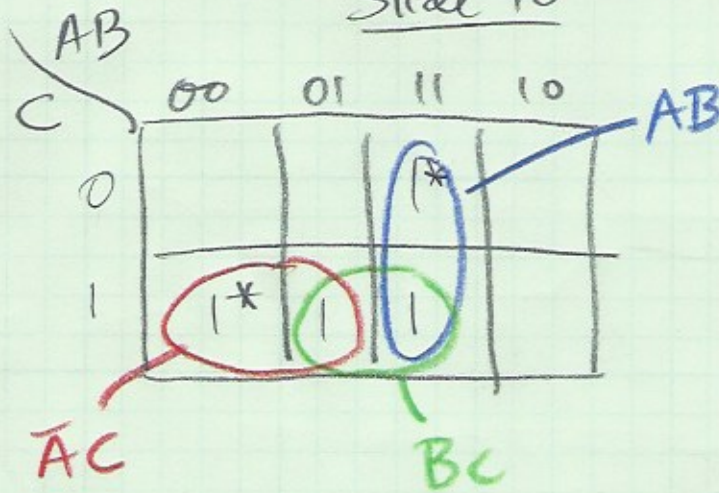
$BC$  is a PI that is not needed to make a minimal SOP expression - both of its 1-cells are covered by other PI's

So  $\bar{A}C + BC + AB$  is not minimal

(It turns out that  $\bar{A}C + AB$  is minimal.)

(Remark:  $AB + \bar{A}C + BC = AB + \bar{A}C$  is theorem T11 in the textbook.)

Slide 40



It's customary to mark distinguished 1-cells with \*.

$\bar{A}C$  and  $AB$  are essential PIs  
 $BC$  is a PI that is not essential.

ENEL 353  
Oct 7 2019  
4 of 4