Paper 7, TDC Part-3
Chapter– 4, Combinational Logic Design
Lecture - 20

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* Diagonal and Offset Adjacencies of Groups of Ones

Now let us see diagonal and offset adjacencies of standard group of two 1's and obtain their simplified terms.

For this we will take 3 or more variable K-Map. Diagonal and offset adjacencies of group of ones is not possible for 2 variable K-Map.

A \ BC	00	01	11	10
0			1	1
1	1	1		

Diagonal 1

Group of 2 ones

$$F_1 = A\bar{B} + \bar{A}B$$
$$= A \oplus B$$

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A \ BC	00	01	11	10
0	1		1	
1	1		1	

Offset 1

Group of 2 Ones

$$F_1 = \bar{B}\bar{C} + BC$$
$$= B \odot C$$

AB \ CD	00	01	11	10
00	1	1		
01			1	1
11		1		1
10		1		1

Diagonal 1 (F_1)

In this K-map there are 4 groups of 2 Ones.

Offset 1 (F_2)

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Diagonal 1

where $F_1 = \bar{A}\bar{B}\bar{C} + \bar{A}BC = \bar{A}(\bar{B}\bar{C} + BC)$

$= \bar{A}(B \odot C)$

Offset 1,

$F_2 = A\bar{C}D + AC\bar{D} = A(\bar{C}D + C\bar{D})$

$= A(C \oplus D)$

From this, we observe or conclude that in K-map if grouping of 2 ones occur in a diagonal or offset adjacent pattern that can be recognised as EX-OR or EX-NOR functions, so ~~and~~ the function can be simplified in terms of EX-OR/ EX-NOR operations.

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Similarly if groups of 4 ones in a K-map are in ~~diag.~~ diagonal or offset adjacencies their simplified terms are also given by EX-OR/ EX-NOR functions.

~~K-map~~ ~~figure~~ below illustrate the diagonal and offset adjacencies of standard groups of four ones

AB \ CD	00	01	11	10
00				
01	1	1	1	1
11				
10	1	1	1	1

Offset Adjacencies 1

AB \ CD	00	01	11	10
00			1	1
01	1	1		
11	1	1		
10			1	1

Diagonal Adjacencies!

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For 1st K-Map we have offset adjacencies of a group of 4 ones and it's simplified expression can be given as

Offset Adjacencies 1. $F_1 = \bar{A}B + A\bar{B}$

$= A \oplus B$

Whereas

~~Similarly~~ for 2nd K-Map we have diagonal adjacencies of group of 4 ones and it's simplified expression can be given as

Diagonal Adjacencies 1, $F_2 = B\bar{C} + \bar{B}C$

$= B \oplus C$

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Procedure for EX-OR and EX-NOR Simplification of K-Maps :-

→ The K-Map should be simplified first using standard methods ~~and then the~~

→ Then the diagonal / Offset adjacencies must be identified.

→ The expression obtained ~~must~~ can be simplifie partially by using boolean theorems and EX-OR / EX-NOR operations.

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Refer book- Modern Digital Electronics by RP Jain.

Thank You