

Paper 7, TDC Part-3
Chapter– 4, Combinational Logic Design
Lecture - 10

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Minimisation of POS Form :->

→ For minimising a given expression in POS form or for a given truth table, we ~~should~~ write zeros in the cells corresponding to maxterms for '0' outputs.

→ Then groups of zeros are formed.

→ Then write the Maxterm for ~~each~~ the

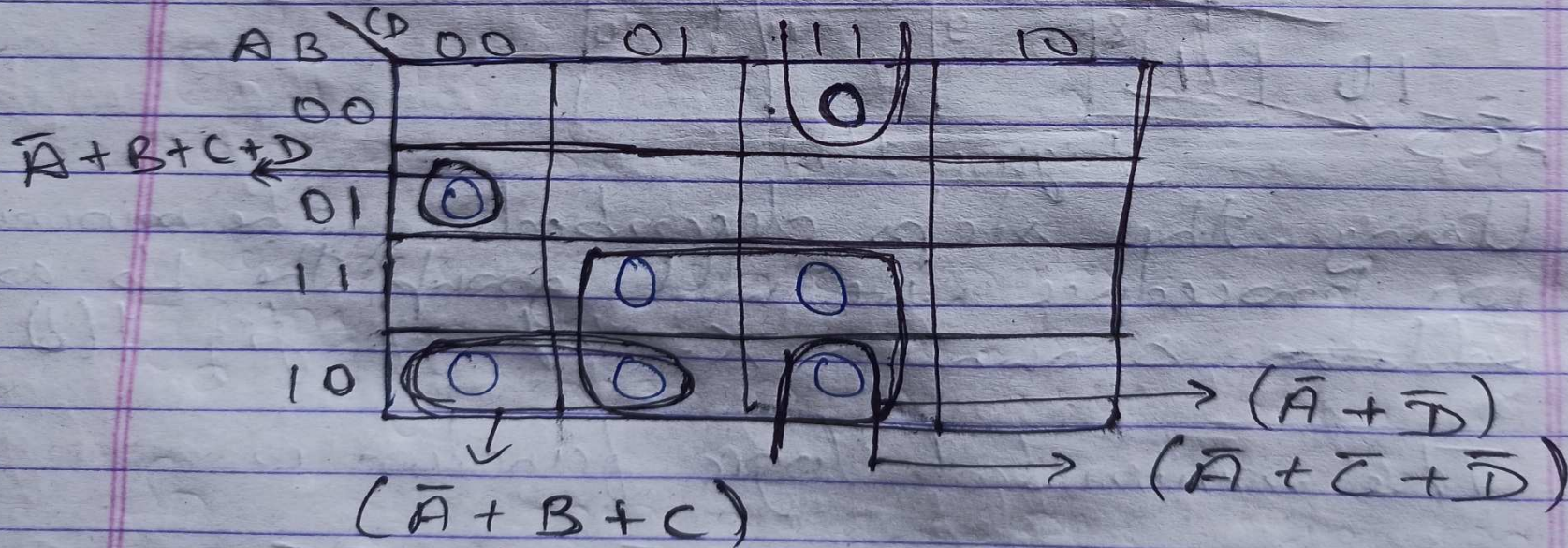
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identified groups of zeros.

Eg: \rightarrow Minimise the ^{given} logic function express in eqn. below.

$$f(A, B, C, D) = \prod M(3, 4, 8, 9, 10, 13, 15)$$

Soln: \rightarrow Let us draw the K-Map



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$$(\bar{A} + B + C) \quad (A + C + D)$$

So the Minimised expression in POS form can be written as.

$$f = (\bar{A} + B + C + D)(\bar{A} + B + C)(\bar{A} + \bar{C} + \bar{D})(\bar{A} + \bar{D})$$

Note: A logic function may be written in SOP & POS form, while the minimization in SOP & POS form will have different number of terms and therefore require different quantities of hardware. So

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one can obtain both minimisation and select the one which requires minimum number of hardware.

Eg-2) Minimise the truth table in Table given below, using maxterm.

A	B	C	D	O/P
0	0	0	0	1
0	0	0	1	1
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0

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0	1	1	1	0
1	0	0	0	0
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	0
1	1	1	1	0

Soln: ~~Let us~~ We shall map the zero's in the K-map to write ~~number~~ logic function in POS form.

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The Karnaugh map is a 4x4 grid with the following structure:

AB \ CD	00	01	11	10
00			0	0
01		0	0	
11	0		0	0
10	0			

Groups and their corresponding Boolean expressions:

- Group 1: (11, 10) in row 00 → $(A + B + \bar{C})$
- Group 2: (01, 11) in row 01 → $(A + \bar{B} + \bar{D})$
- Group 3: (11, 10) in row 11 → $(\bar{A} + \bar{B} + \bar{C})$
- Group 4: (10, 11) in column 00 → $(\bar{A} + C + D)$

There is no possible groups of Four adjacent zero's can be formed.

Only the groups of two adjacent zero's can be formed.

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can be formed.

The best possible groups of 2 adjacent zeros have formed and the corresponding maxterms have been written.

So the minimised logic function in POS Form (maxterm) can be written as below,

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

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Refer book- Modern Digital Electronics by RP Jain.

Thank You