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ON LINE LECTURE

NOTES FOR.

M. Sc. II sem physics.

Paper:- MPHYCC-7

Unit:- 4. Digital Electronics.

Topic:- K-Map for two variables.



1) Karnaugh map for two variables - Let us consider a two variables A and B. Hence, there are four combinations of A and B (both being logical variables can have a value 1 or 0).

Let the function follow the truth table given below.

Two variable truth table for $C = A + B$

	0	1	2	3	→ m (minterm designator)
A →	0	0	1	1	
B →	0	1	0	1	
C →	0	1	1	1	→ minterm.

There will be four minterms with variable A and B i.e. $\bar{A}\bar{B}$, $A\bar{B}$, $\bar{A}B$ and AB . The numbers mentioned above the columns in the truth table are minterm designators m_0, m_1, m_2, m_3 . Here minterm 0 when A and B both are 0. Hence, representing barred numbers by 0 and unbarred numbers by 1, m_0 will represent $\bar{A}\bar{B}$. Similarly $m_1 = 1$ represents $A\bar{B}$, $m_2 = 2$ i.e. $\bar{A}B$ and $m_3 = 3$ means AB . In the truth table C has been ^{shown as the} output.

Here,

$$C = \bar{A}\bar{B} + A\bar{B} + \bar{A}B$$

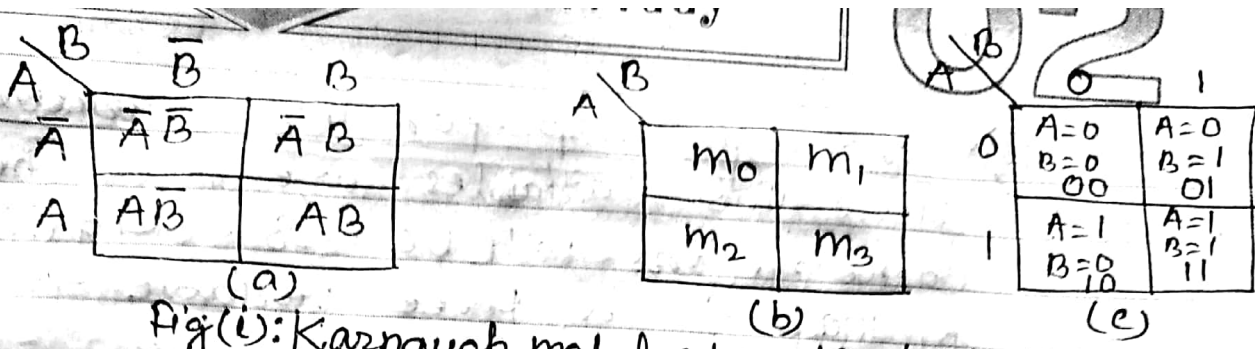
This can be also written as a sum of the minterms or summation of all the minterms

i.e. $C = \sum m(1, 2, 3)$

This is read as C is equal to the sum of minterms 1, 2 and 3.

Now again, the K-map for two variables has four squares. Each

MAY 1997	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31



Fig(i): Karnaugh map for two variables

In this figure, first row has the minterms having \bar{A} i.e. in the first row all the squares or minterm will have minterms with \bar{A} . Similarly in the second row all the squares or minterms will have A as a variable of the product. In all the minterms of first column the variable \bar{B} appears and in the second column the variable B appear in all the minterms.

These squares can be marked by the minterm designator as shown in fig(i)(b) and (c). Here, note that B is taken as the less significant digit (LSD) while A is most significant digit (MSD). In order to define an output term binary digit 1 is placed in the square for minterms to be considered present, and 0 is placed in the squares whose minterms are not to be considered present or are to be excluded as shown in fig(ii).

Now again in fig(ii) K-map for expression $\bar{A}B + AB + AB$ i.e. $\Sigma m(1, 2, 3)$ is shown. As the term $\bar{A}\bar{B}$ is not appearing in the expression into first square 0 is written and for minterm m_1, m_2 and m_3 a 1 is written in the squares.

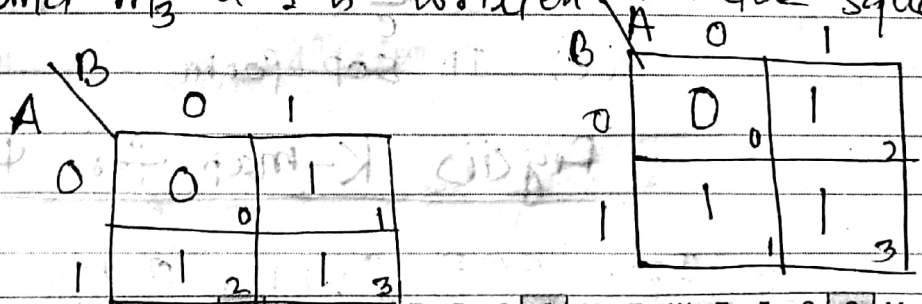


Fig-(ii)

N 97	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	◊	◊							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	◊	◊