DIGITAL SYSTEM DESIGN

GATEWAY CLASSES

UNIT 1 : LOGIC SIMPLIFICATION AND COMBINATIONAL LOGIC DESIGN

Today's Target

- Methods to simplify the boolean function
- 2,3,4 Variable K-Map
- Numerical Practice
- DPP
- University Questions

Methods to simplify the boolean function

The methods used for simplifying the Boolean function are as follows −

- Karnaugh-map or K-map
- NAND gate method
- Tabular method

2 Variable K-Map

- The number of cells is four, since the number of variables is two.
- **2 variable K-Map**.

Example - X'Y+XY

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Example - X'Y+XY+XY'

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Example- f(A,B) = ∑m(0,1,3)=A’B’+A’B+AB

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3 Variable K-Map

- The number of cells in 3 variable K-map is eight, since the number of variables is three.
- **3 variable K-Map**

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Example- F = XYZ'+XYZ+X'YZ

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Example- F(X,Y,Z) = (1,3,4,5,6,7)

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4 Variable K-Map

- number of cells in 4 variable K-map is sixteen
- **4 variable K-Map**.

Example-$f(a,b,c,d) = \sum m(0,3,5,7,10,11,12,13,14,15) = \prod M(1,2,4,6,8,9)$

Example: F = ΠM(3,4,6,7,11,12,13,14,15)

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DPP

a) Example : Minimize the following Boolean function using sum of products (SOP): $f(a,b,c,d) = \sum m(3,7,11,12,13,14,15)$

b) Simplify the expression $F(A,B,C,D)= ACD+ A'B + D'$ by K map

c) Simplify the logic function using K-map $F(A,B,C,D)= \Sigma m(0,1,8,9,11,15)$

UNIVERSITY QUESTIONS

YEAR	QUESTION	MARKS	ANSWER
21-22	Simplify the expression F(A,B,C) =AB+BC+A' by K map	2 marks	A'+B
21-22	Minimize the following Boolean function F(A,B,C,D)= Σm(0,3,4,5,7,9,13,14,15)	10 marks	BD+A'C'D'+ A'CD+AC'D+ ABC
20-21	Simplify using K map to obtain a minimum POS expression: (A'+B'+C+D)(A+B'+C+D)(A+B+C'+D') (A'+B+C'+D') (A+B+C'+D)	10 marks	(B'+C+D) (A+B+C') (B+C'+D)

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