ECE213: Digital Electronics

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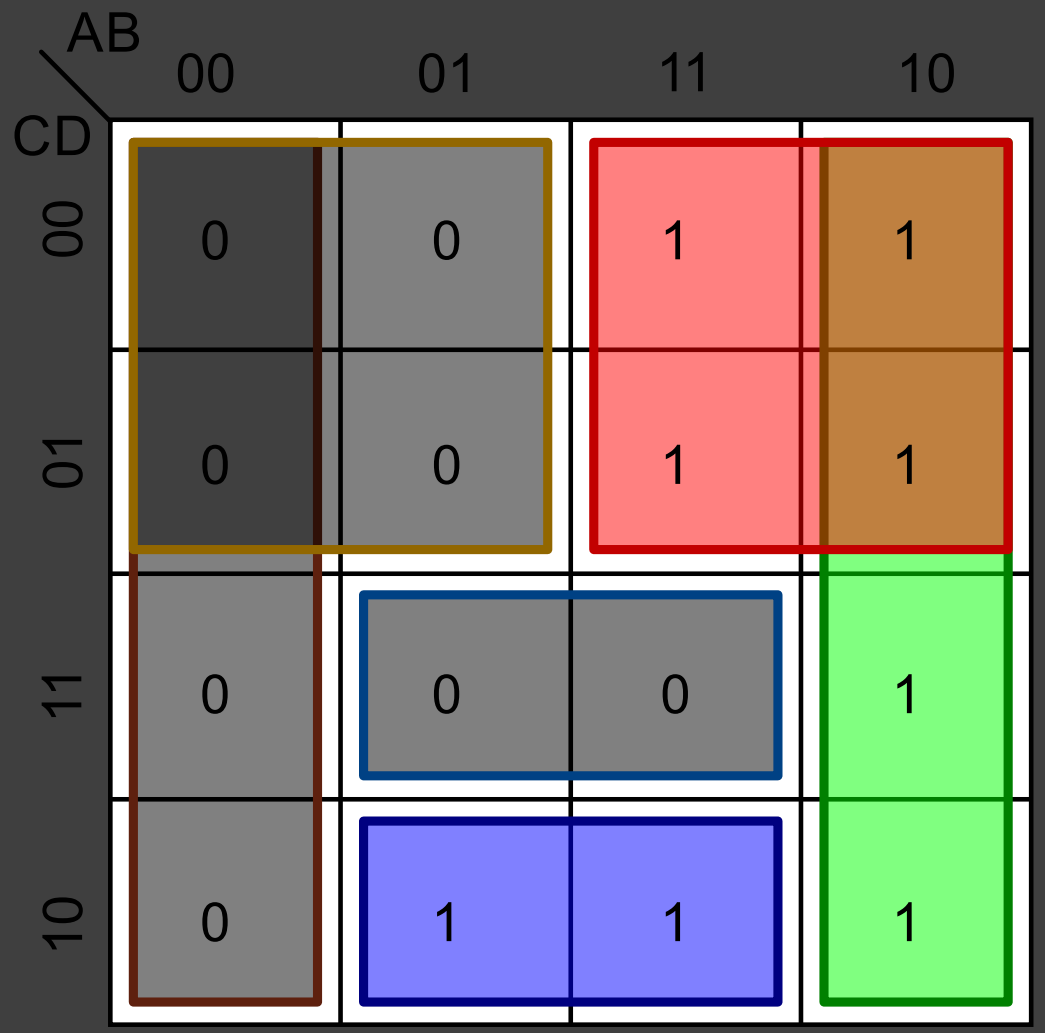
The Course Contents

Unit II

Combinational Logic System : Truth table, Basic logic operation, Boolean Algebra, Basic postulates, Standard representation of logic functions -SOP forms, Simplification of switching functions - K-map, Synthesis of combinational logic circuits, Logic gates, Fundamental theorems of Boolean algebra, Standard representation of logic functions POS forms

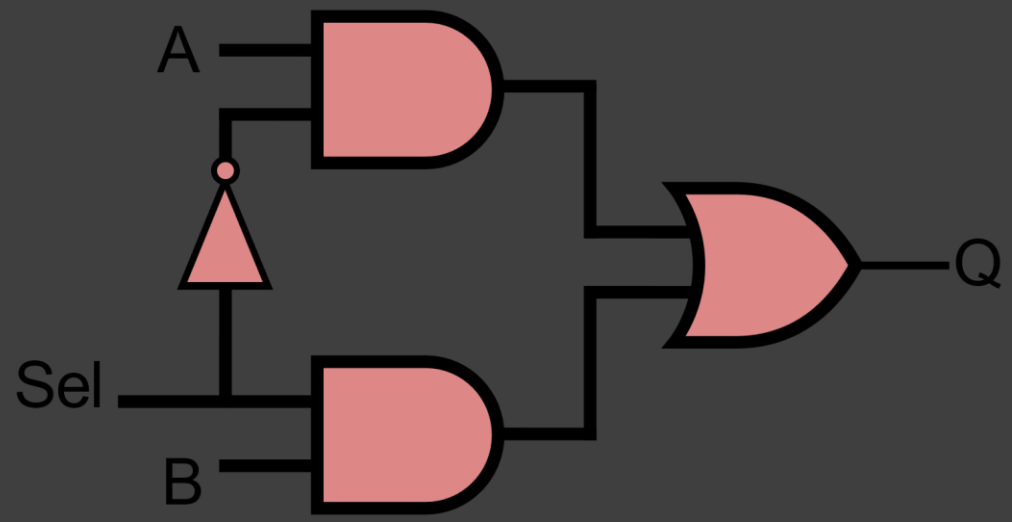


The Course Contents

Unit III

Introduction to Combinational Logic Circuits : Adders, Subtractors, Comparators, Multiplexers and Demultiplexers, Decoders, Encoders, Parity circuits

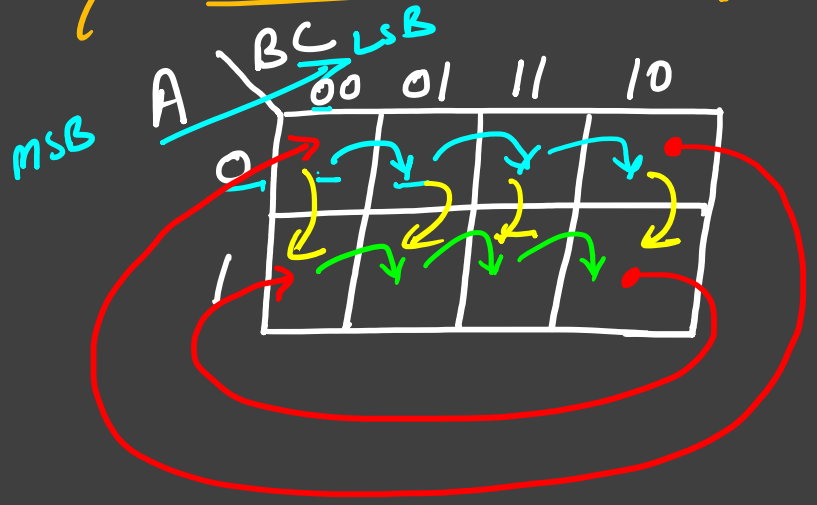
Introduction to Logic Families : Introduction to different logic families, Structure and operations of TTL, MOS and CMOS logic families

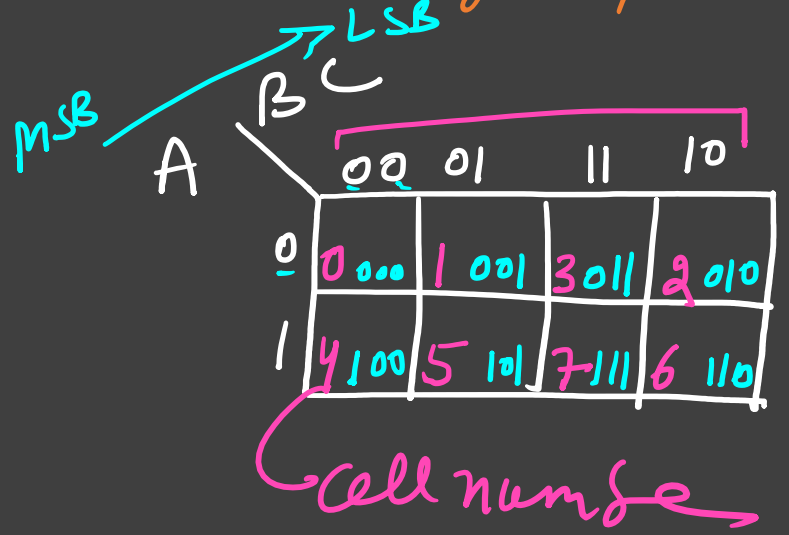


Combinational Logic System

Simplification of switching functions - Karnaugh-map

3-Var K-map





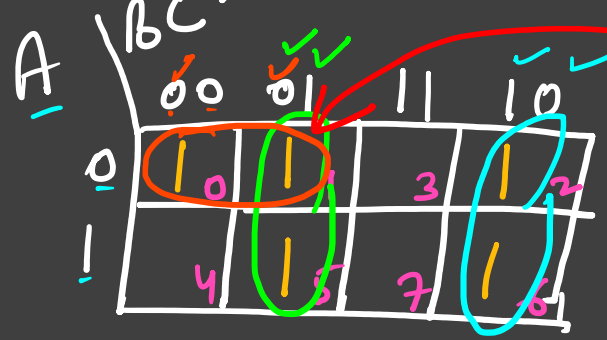
Combinational Logic System

Simplification of switching functions - K-map

2-Var	0-3
3-Var	0-7
4-Var	0-15
5-Var	0-31
6-Var	0-63

Ex Reduce the following Boolean fun. using K-map

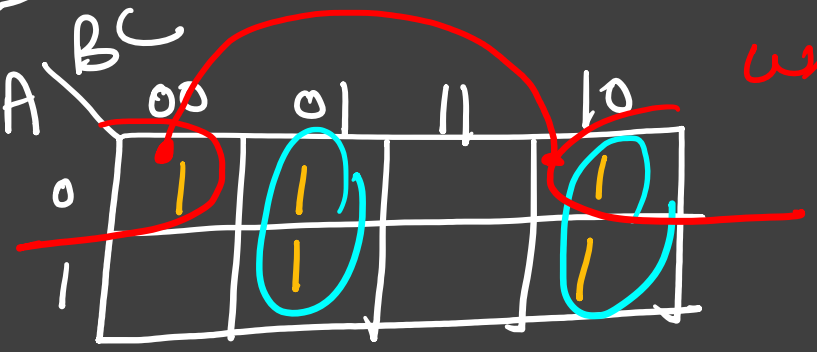
$$Y = \sum m(0,1,2,5,6)$$



overlap

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

$$Y = (B \oplus C) + \bar{A}\bar{B}$$



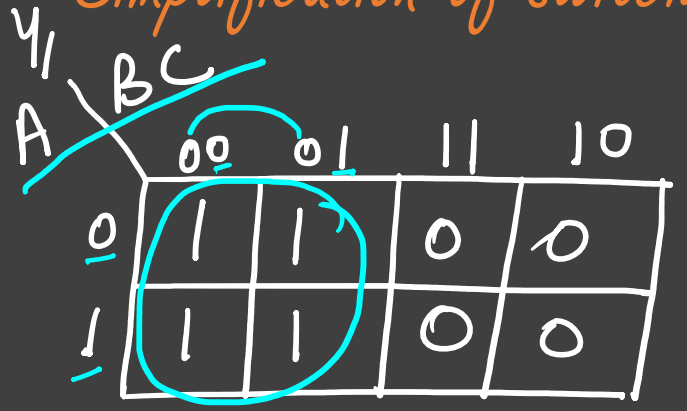
wrap around

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

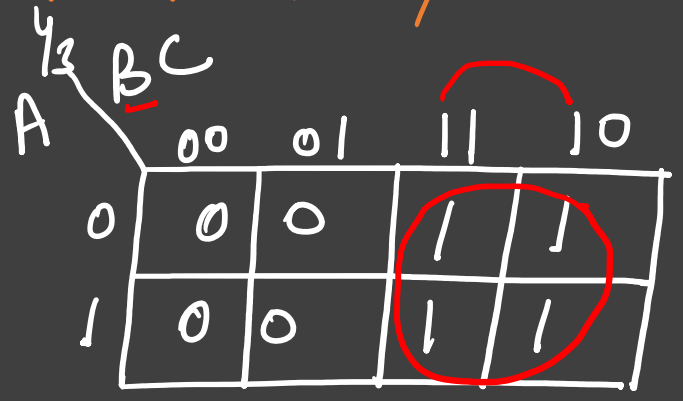
$$Y = (B \oplus C) + \bar{A}\bar{C}$$

Combinational Logic System

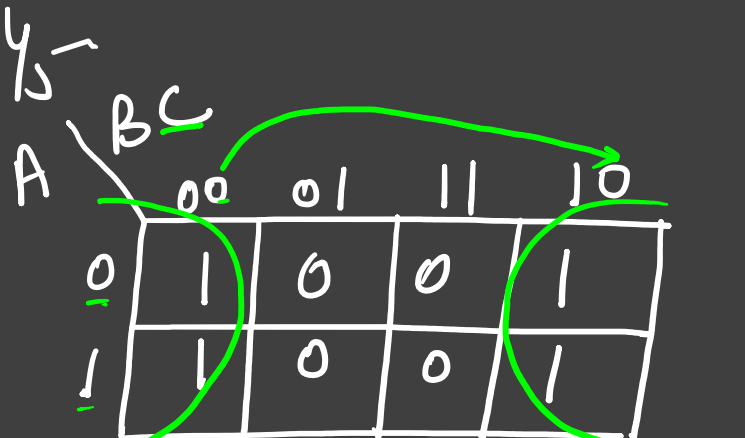
Simplification of switching functions - K-map



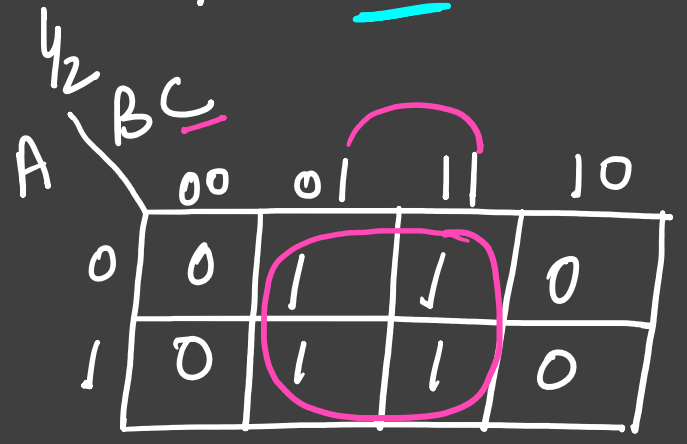
$Y_1 = \overline{B}$



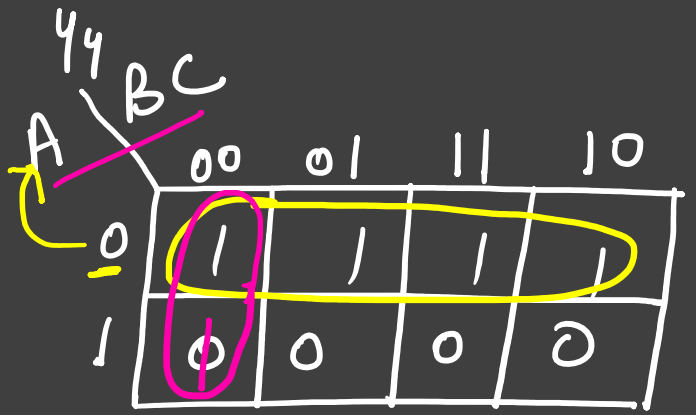
$Y_3 = B$



$Y_5 = \overline{C}$



$Y_2 = C$



$Y_4 = \overline{A} + \overline{B}\,\overline{C}$

Q: How many variable can be eliminate using 2^n group size in K-map

A! $n = 0$ $2^0 = 1$ n-variable

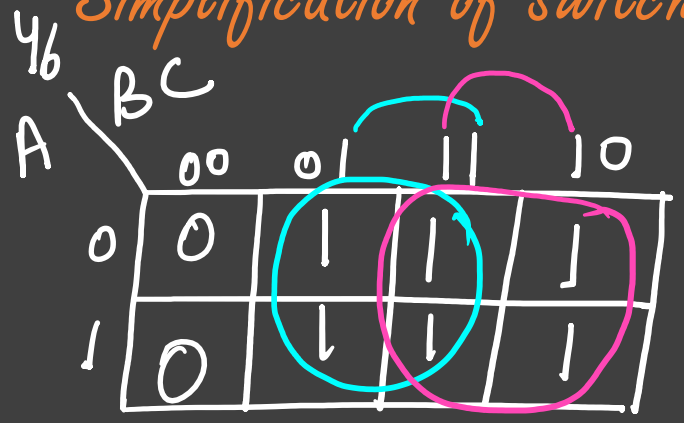
$n = 1$ $2^1 = 2$ ←

$n = 2$ $2^2 = 4$

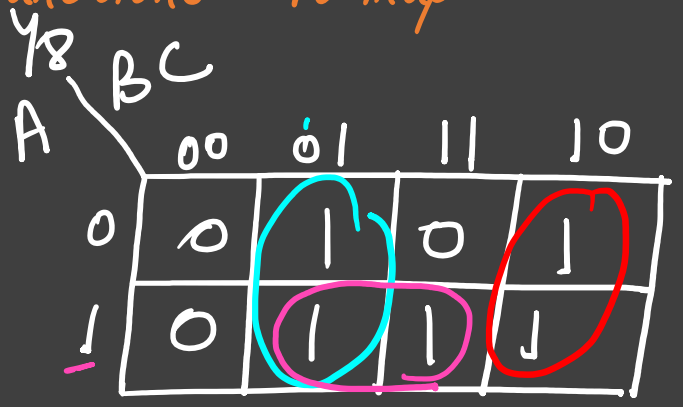
$n = 3$ $2^3 = 8$

Combinational Logic System

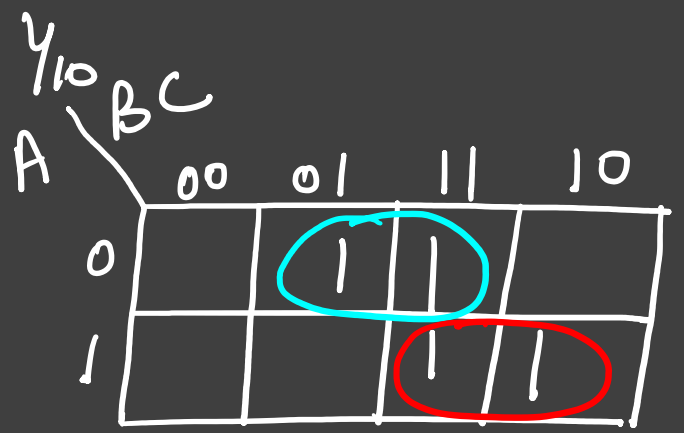
Simplification of switching functions - K-map



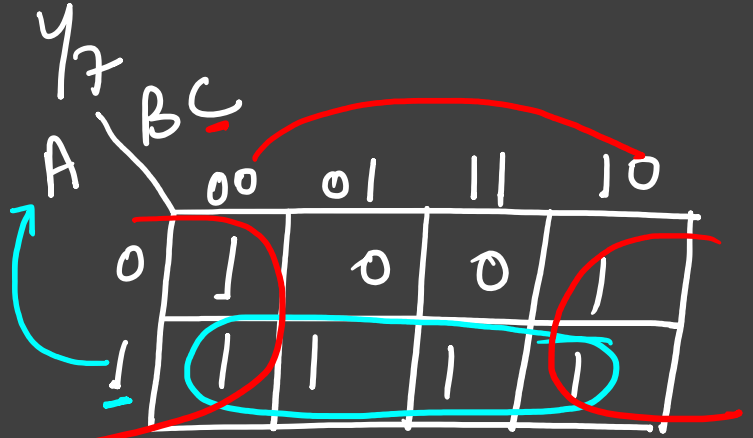
$$Y_6 = C + B$$



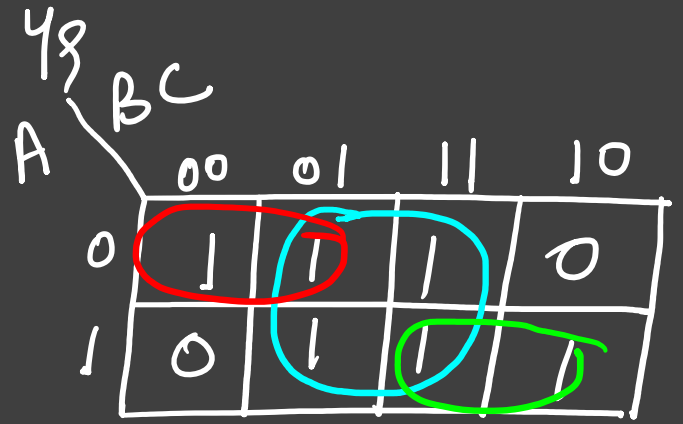
$$Y_8 = \bar{B}C + B\bar{C} + AC$$



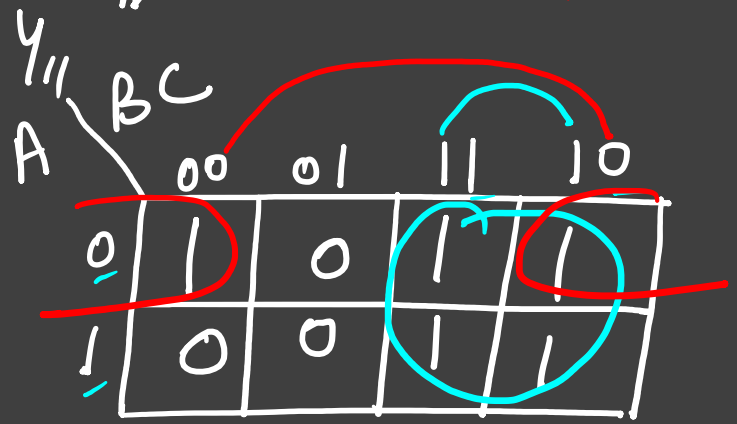
$$Y_{10} = \bar{A}C + AB$$



$$Y_7 = A + \bar{C}$$



$$Y_9 = C + \bar{A}\bar{B} + AB$$



$$Y_{11} = B + \bar{A}\bar{C}$$

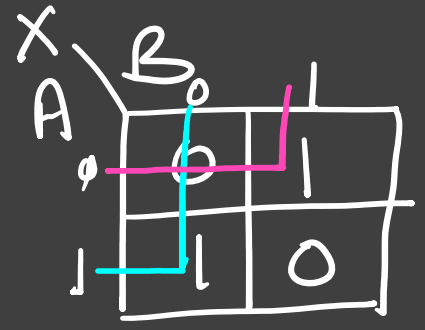
Combinational Logic System

Simplification of switching functions - K-map

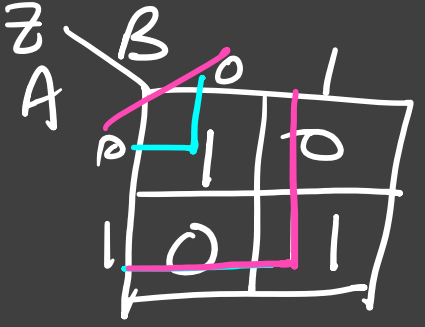
Ex

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

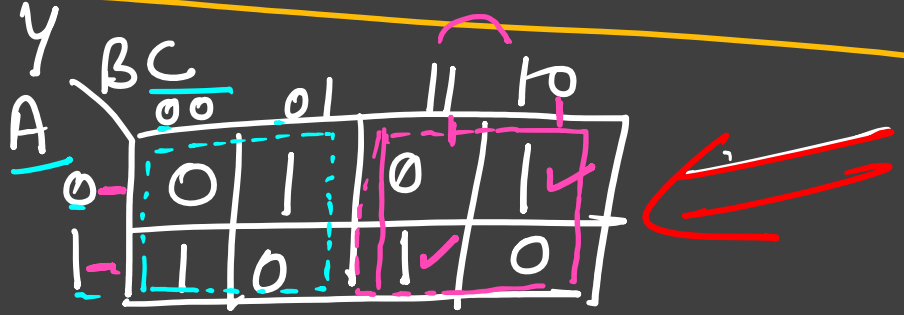
$$Y = \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C} + ABC$$
$$= \bar{A}(\bar{B}C + B\bar{C}) + A(\bar{B}\bar{C} + BC)$$
$$= \bar{A}(B \oplus C) + A(\overline{B \oplus C})$$
$$= A \oplus B \oplus C$$



$$X = A \oplus B$$



$$Z = \overline{A \oplus B}$$

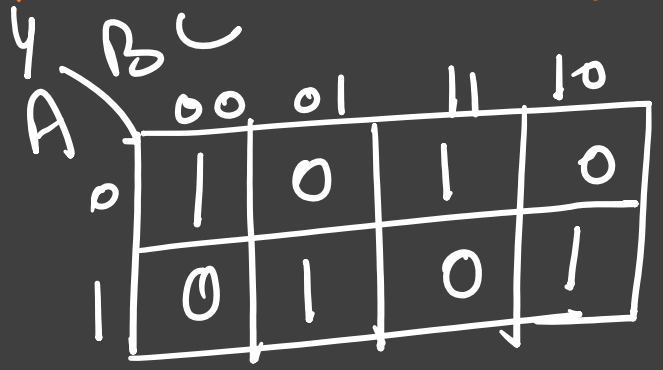


$$Y = \bar{B}(A \oplus C) + B(\overline{A \oplus C})$$
$$= A \oplus B \oplus C$$

Combinational Logic System

Simplification of switching functions - K-map

Ex



$y =$