ECE213: Digital Electronics

Ajmer Singh

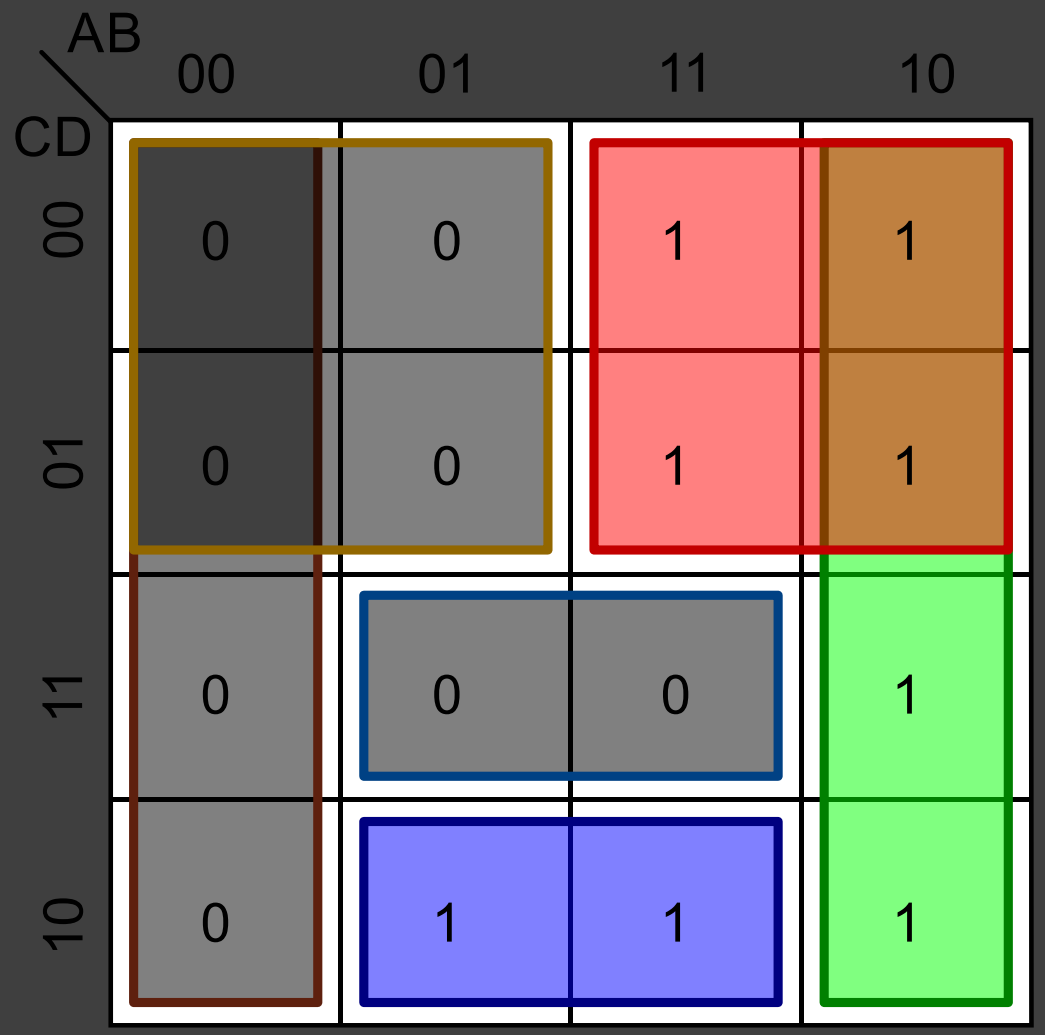
9988921373

ajmer.17381@lpu.co.in

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

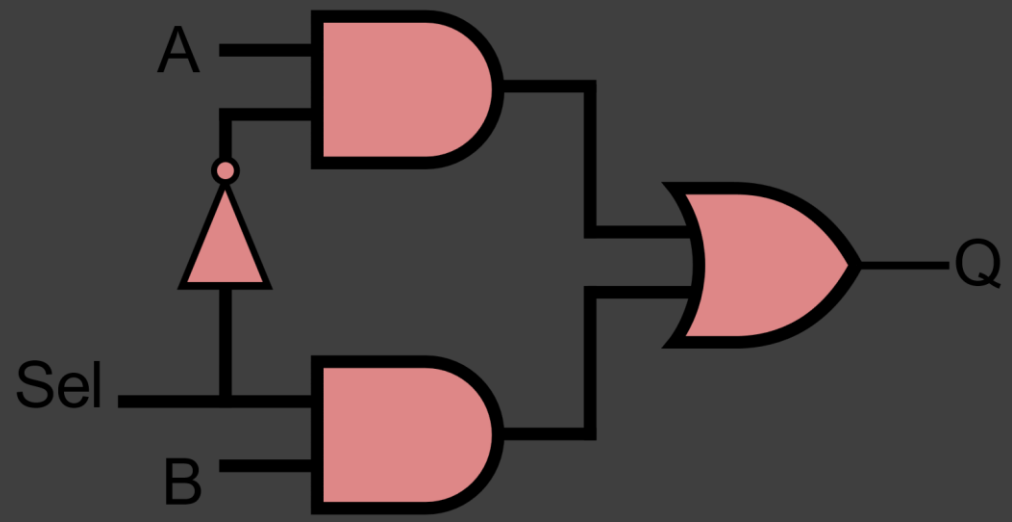


The Course Contents

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

To reduce the Boolean functions

For one variable function

A	Y_1	Y_2	Y_3	Y_4
0	0	1	0	1
1	1	0	0	1

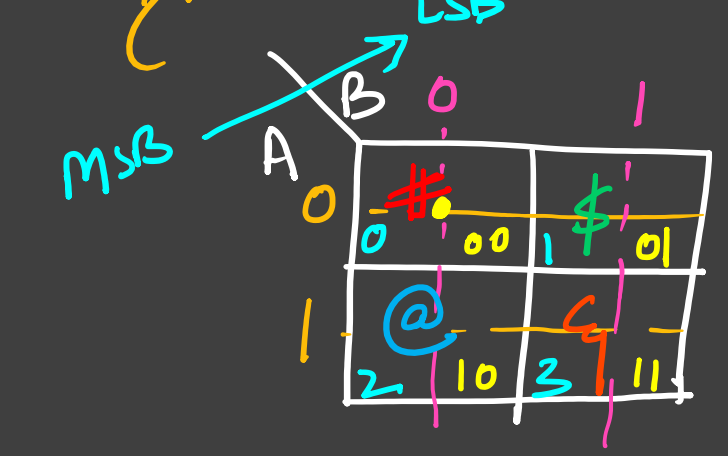
$Y_1 = A$

$Y_2 = \bar{A}$

$Y_3 = 0$

$Y_4 = 1$

For two variable fun



A	B	Y
0	0	#
0	1	$
1	0	@
1	1	¢

Q. How many no of cell we have in n-vars K-map

A. (a) n
(b) n+1
(c) n^2
(d) n*n

All are wrong

2^n

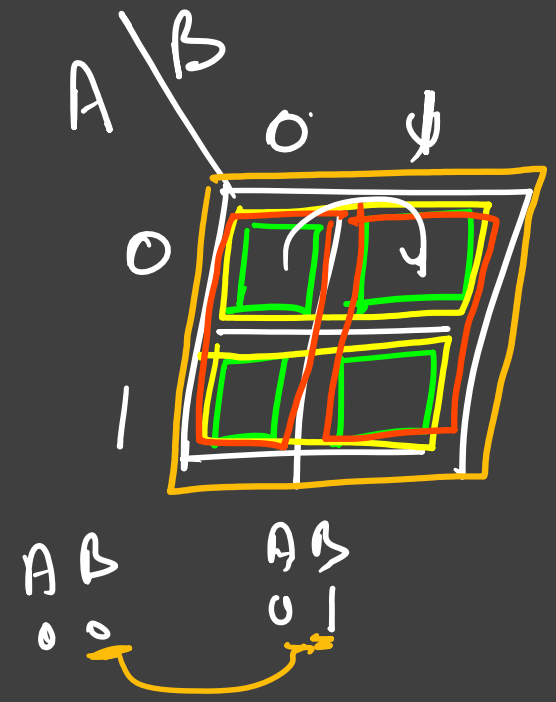
n=1	2
n=2	4
n=3	8
n=4	16

Combinational Logic System

Simplification of switching functions - K-map

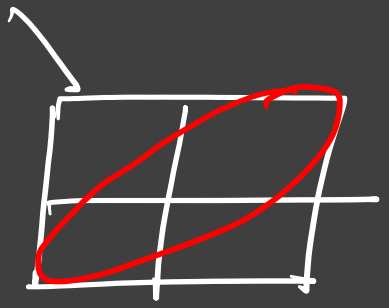
K-map reduces the function based on Grouping of cells

Valid Grouping: When cells can move from one cell to another cell in the group. Only one bit change



* Size of Group

A 2^n, 1, 2, 4, 8, 16, 32, ---



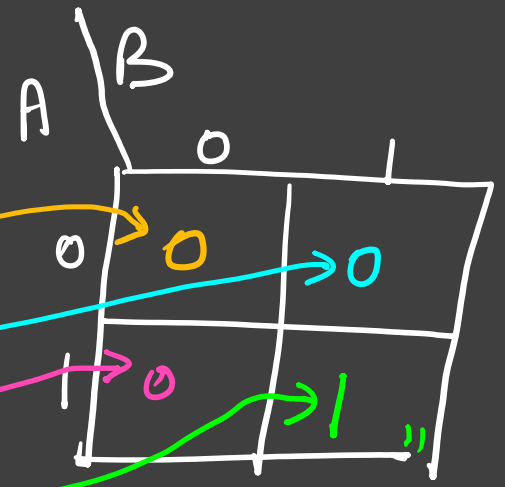
* No diagonal Grouping is allowed

Combinational Logic System

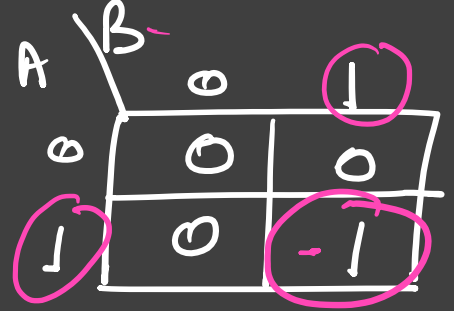
Simplification of switching functions - K-map

Ex And logic

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

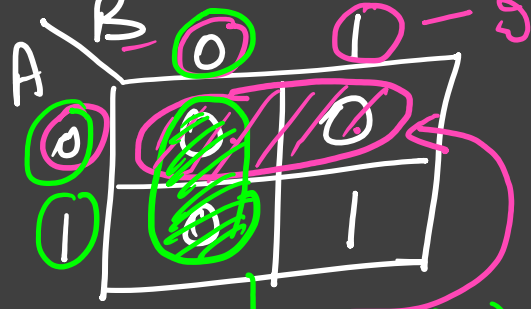


For SOP – Make the Groups of ones



$Y = AB$

For POS – Make the Groups of zeros



1 – It is not easy

$Y = (A).(B) = AB$

Note: Always make the largest possible Groups

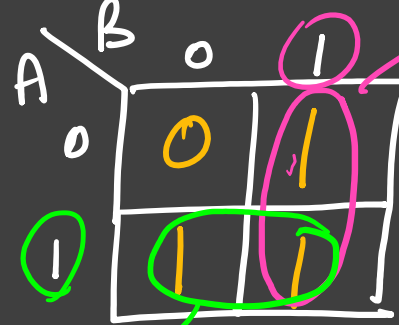
Combinational Logic System

Simplification of switching functions - K-map

Ex OR Logic

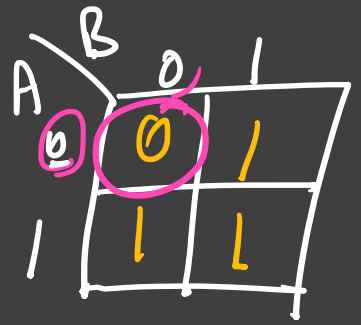
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

For SOP



$Y = A + B$

For POS



$Y = (A + B)$

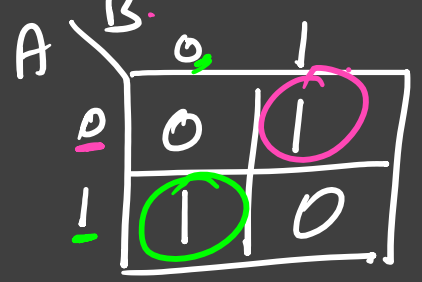
Combinational Logic System

Simplification of switching functions - K-map

Ex XOR Gate

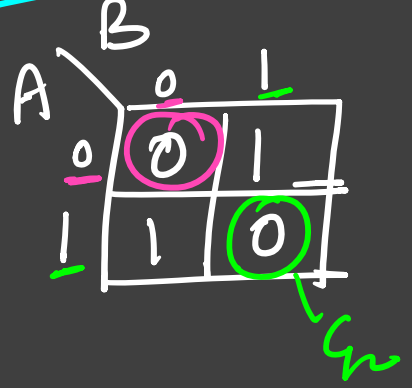
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

For SOP



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

For POS



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

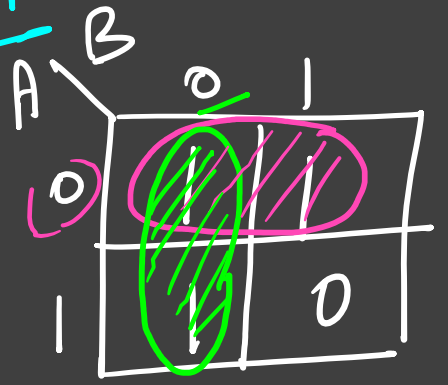
Combinational Logic System

Simplification of switching functions - K-map

Ex NAND Logic

A	B	y
0	0	1
0	1	1
1	0	1
1	1	0

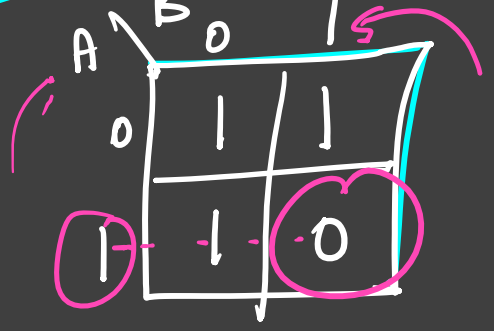
for sop



$$y = \overline{A} + \overline{B}$$

$$y = \overline{AB}$$

for pos



$$y = \overline{A} + \overline{B}$$