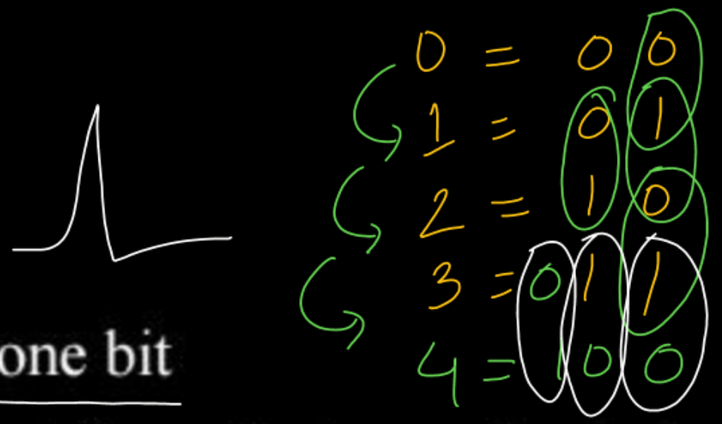
UNIT 1 : LOGIC SIMPLIFICATION AND COMBINATIONAL LOGIC DESIGN

Today's Target

- Gray code
- Binary to Gray Conversion
- Gray to Binary Conversion
- Signed Magnitude Representation
- 1's Complement & 2's Complement of a number
- DPP

Gray code

- The reflected binary code (RBC)
- reflected binary (RB) or Gray code
- after Frank Gray,
- two successive values differ in only one bit



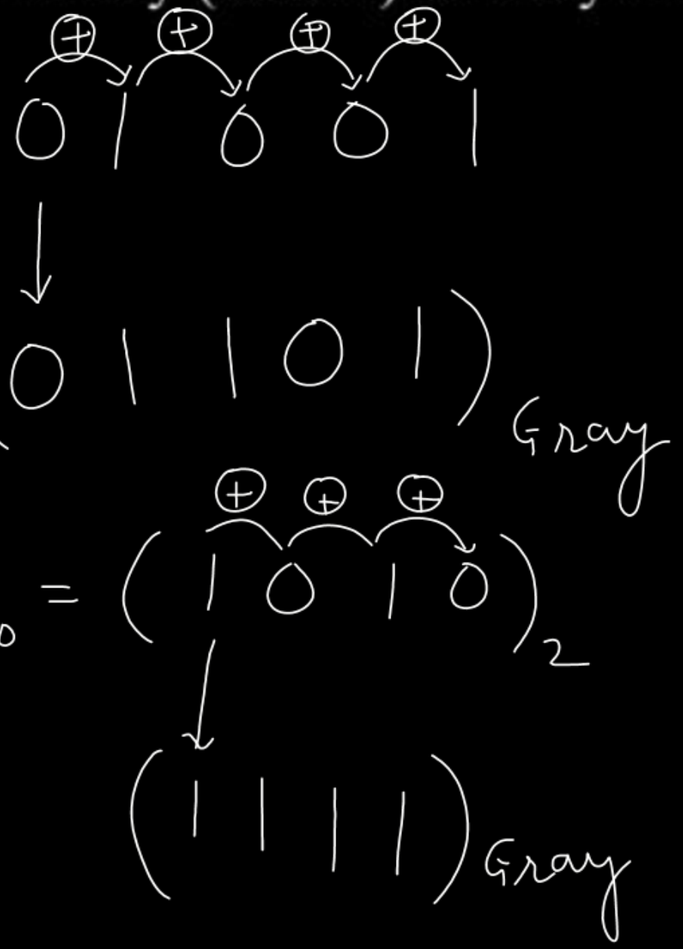
- widely used to prevent spurious output from electromechanical switches
- to facilitate error correction in digital communications such as digital terrestrial television and some cable TV systems.
- Many devices indicate position by closing and opening switches. If that device uses natural binary codes, positions 3 and 4 are next to each other but all three bits of the binary representation differ:

• 3=011 & 4=100

DECIMAL	BINARY	GRAY
0	0000	0000
1	0001	0001
2	0010	0011
3	0011	0010
4	0100	0110
5	0101	0111
6	0110	0101
7	0111	0100
8	1000	1100
9	1001	1101
10	1010	1111
11	1011	1110
12	1100	1010
13	1101	1011
14	1110	1001
15	1111	1000

How to Convert Binary to Gray Code

- Convert binary (01001) to Gray Code



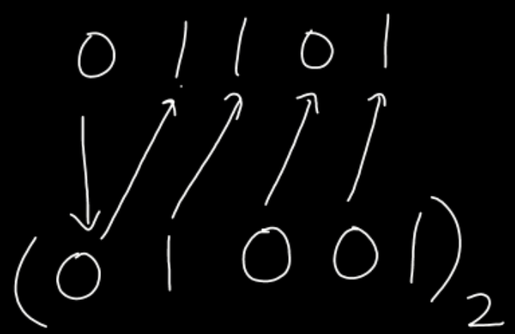
Ex-OR

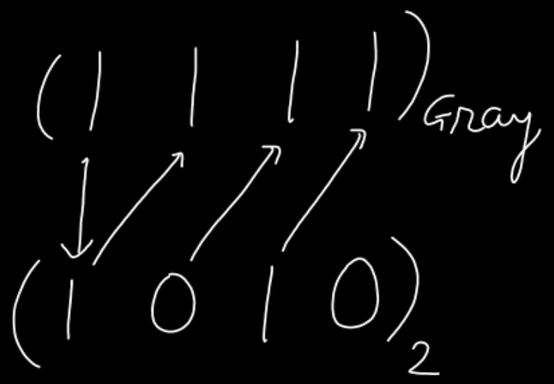
$Y = \bar{A}B + A\bar{B}$

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

Gray to Binary Code Converter

- Convert Gray number 01101 to binary





$(43)_{10} \Rightarrow (\quad)_{Gray}$

$(43)_{10} = (101011)_2 = (111110)_{Gray}$

2	43	1
2	21	1
2	10	0
2	5	1
2	2	0
2	1	1
	0	

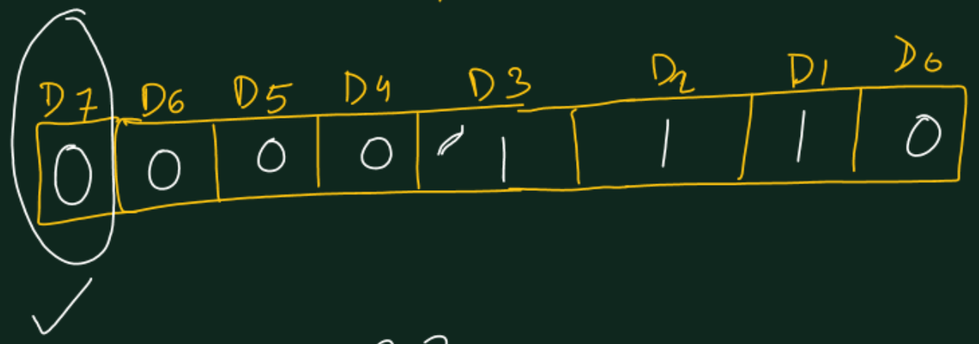


$(1\ 1\ 1\ 1\ 1\ 0)$

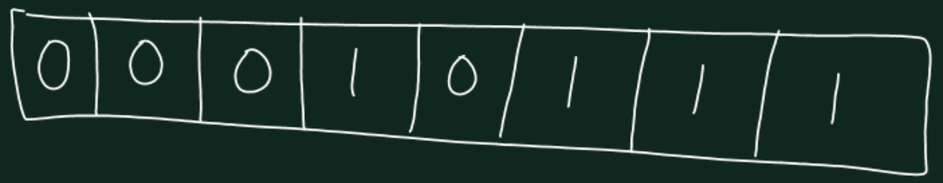
Signed Magnitude Representation

- In the signed magnitude form;
- the MSB(Most Significant Bit) is used to represent the sign
- If the sign bit is zero, the binary number is positive
- If the sign bit is one, the binary number is negative.
- The rest of the bits represent the magnitude of the given number.
- The negative number is represented by its complement form.

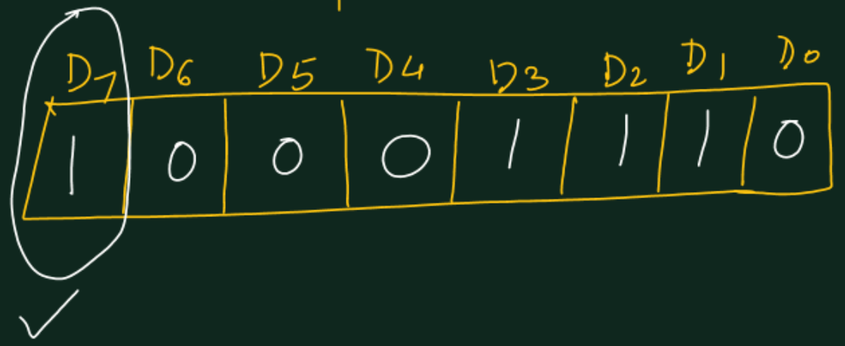
+14



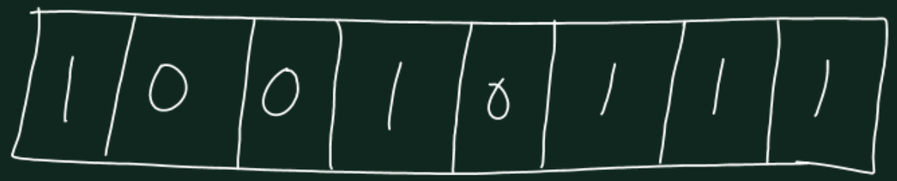
+23



-14



-23



16 8 4 2 1

$23 = 10111$

$2^4\ 2^3\ 2^2\ 2^1\ 2^0$

1's Complement & 2's Complement

- 1's complement of (-19) is:

no = 10011

1's = 01100

2's = 1's + 1

- 2's complement of (-19) is:

no = 10011

2's = 01101

1's = 01100

\+ 1

2's ⇒ 01101

2	19	1
2	9	1
2	4	0
2	2	0
2	1	1
	0	

$(19)_{10} = (10011)_2$

16	8	4	2	1
1	0	0	1	1

no ⇒ 1 0 0 1 0 0

2's ⇒ 0 1 1 1 0 0

no ⇒ 1 0 0 1 0 0

1's ⇒ 0 1 1 0 1 1

\+ 1

2's ⇒ 0 1 1 1 0 0

GW
GATEWAY CLASSES

- 1's complement of 0110.100 is

1's ⇒ 1001.011

- 2's complement of 0110.100 is

2's ⇒ 1001.100

GW
GATEWAY CLASSES

DPP

Convert :

a) $(1011010110)_2 = (\ )_{\text{Gray}}$

b) $(1011010)_{\text{Gray}} = (\ )_2$

c) Find 1's complement of number $(-14.23)_{10}$

d) Find 2's complement of number $(-26.414)_{10}$

Results:

a) (1110111101)

b) (1101100)

c) (0001.11000)

d) (00101.10011)

UNIVERSITY QUESTIONS

YEAR	QUESTION	MARKS	ANSWER
20-21	Convert binary code (00011011) to gray code.	2 marks	(00010110)
18-19	Define cyclic codes	2 marks	First slide

GATEWAY CLASSES

AKTU Full Courses (Paid)

Download Gateway Classes Application

From Google Play store

All Subjects

Link in Description

Thank You

GATEWAY CLASSES