DELD Lab Assignment - 1.

- **Problem Statement** - To realise 3 bit Binary to Gray & 3 Bit Gray to Binary converter using logic gates.

- **Objectives** -

  1. To study combinational circuits using gates.
  2. Advantages & disadvantages of both codes.
  3. Applications of Binary & Gray ~~codes~~ Code

- **Theory**

Binary Code & Gray Code :- In mathematics & Digital Electronics, a binary code represents data using the base-2 numeral system or simply a 2-symbol system. (often "0" & "1")

Gray Code or Reflected Binary Code is an ordering of binary code such that two successive values differ in only one bit (digit).

for instance, $(1)_{10} = (001)_2$

$\quad$ & $(2)_{10} = (010)_2$

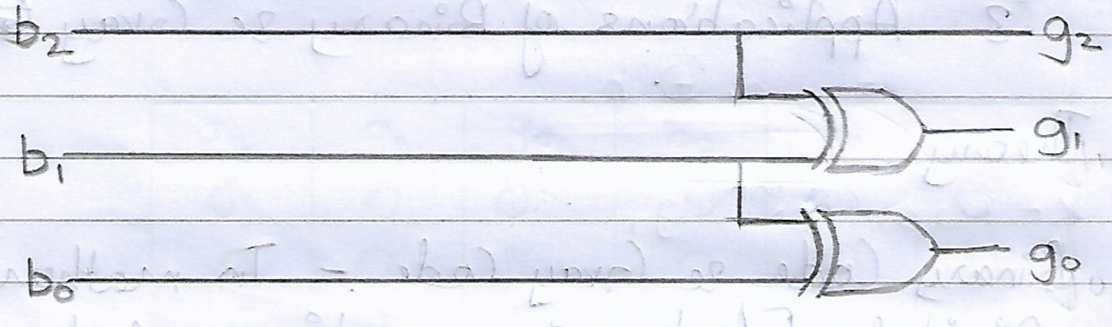
but $G(1) = (001)$ & $G(2) = (011)$

Thus, incrementing a value requires only one bit to be modified.

Binary & Gray codes are used widely in digital electronics, further, gray codes are also used to facilitate error corrections in communication systems.

■ Design -

1. Binary to Gray code.



b_2	b_1	b_0	g_2	g_1	g_0
0	0	0	0	0	0
0	0	1	0	0	1
0	1	0	0	1	1
0	1	1	0	1	0
1	0	0	1	1	0
1	0	1	1	1	1
1	1	0	1	0	1
1	1	1	1	0	0

→ K-Map for g_0,

$b_2 \backslash b_1b_0$	00	01	11	10
0	0	1	0	1
1	0	1	0	1

group 1 group 2.

$$g_0 = G1 + G2 = \bar{b_0}\, b_1 + b_0 \bar{b_1}$$

$$= \underline{\underline{b_0 \oplus b_1}}.$$

→ K-Map for g_1

$b_2 \backslash b_1b_0$	00	01	11	10
0	0	0	1	1
1	1	1	0	0

→ group 1

→ group 2.

$$g_1 = G1 + G2.$$

$$= \bar{b_2} b_1 + b_2 \bar{b_1} = \underline{\underline{b_1 \oplus b_2}}.$$

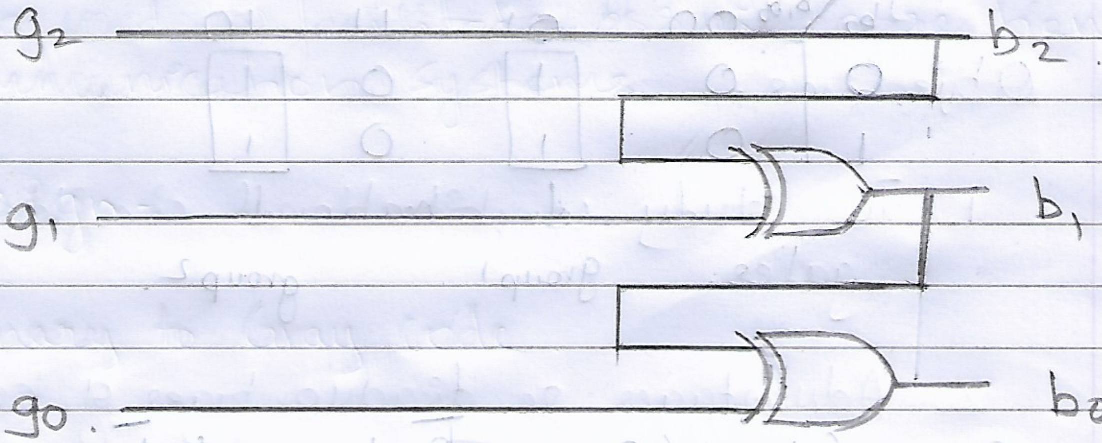
→ K-Map for g_2.

$b_2 \backslash b_1b_0$	00	01	11	10
0	0	0	0	0
1	1	1	1	1

→ group 1.

$$g_2 = G1 = \underline{\underline{b_2}}$$

2. Gray code to Binary :



g_2	g_1	g_0	b_2	b_1	b_0
0	0	0	0	0	0
0	0	1	0	0	1
0	1	1	0	1	0
0	1	0	0	1	1
1	1	0	1	0	0
1	1	1	1	0	1
1	0	1	1	1	0
1	0	0	1	1	1

→ K-Map for b_0.

$g_2 \backslash g_1 g_0$	00	01	11	10
0	0	1	0	1
1	1	0	1	0

$b_0 = g_0 \oplus g_1 \oplus g_2$.

→ k-map for b_1

$g_2 \backslash g_1 g_0$	00	01	11	10
0	0	0	1	1
1	1	1	0	0

→ group 1

↳ group 2.

$b_1 = G1 + G2$

$= g_1\bar{g_2} + \bar{g_1}g_2 = \underline{g_1 \oplus g_2}$

→ k-map for b_2.

$g_2 \backslash g_1 g_0$	00	01	11	10
0	0	0	0	0
1	1	1	1	1

→ group 1.

$b_2 = G1 = \underline{g_2}$.

▪ Conclusion: Realised a simulated version of 3bit binary to gray code & 3bit gray code to binary converter.

▪ FAQ:

Q Why is code conversion necessary?

→ Every form of code has it's set of advantages and disadvantages, thus, to suit our needs, We rely on the ability to move data from one form to another.