Dec	Binary	Gray
0	000	000
1	001	001
2	010	011
3	011	010
4	100	110
5	101	111
6	110	101
7	111	100

Binary → Gray

0 1 1

MSB (most significant number)

We compare 2 numbers
If same write 0
If different write 1

0 1 1

1) Re-write MSB

0

2. Compare 1st 2 bits.
If same = 0 &
different = 1

0 1

3 Compare 2nd & 3rd bits
Same = 0 Dif = 1

∴ G = 010

Example 2: Convert 110 in to a Gray code

Solution

110 → 101

MSB

Example 3: convert 101011 to a Gray code

Solution

101011 → 111110

MSB

Q) Convert the ff

A) 110111

B) 10101101

Solution

A)
S D S
1 1 0 1 1 1
D S

101100

B)
D D D
1 0 1 0 1 1 0 1
D D S D

11111011

Gray → Binary

Example: Let's say we have a Gray code of 110, find the Binary.

Solutions

	1	1	0
write d MSB	1	0	0

(S) (S)

Example 2

G	1	1	1
B	1	0	1

Example 3:

G	1	1	0	0	1	0
		S	S	S	D	
B	1	0	0	0	1	1

Example 4

G	1	1	1	1	0	1
		S	D	S	S	D
B	1	0	1	0	0	1

Example 5

G 1 0 1 1 1 0 1 1

NOTE

The Gray code as you go from one number to the next number. It only differs by 1 bit. in the Binary code it can differ by more than 1 bit. in successive values.

G. Code reduces switching operations as you go in to designing a circuit using it.

Example:

Dec	Bin	Gray code
5	101	111
↓	↓↓	↓
6	110	101

K'MAP (Karnaugh Map)

The results from Booleem is not always minimum. So it is used to minimize the circuits from a given Logic.

→ Given a fuction

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

Make a Truth Table of F.

A	B	C	F	
0	0	0	0	m_0
0	0	1	0	m_1
0	1	0	1	m_2
0	1	1	0	m_3
1	0	0	1	m_4
1	0	1	1	m_5
1	1	0	1	m_6
1	1	1	1	m_7

Canonical sum of product

F Canonical SoP

$$F = \bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C} + ABC$$

Can we reduce it?

1. Use Boolean Algebra.

$$F = \bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + AB\bar{C} + ABC$$
$$= \bar{A}B\bar{C} + A\bar{B}(\bar{C} + C) + AB(\bar{C} + C)$$
$$= \bar{A}B\bar{C} + A\bar{B} + AB$$
$$= \bar{A}B\bar{C} + A$$

Canonical SoP form

p	q	r	f
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

$$f = p'qr + pq'r + pqr' + pqr$$

Other ways:

$$f = m_3 + m_5 + m_6 + m_7$$

$$f = \sum m(3, 5, 6, 7)$$

Distributive law:

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

Now we arrange d cells such at the neighboring cell has only one variable changing.

	BC 00	BC 01	BC 11	BC 10
A=0	m_0	m_1	m_3	m_2
A=1	m_4	m_5	m_7	m_6

Map rolling

Rule of adjacency

NB:
the adjacent cell shd have only 1 variable changing

K-map for 3 variables

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

II

I

Next is pairing.

Pairing ~~of~~ is in powers of 2.

1, 2, 4, 8, 16 ....

$F = \mathrm{I} + \mathrm{II}$

$= A \cdot 1 \cdot 1 + B\bar{C}$

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