INSTITUTO POLITÉCNICO NACIONAL

ESCUELA SUPERIOR DE CÓMPUTO

CONVERTIDOR BIN/GRAY

PRÁCTICA No. 3

BLÁSQUEZ MATÍNEZ YAEL ANDRÉ
MOLINA ACUÑA JUAN LUIS
OLVERA MARTÍNEZ AARÓN
REYES FRANCISCO PAOLA

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Desarrollo.

Breve explicación. Máximo media cuartilla.

Tabla de verdad.

	A	B	C	D	G3	G2	G1	G0
0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	1
2	0	0	1	0	0	0	1	1
3	0	0	1	1	0	0	1	0
4	0	1	0	0	0	1	1	0
5	0	1	0	1	0	1	1	1
6	0	1	1	0	0	1	0	1
7	0	1	1	1	0	1	0	0
8	1	0	0	0	1	1	0	0
9	1	0	0	1	1	1	0	1
10	1	0	1	0	1	1	1	1
11	1	0	1	1	1	1	1	0
12	1	1	0	0	1	0	1	0
13	1	1	0	1	1	0	1	1
14	1	1	1	0	1	0	0	1
15	1	1	1	1	1	0	0	0

Funciones y simplificación.

$$\boldsymbol{G_3(A,B,C,D)} = A\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C}D + A\bar{B}C\bar{D} + A\bar{B}CD + AB\bar{C}\bar{D} + AB\bar{C}D + ABC\bar{D} + ABCD$$

$$= A\bar{B}(\bar{C}\bar{D} + \bar{C}D + C\bar{D} + CD) + AB(\bar{C}\bar{D} + \bar{C}D + C\bar{D} + CD)$$

$$= A\bar{B}\big(\bar{C}(\bar{D} + D) + C(\bar{D} + D)\big) + AB\big(\bar{C}(\bar{D} + D) + C(\bar{D} + D)\big)$$

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

$$\boldsymbol{G_2(A,B,C,D)} = \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D + \bar{A}BC\bar{D} + A\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C}D + A\bar{B}C\bar{D} + \bar{A}BCD + A\bar{B}CD$$

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

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

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

$$\boldsymbol{G_1(A,B,C,D)} = \bar{A}\bar{B}C\bar{D} + \bar{A}\bar{B}CD + \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D + A\bar{B}C\bar{D} + A\bar{B}CD + AB\bar{C}\bar{D} + AB\bar{C}D$$

$$= \bar{A}\bar{B}(C\bar{D} + CD) + \bar{A}B(\bar{C}\bar{D} + \bar{C}D) + A\bar{B}(C\bar{D} + CD) + AB(\bar{C}\bar{D} + \bar{C}D)$$

$$= \bar{A}\bar{B}\big(C(\bar{D} + D)\big) + \bar{A}B\big(\bar{C}(\bar{D} + D)\big) + A\bar{B}\big(C(\bar{D} + D)\big) + AB\big(\bar{C}(\bar{D} + D)\big)$$

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

$$\boldsymbol{G_0(A,B,C,D)} = \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}C\bar{D} + \bar{A}B\bar{C}D + A\bar{B}\bar{C}D + \bar{A}BC\bar{D} + A\bar{B}C\bar{D} + AB\bar{C}D + ABC\bar{D}$$

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

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

$$= \bar{C}D(\bar{A} + A) + C\bar{D}(\bar{A} + A) = \boldsymbol{\bar{C}D + C\bar{D} = C \oplus D}$$

Código en VHDL

```
library ieee;
use ieee.std_logic_1164.all;

entity GRAY is port(
A,B,C,D: in std_logic;
G3,G2,G1,G0: out std_logic);
end GRAY;

architecture AGRAY of GRAY is
begin
G3 <= A;
G2 <= A XOR B;
G1 <= B XOR C;
G0 <= C XOR D;
end AGRAY;
```

Fotografías de la práctica