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* AIM: To analyse the truth table of binary to gray and gray to binary converter using combination of NAND gates and to understand the working of binary to gray and gray to binary converter with the help of LED's display.

* THEORY:

→ INTRODUCTION:

- In mathematics and digital electronics, a binary number is a number expressed in the base-2 numeral system or binary numeral system, which uses only two symbols: '0' and '1'.
- The base-2 numeral system is a positional notation with a radix of 2. Each digit is referred to as a bit. Because of its straightforward implementation in logic gates, the binary system is used by almost all modern computers and computer-based devices.
- The reflected binary code (RBC) also known as Gray code is an ordering of the binary numeral system such that two successive values differ in only one bit. That way, incrementing a value from 1 to 2 requires only one bit to change, instead of two.
- Gray codes are widely used to prevent spurious output from electromechanical switches and to facilitate error correction in digital communications.

→ BINARY TO GRAY CODE CONVERSION:

This conversion method strongly follows the Ex-OR gate operation between binary bits. The below steps show how to perform binary to gray code conversion.

- To convert binary to gray code, bring down the most significant digit of the given binary number, because, the first digit or most significant digit of the gray code number is same as the binary number.
- To obtain the successive gray coded bits to produce the equivalent gray coded number for the given binary, add the first bit or the most significant digit of binary to the second one and write down the result next to the first bit of gray code, add the second binary bit to third one and write down the result next to the second bit of gray code, follow this operation until the last binary bit and write down the results based on EX-OR logic to produce the equivalent gray coded binary.

GRAY TO BINARY

EXAMPLE:

	g(3)	g(2)	g(1)	g(0)
GRAY	1	0	1	0
	b(3)	b(2)	b(1)	b(0)
BINARY	1	1	0	0

i.e. $b(3) = g(3)$; $b(2) = b(3) \oplus g(2)$;

$b(1) = b(2) \oplus g(1)$; $b(0) = b(1) \oplus g(0)$

→ GRAY CODE OF BINARY CONVERSION:

This conversion method also follows the EX-OR gate operation between gray & binary bits. The below steps show how to perform gray code to binary conversion.

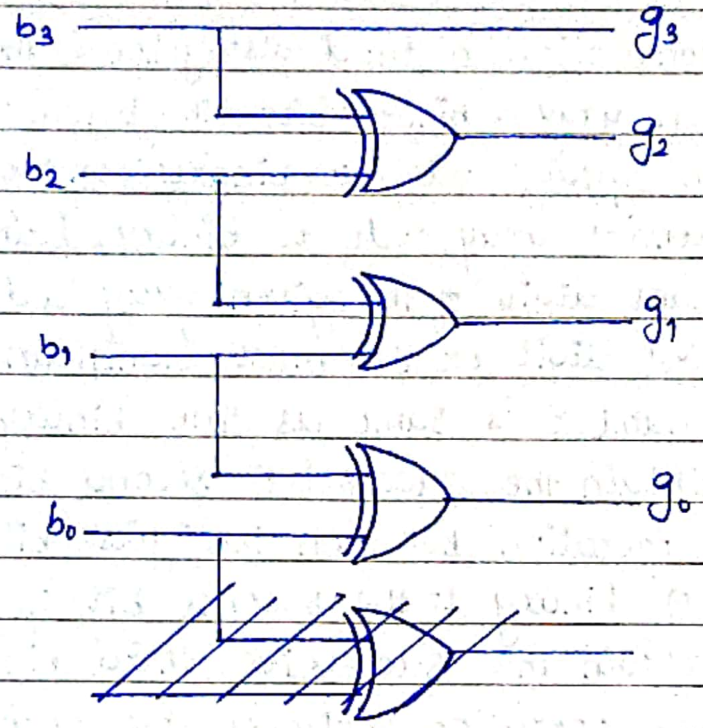
- To convert gray code to binary, bring down the most significant digit of the given gray code number, because, the first digit or the most significant digit of the gray code number is same as the binary number.
- To obtain the successive second binary bit, perform the EX-OR operation between the first bit or most significant digit of binary to the second bit of the given gray code.
- To obtain the successive third binary bit, perform the EX-OR operation between the second bit or most significant digit of binary to the third MSB of gray code and so on for the next successive binary bits conversion to find the equivalent.

BINARY TO GRAY CODE CONVERSION:

Convert the binary 11101_2 to its equivalent Gray code.

b(1)		b(2)		b(3)		b(4)		b(5)	
1	$\oplus \to$	1	$\oplus \to$	1	$\oplus \to$	0	$\oplus \to$	1	BINARY
↓		↓		↓		↓		↓	
1		0		0		1		1	
g(1)		g(2)		g(3)		g(4)		g(5)	GRAY

Binary to Gray code circuit :



Gray code to Binary circuit: