



EXPERIMENT - 7

Switching Theory and Logic Design (STLD)

Aim

To realize binary to gray and gray to binary code converter.

Syeda Reeha Quasar
14114802719
3C7

EXPERIMENT - 7

AIM:

To realize binary to gray and gray to binary code converter.

Hardware and Software Apparatus Required

Hardware:

Breadboard, IC 7486 (XOR), LEDs, 5V power supply, connecting wires.

Software Simulation:

The schematic models of the desired circuits will be stimulated on MULTISIM (Free Software), easily accessible at www.multisim.com.

Components used – Source (Clock Voltage), Passive elements (resistor), Digital components (AND, OR, NAND, NOR, XOR, XNOR, Inverter), Probe for Analysis and annotation (Digital), Schematic connectors (Ground)

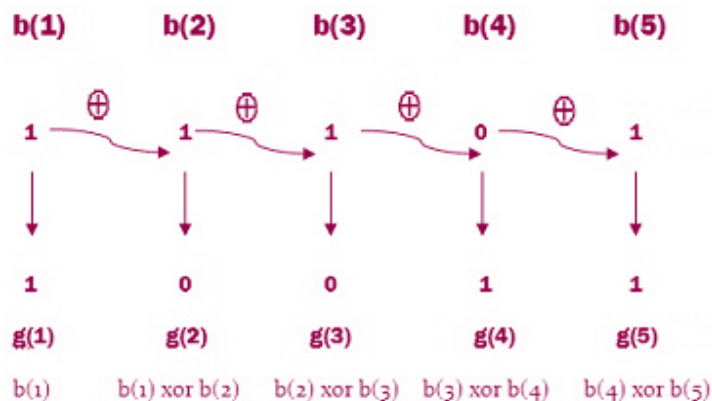
Theory:

The gray code is a non weighted code. The successive gray code differs in one bit position only that means it is a unit distance code. It is also referred as cyclic code. It is not suitable for arithmetic operations. It is the most popular of the unit distance codes. It is also a reflective code. An n-bit Gray code can be obtained by reflecting an n-1 bit code about an axis after 2^{n-1} rows, and putting the MSB of 0 above the axis and the MSB of 1 below the axis. The below solved examples may useful to understand how to perform binary to gray and gray to binary code conversion. This conversion method strongly follows the EX-OR gate operation between binary bits.

Method of Conversion

Convert the binary 11101_2 to its equivalent Gray code

a)



b)

Convert the Gray code 1010 to its equivalent Binary

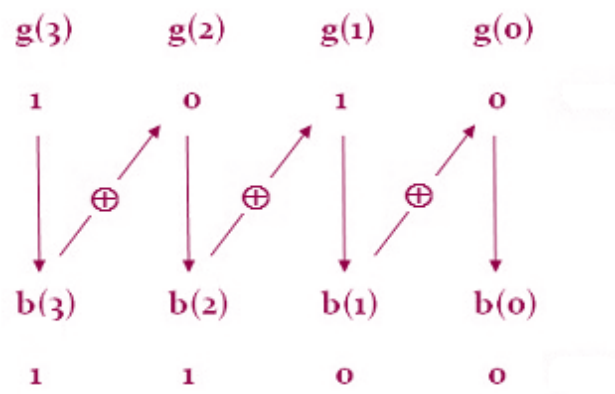
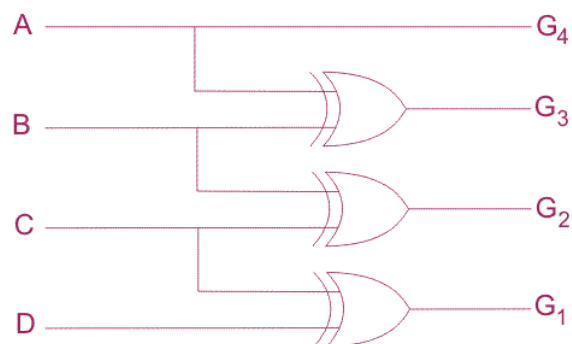


Fig 13.1 a) Binary to gray b) Gray to Binary

Logic Diagrams

a)



b)

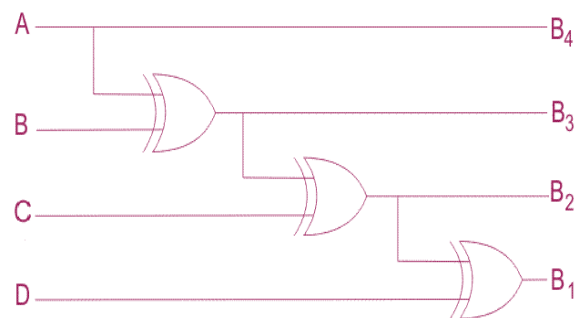


Fig 13.2 Logic Diagram of a) Binary to Gray b) Gray to Binary

Binary to Gray Code Converter Table

Decimal Number	Binary Code	Gray Code
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

Gray to Binary Code Converter Table

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

Procedure followed on MULTISIM:

1. Check all the components for their working.
2. Insert the appropriate IC into the IC base.
3. Make connections as shown in the circuit diagram.
4. Verify the results and observe the outputs.

PRECAUTIONS:

1. All ICs should be checked before starting the experiment.
2. All the connection should be tight.
3. Always connect ground first and then the supply.
4. Switch off the power supply after completion of the experiment.

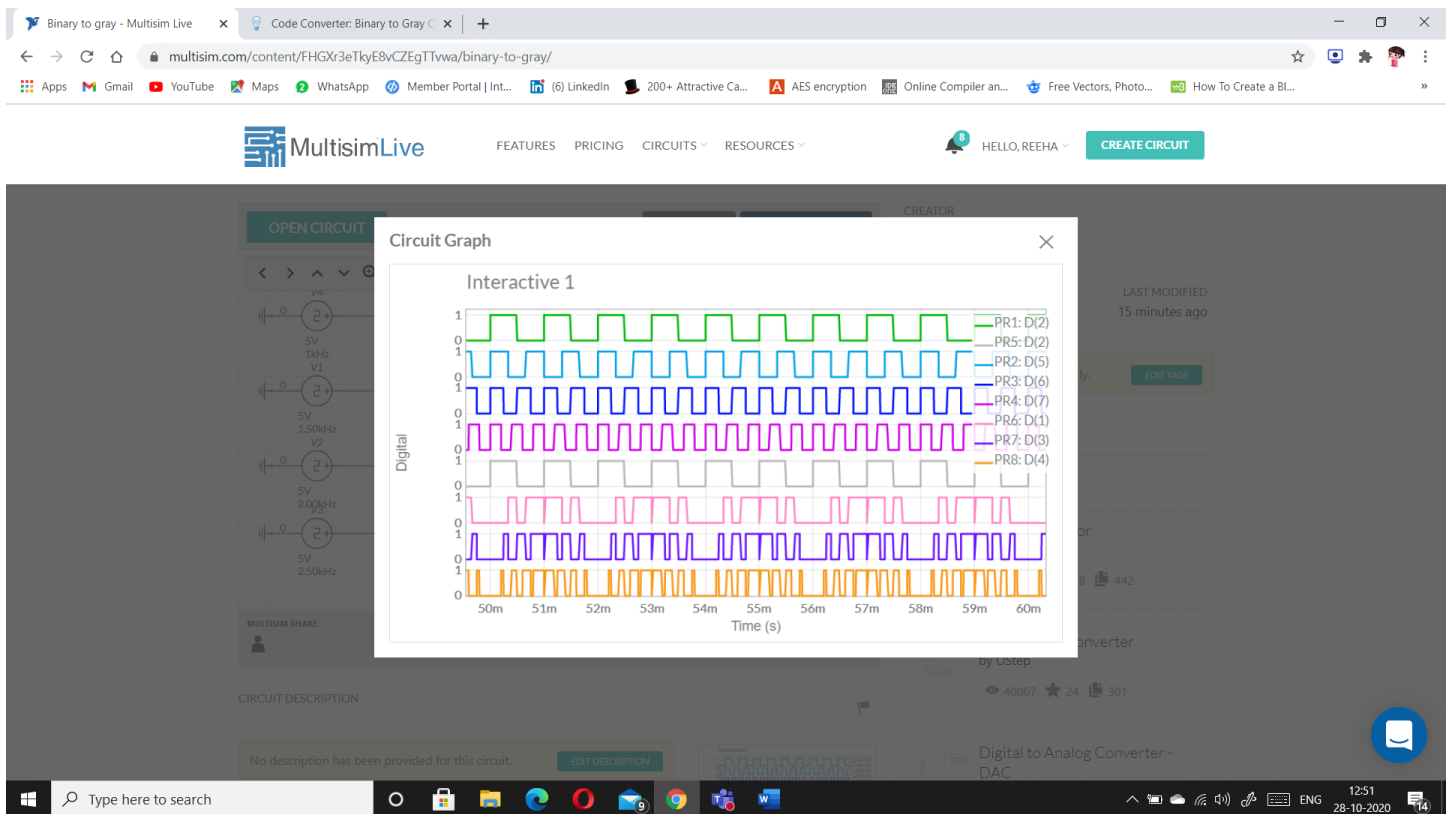
RESULT:

Gray to binary and binary to Gray code converter has been studied and its truth table is verified.

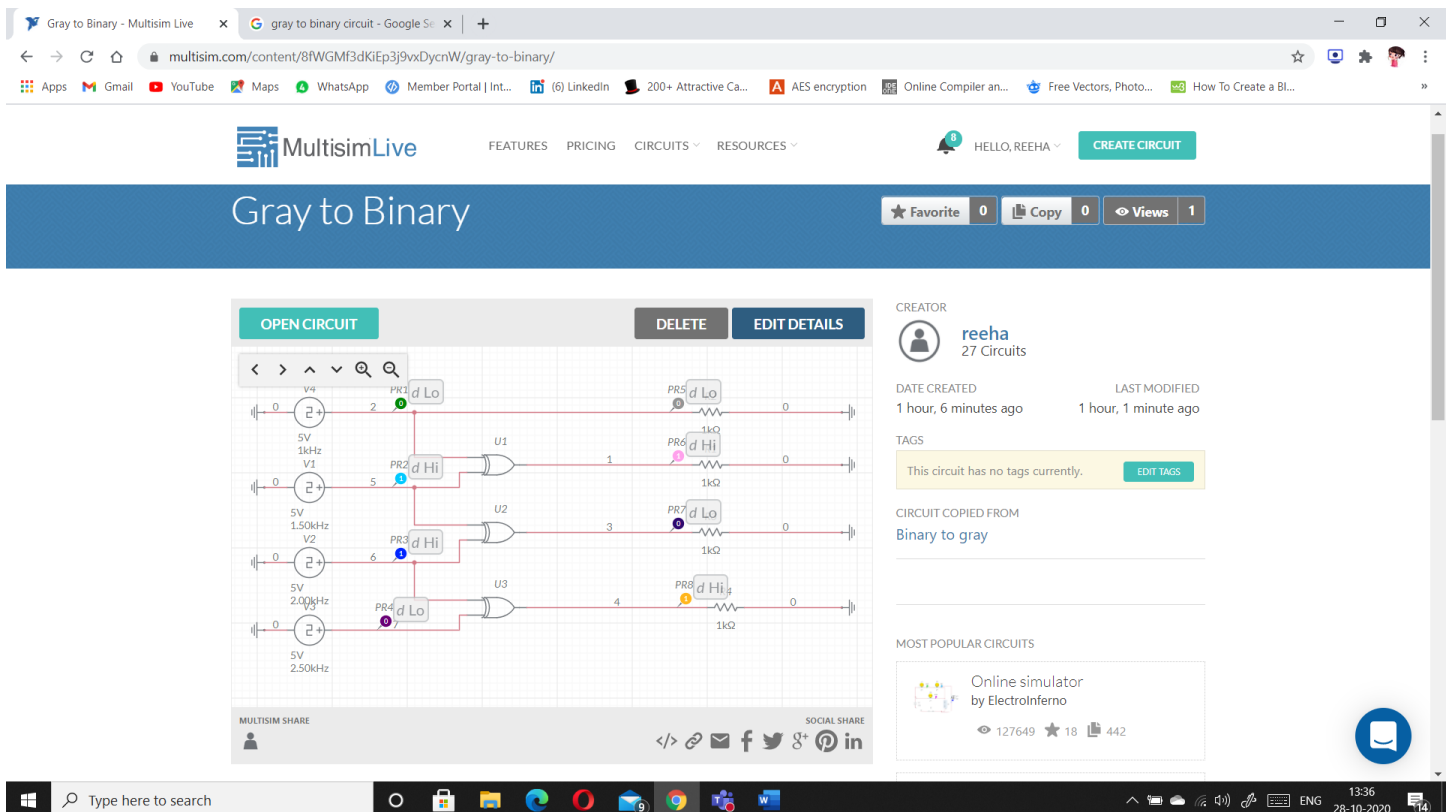
Circuits and Output waveform

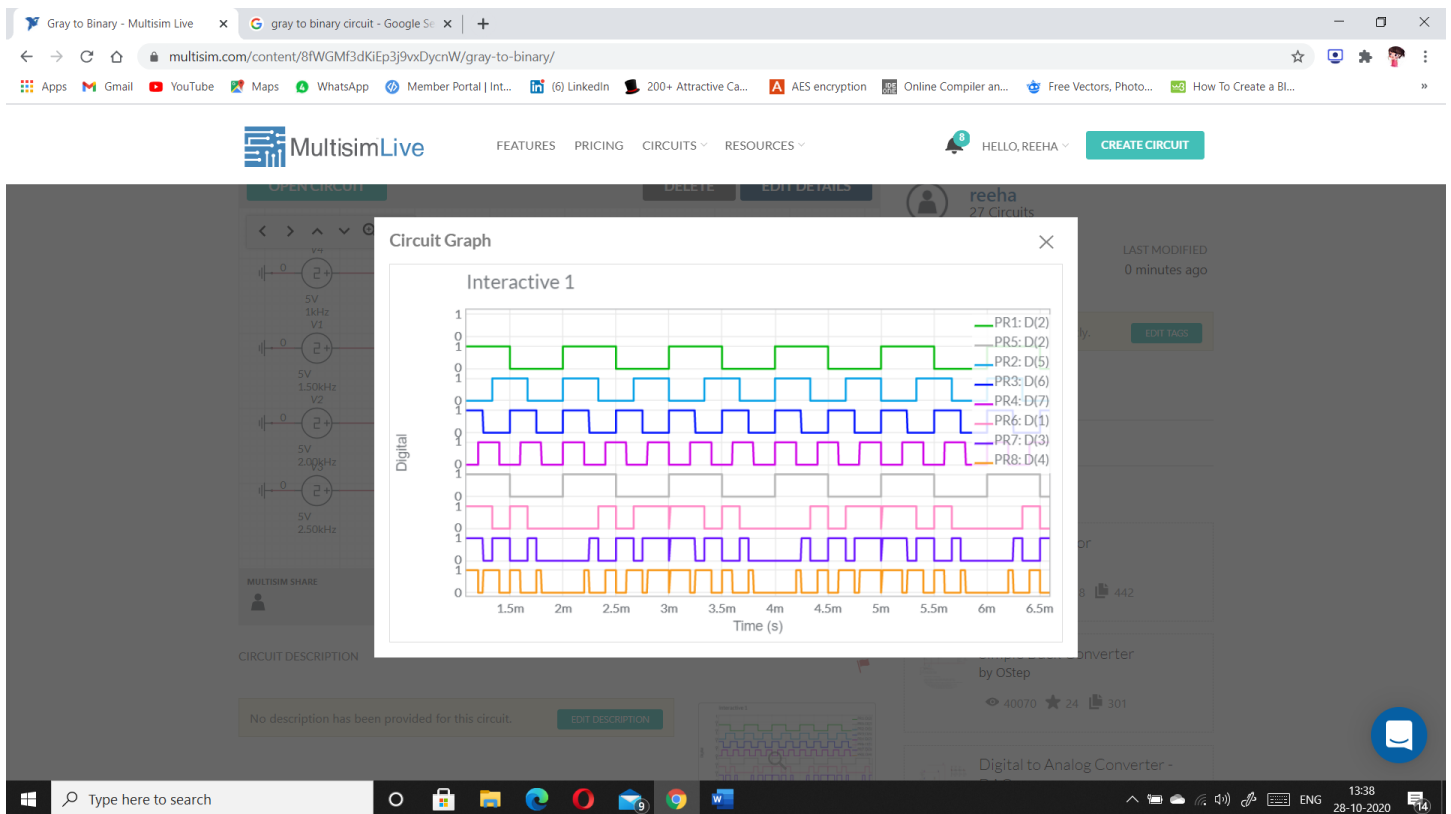
Binary to Gray

The screenshot shows a MultisimLive circuit simulation titled "Binary to gray". The circuit is a Binary to Gray converter. It consists of three 5V AC voltage sources (V1, V2, V3) connected to three 2-input OR gates (U1, U2, U3). The outputs of the OR gates are connected to three 1kΩ resistors (R1, R2, R3) which are then connected to three LEDs (PR1, PR2, PR3). The circuit is titled "Binary to gray" and is created by "reeha". The page shows the circuit diagram, the creator's name, the date created (16 minutes ago), the last modified time (15 minutes ago), and the number of views (1). The circuit is also listed as one of the most popular circuits on the site.



Gray to Binary





VIVA-VOCE QUESTIONS:

1. Why Gray code are called Unit Distance Code?

Ans.

A unit distance code derives its name from the fact that there is only one bit change between two consecutive numbers. The excess 3 gray code is such a code, the values for zero and nine differ in only 1 bit, and so do all values for successive numbers.

2. What are applications of Gray Codes?

Ans.

Its used in in digital electronics. For example an adder. Practical applications can be thought of any condition which requires not more than one bit to switch at a time. Even in terms of devices when we think at a level which is at a threshold of device physics and digital vlsi; if a cmos gate switches which is a part of series of other gates; its fine.

3. What are Reflected codes?

Ans.

The reflected binary code or Gray code is an ordering of the binary numeral system such that two successive values differ in only one bit (binary digit).

4. Why Gray Coding is used in K- mapping instead of binary?

Ans.

Because Gray code only changes one bit at a time as you move between adjacent states, so it makes the groupings of terms possible, because they're next to each other. If you used binary code, the regions would be disjointed and the grouping of terms not obvious.