SARDAR VALLABHBHAI NATIONAL INSTITUTE OF TECHNOLOGY, SURAT
ELECTRONICS ENGINEERING DEPARTMENT

Expt. No: 10	Binary to/from Gray node
Date: 26/10/21	

NAME - ADITYA RAJ
B100
ADMISSION NO. - U20CS100

AIM:

To design and implement three-bit binary to gray and three-bit gray to binarycode converter using Multi-Sim.

SOFTWARE TOOLS / OTHER REQUIREMENTS:

1. Multisim Simulator/Circuit Simulator

THEORY:

The reflected binary code or Gray code is an ordering of the binary numeral systemsuch that two successive values differ in only one bit (binary digit). Gray code also known as reflected binary code, because the first (n/2) values compare with those ofthe last (n/2) values, but in reverse order.

Gray code is not weighted that means it does not depends on positional value of digit. This cyclic variable code that means every transition from one value to the next value involves only one bit change.

Gray codes are very useful in the normal sequence of binary numbers generated bythe hardware that may cause an error or ambiguity during the transition from one number to the next. So, the Gray code can eliminate this problem easily since onlyone bit changes its value during any transition between two numbers.

BINARY TO GRAY CODE CONVERSION:

Let *B0, B1, B2* be the bits representing the binary numbers, where *B0* is the LSB and *B2* is the MSB, and let *G0, G1, G2* be the bits representing the gray code of thebinary numbers, where *G0* is the LSB and *G2* is the MSB.

The truth table for the conversion of three-bit binary to gray code is given below.

Decimal	Binary Input			Gray Output		
	B2	B1	B0	G2	G1	G0
0	0	0	0	0	0	0
1	0	0	1	0	0	1
2	0	1	0	0	1	1
3	0	1	1	0	1	0
4	1	0	0	1	1	0
5	1	0	1	1	1	1
6	1	1	0	1	0	1
7	1	1	1	1	0	0

BC→	00	01	11	10
A↓				
0	0	0	0	0
1	1	1	1	1

K-map for G2

BC→	00	01	11	10
A↓				
0	0	0	1	1
1	1	1	0	0

K-map for G1

BC→	00	01	11	10
A↓				
0	0	1	0	1
1	0	1	0	1

K-map for G0

Corresponding minimized Boolean expressions for Gray code are:

G2 = B2

G1 = B2'*B1 + B1'*B2

G0 = B1'*B0 + B1*B0'

GRAY TO BINARY CODE CONVERSION:

Let *B0, B1, B2* be the bits representing the binary numbers, where *B0* is the LSB and *B2* is the MSB, and let *G0, G1, G2* be the bits representing the gray code of thebinary numbers, where *G0* is the LSB and *G2* is the MSB. The truth table for the conversion of three-bit binary to gray code is given below.

Decimal	Gray Output			Binary Input		
	G2	G1	G0	B2	B1	B0
0	0	0	0	0	0	0
1	0	0	1	0	0	1
2	0	1	0	0	1	0
3	0	1	1	0	1	1
4	1	0	0	1	0	0
5	1	0	1	1	0	1
6	1	1	0	1	1	0
7	1	1	1	1	1	1

BC→	00	01	11	10
A↓				
0	0	0	0	0
1	1	1	1	1

K-map for B2

BC→	00	01	11	10
A↓				
0	0	0	1	1
1	1	1	0	0

K-map for B1

BC→	00	01	11	10
A↓				
0	0	1	0	1
1	1	0	1	0

K-map for B0

Corresponding minimized Boolean expressions for Gray code are:

B0 = G2

B1 = G2'*G1 + G1'*G2

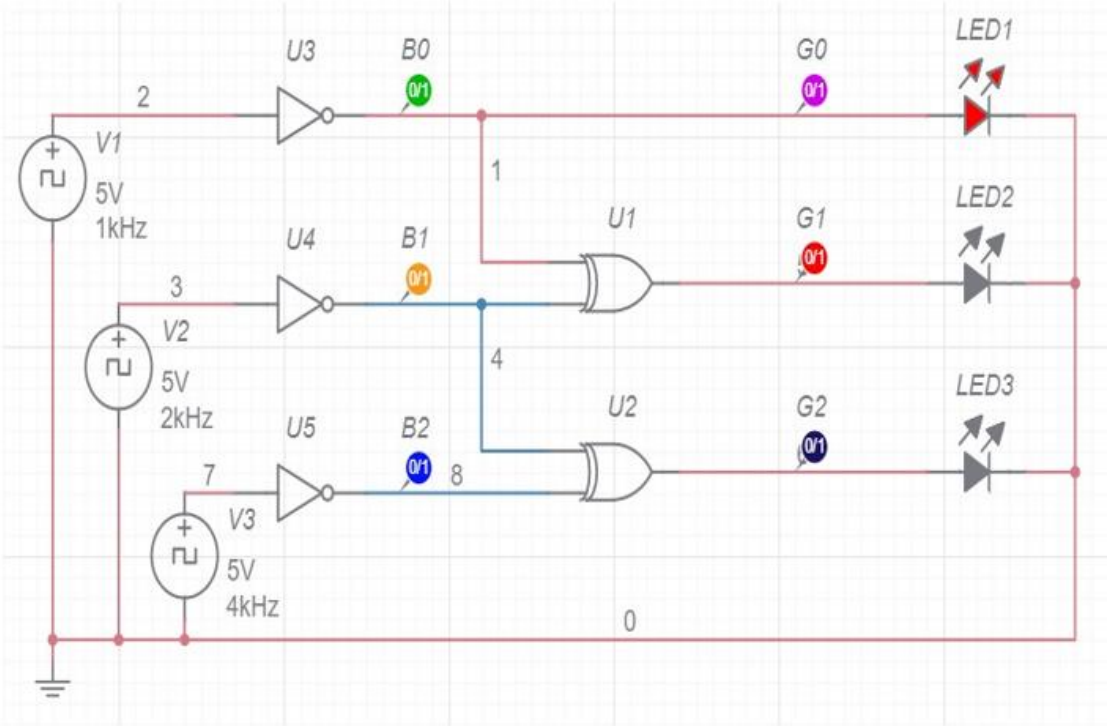
B0 = G2'*(G1'*G0 + G1*G0') + G2*(G1'*G0' + G1*G0)

= G2'* (G1 ⊕ G0) + G2*(G1 ⊙ G0)

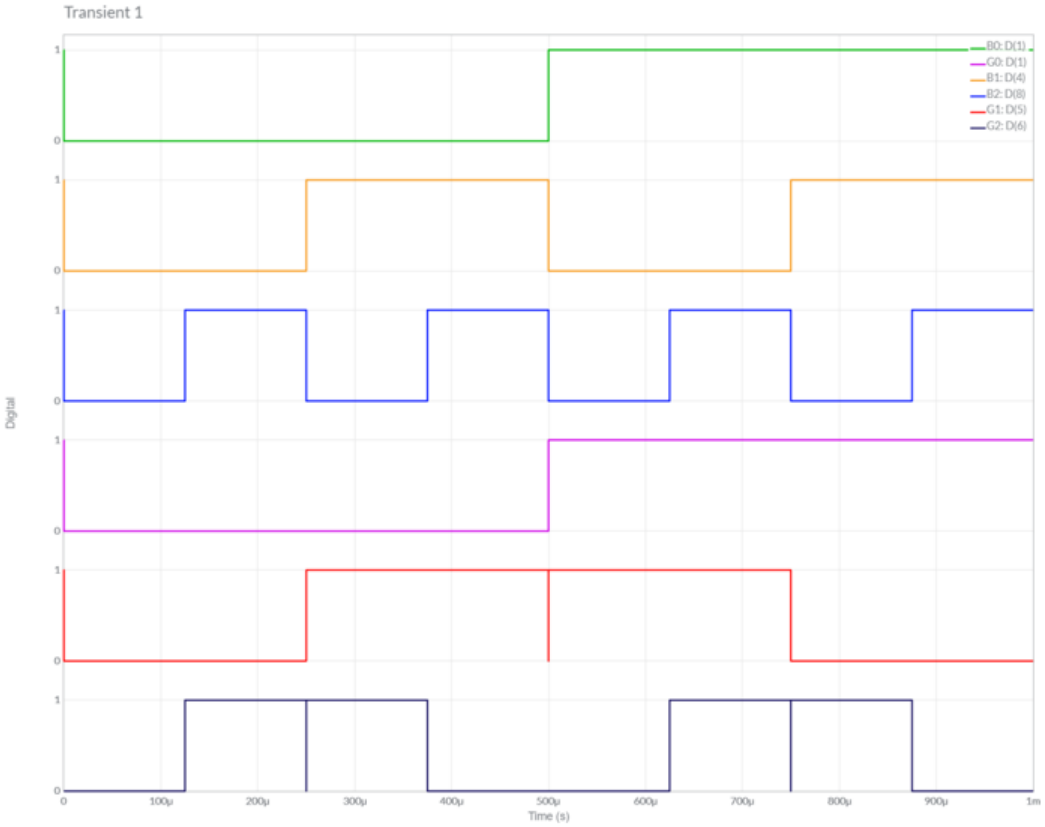
B0 = G0 ⊕ G1 ⊕ G2

BINARY TO GRAY CODE CONVERSION:

CIRCUIT/CONNECTION DIAGRAMS (FROM MULTISIM)\

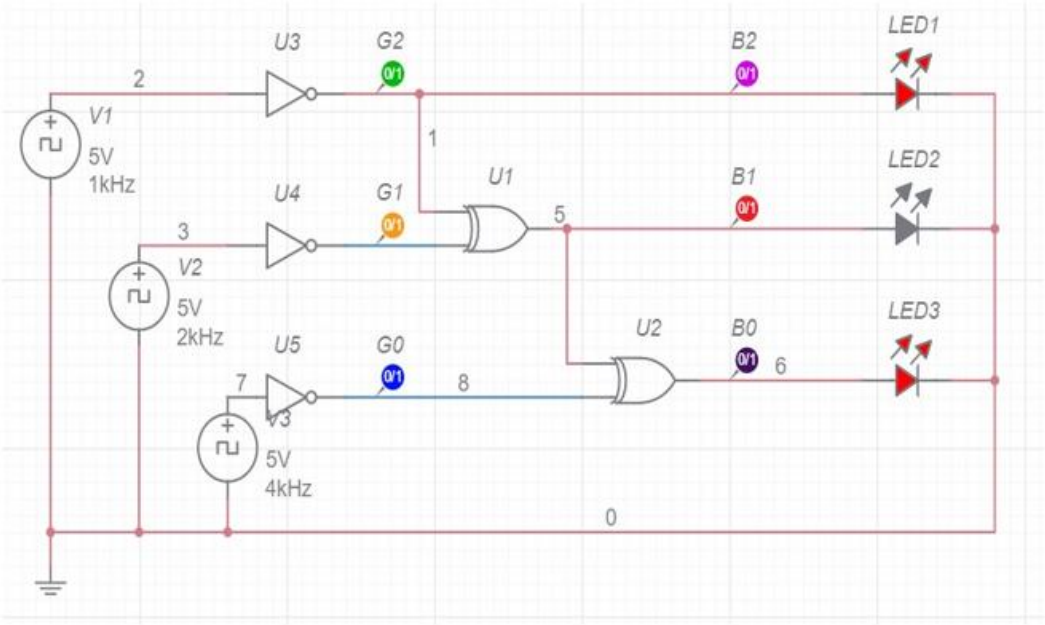


WAVEFORMS (FROM MULTISIM)

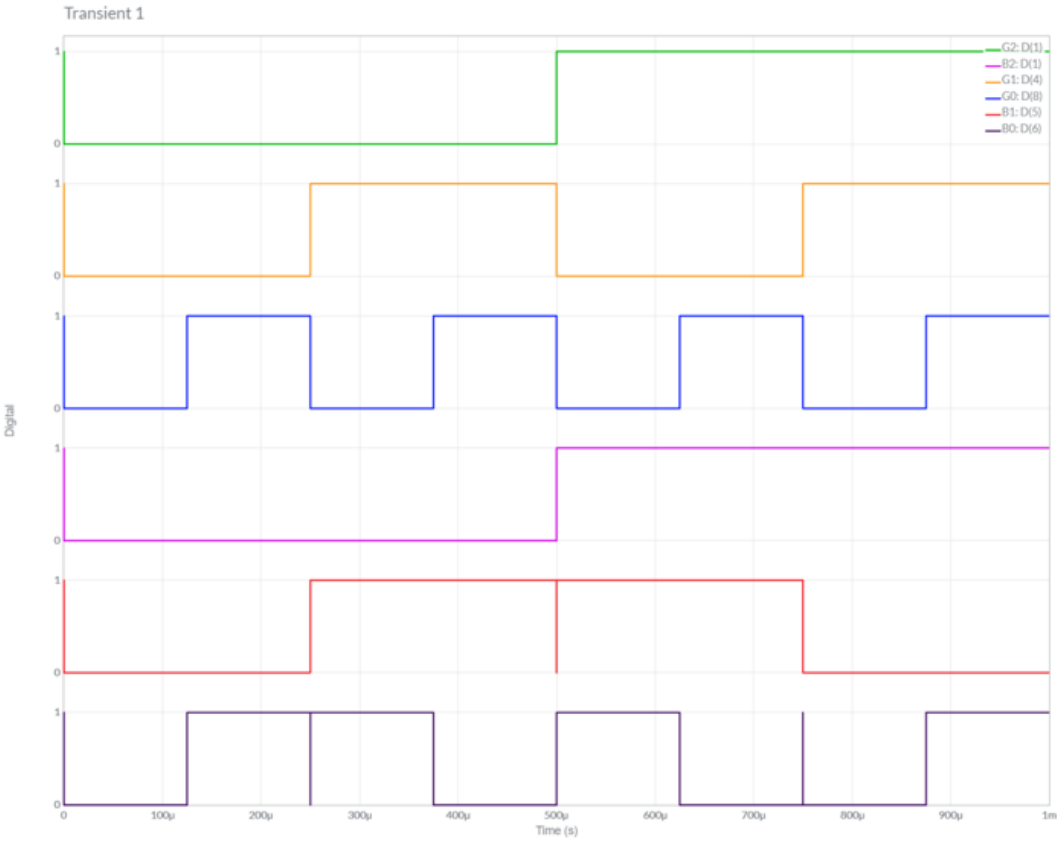


GRAY TO BINARY CODE CONVERSION:

CIRCUIT/CONNECTION DIAGRAMS (FROM MULTISIM)



WAVEFORMS (FROM MULTISIM)



CONCLUSIONS:

The truth table in theory and the stimulation of binary to gray and gray to binary code conversion are equal. Hence verified.