BINARY TO GRAY CODE CONVERSION AND VICE VERSA

Aim: To realize binary to gray and gray to binary code converters.

Learning objective:

- To learn the importance of non-weighted code.
- To learn to generate gray code.

Components required: **IC** 7486, trainer kit, patch cords.

Theory:

The logical circuit which converts binary code to equivalent gray code is known as **binary to gray code converter**. 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.

Circuit implementation:

Binary to gray code converter:

0	0	1	1	
0	0	1	1	
0	0	1	1	
0	0	1	1	

G3 = B3

0	1	1	0	
0	1	1	0	
1	0	0	1	
1	0	0	1	

G1=B1 ⊕ B2

0	1	0	1	
0	1	0	1	
0	1	0	1	
0	1	0	1	

G2= B3 ⊕ B2

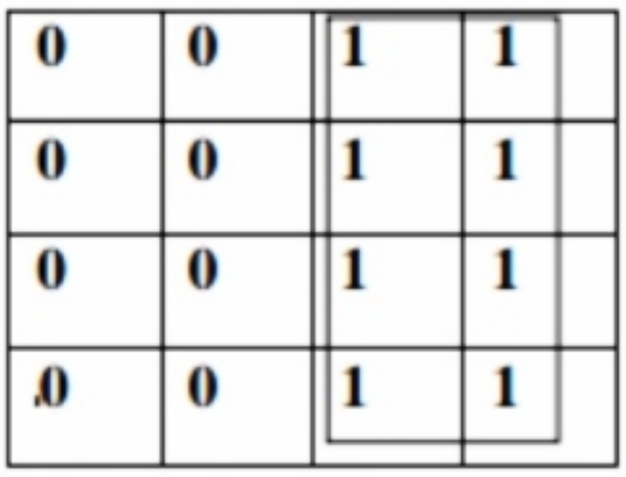
0	0	0	0	
1	1	1	1	
0	0	0	0	
1	1	1	1	

G0=B1 ⊕ B0

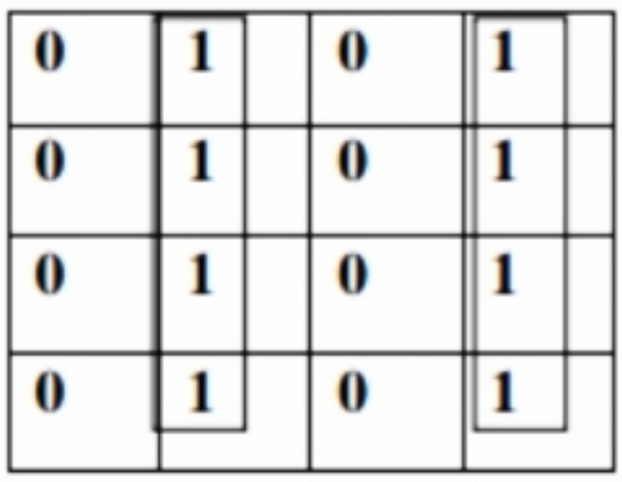
Truth table:

Binary inputs				Gray outputs			
B3	B2	B1	B0	G3	G2	G1	G0
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1
0	0	1	0	0	0	1	1
0	0	1	1	0	0	1	0
0	1	0	0	0	1	1	0
0	1	0	1	0	1	1	1
0	1	1	0	0	1	0	1
0	1	1	1	0	1	0	0
1	0	0	0	1	1	0	0
1	0	0	1	1	1	0	1
1	0	1	0	1	1	1	1
1	0	1	1	1	1	1	0
1	1	0	0	1	0	1	0
1	1	0	1	1	0	1	1
1	1	1	0	1	0	0	1
1	1	1	1	1	0	0	0

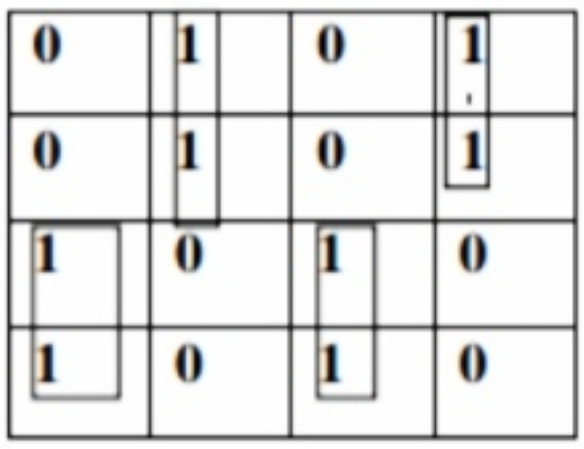
Gray to binary code converter:



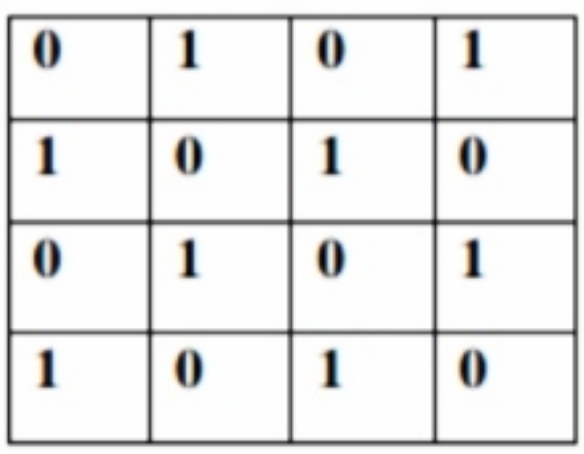
B3 = G3



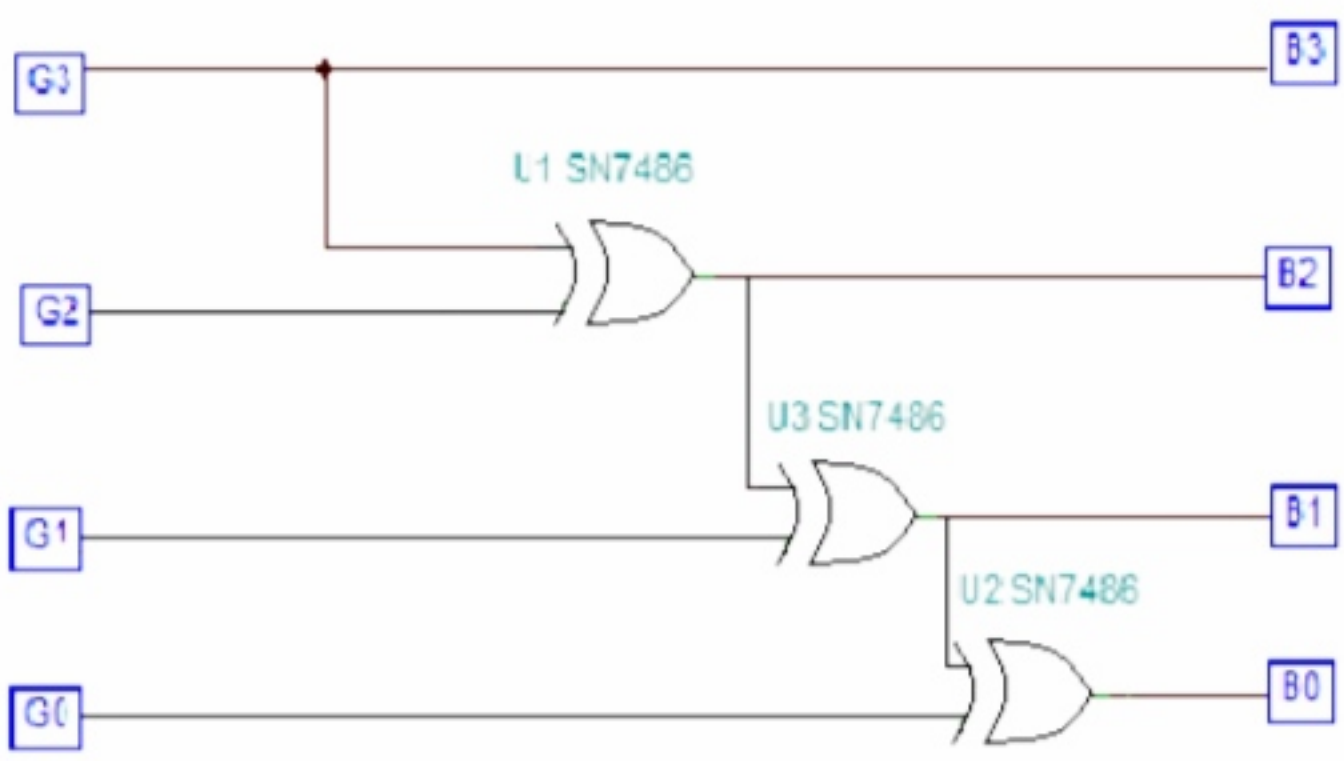
B2=G3 ⊕ G2



$B1=G3 \oplus G2 \oplus G1$



$B0=G3 \oplus G2 \oplus G1 \oplus G0$



Truth table:

Gray inputs				Binary outputs			
G3	G2	G1	G0	B3	B2	B1	B0
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1
0	0	1	0	0	0	1	1
0	0	1	1	0	0	1	0
0	1	0	0	0	1	1	1
0	1	0	1	0	1	1	0
0	1	1	0	0	1	0	0
0	1	1	1	0	1	0	1
1	0	0	0	1	1	1	1
1	0	0	1	1	1	1	0
1	0	1	0	1	1	0	0
1	0	1	1	1	1	0	1
1	1	0	0	1	0	0	0
1	1	0	1	1	0	0	1
1	1	1	0	1	0	1	1
1	1	1	1	1	0	1	0

Procedure:

- Check the components for their working.
- Insert the appropriate IC into the IC base.
- Rig up the circuit as shown in the logic circuit diagram.
- Apply various input data to the logic circuit via the input logic switches.
- Note down the corresponding output and verify the truth table.

Result: