Laboratory Report Cover Sheet

SRM Institute of Science and Technology Faculty of Engineering and Technology Department of Electronics and Communication Engineering
15EC203J Digital Systems **Third Semester, 2018-19 (odd semester)**

Name :

Register No. :

Day / Session :

Venue :

Title of Experiment :

Date of Conduction :

Date of Submission :

Particulars	Max. Marks	Marks Obtained
Pre-lab questions	10	
In-lab experiment	20	
Post-lab questions	10	
Total	40	

REPORT VERIFICATION

Date :

Staff Name :

Signature :

Lab 6: DESIGN OF CODE CONVERTERS

BINARY-TO-GRAY CODE CONVERSION

Truth Table of Binary to Gray code conversion

Decimal	Binary code				Gray code			
	D	C	B	A	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

The design equations are

$G0 = B \oplus A$

$G1 = C \oplus B$

$G2 = D \oplus C$

$G3 = D$

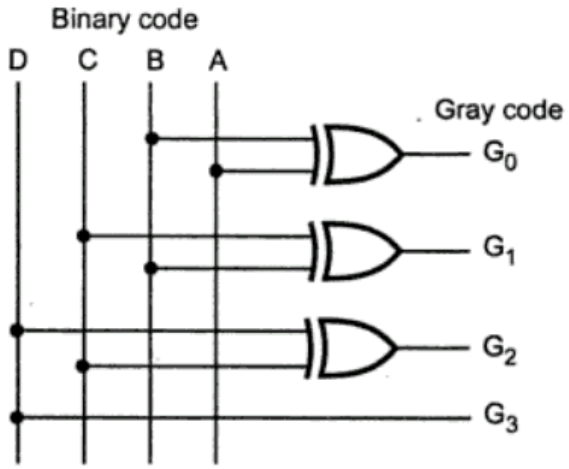

Figure 5.1: Realization of Binary-to-Gray Code Converter

Lab 6: DESIGN OF CODE CONVERTERS

Aim

To design and verify four bit Binary to Gray, Gray to Binary Number converter circuit.

Hardware Requirement

a. Equipments - Digital IC Trainer Kit
b. Discrete Components – 74LS86 Quad 2-Input EX-OR gate

Theory

The conversion from one code to another is common in digital systems. Sometimes the output of a system is used as the input to the other system.
The availability of large variety of codes for the same discrete elements of information results in the use of different codes by different systems. A conversion circuit must be inserted between the two systems if each uses different codes for same information. Thus, code converter is a circuit that makes the two systems compatible even though each uses different binary code. The bit combination assigned to binary code to gray code. Since each code uses four bits to represent a decimal digit. There are four inputs and outputs. Gray code is a non-weighted code. The input variable are designated as B3,B2,B1,B0 and the output variable are designated as C3,C2,C1,Co.from the truth table, combinational circuit is designed. The Boolean functions are obtained from K-Map for each output variable.

Binary-to-Gray code conversion:

1. MSB Gray code = MSB Binary code
2. From left to right, add each adjacent pair of binary code bits to get the next Gray code bit.
\
   Discard carries

Example: Consider the decimal number 68.
$(68)_{10} = (1000100)_2$
Binary code : 1 0 0 0 1 0 0
Gray code : 1 1 0 0 1 1 0

Gray-to-binary code conversion:

1. MSB binary code = MSB Gray code
2. Add each binary code bit generated to the Gray code bit in the next adjacent position.
   Discard carries

Example: Consider the decimal number 68.
$(68)_{10} = (1000100)_2$
Gray code : 1 1 0 0 1 1 0
Binary code : 1 0 0 0 1 0 0

GRAY-TO-BINARY CODE CONVERSION

Truth Table of Gray-to-Binary code conversion

Gray code				Binary code			
G3	**G2**	**G1**	**G0**	**D**	**C**	**B**	**A**
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1
0	0	1	1	0	0	1	0
0	0	1	0	0	0	1	1
0	1	1	0	0	1	0	0
0	1	1	1	0	1	0	1
0	1	0	1	0	1	1	0
0	1	0	0	0	1	1	1
1	1	0	0	1	0	0	0
1	1	0	1	1	0	0	1
1	1	1	1	1	0	1	0
1	1	1	0	1	0	1	1
1	0	1	0	1	1	0	0
1	0	1	1	1	1	0	1
1	0	0	1	1	1	1	0
1	0	0	0	1	1	1	1

The logic equations for Gray to binary code conversion

$A = (G3 \oplus G2) \oplus (G1 \oplus G0)$

$B = (G3 \oplus G2) \oplus G1$

$C = G3 \oplus G2$

$D = G3$

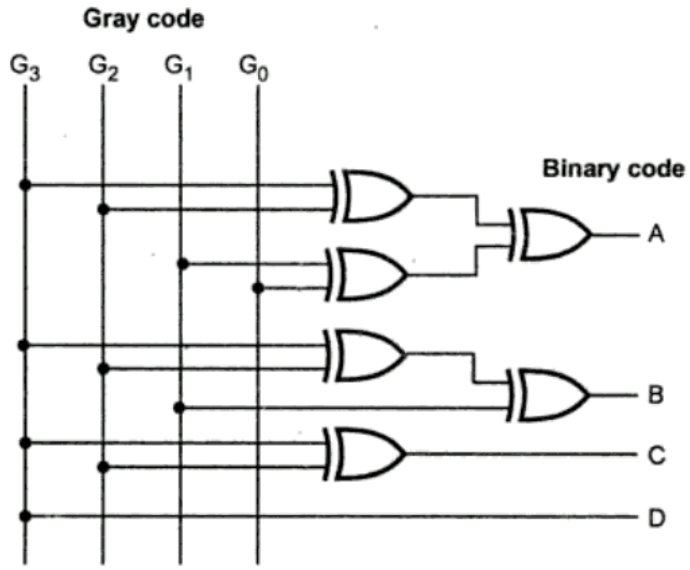

Figure 5.2: Realization of Gray-to-Binary Code Converter

Pre Lab

1. What do you mean by code conversion? What are the applications of code conversion?
2. What are the advantages of gray code?
3. Determine the Gray code for (a) 37 and (b) 128.
4. Derive the Boolean expression for four bit Excess 3 code to Binary code converter
5. Derive the Boolean expression for four bit BCD to Gray code converter
6. Convert gray code 101011 into its binary equivalent.

Lab Procedure

1. Using the derived expression, implement binary to gray and Gray to binary code convertor using logic gates and verify its functional table.
2. In the case of gray to binary conversion, the inputs G_0, G_1, G_2 and G_3 are given at respective pins and outputs B_0, B_1, B_2 and B_3 are taken for all the 16 combinations of inputs.
3. In the case of binary to gray code conversion, the inputs B_0, B_1, B_2 and B_3 are given at respective pins and outputs G_0, G_1, G_2 and G_3 are taken for all the 16 combinations of inputs.

Post Lab

1. Design the BCD to Binary code converter circuit

Result