Switching Circuit & Logic Design

Lecture 16 : Combinational Circuit - Decoders

Gray Code

0
1

Gray Code

0
1

0	0
0	1
1	1
1	0

Gray Code

0
1

0	0
0	1
1	1
1	0

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

Gray Code

0
1

0	0
0	1
1	1
1	0

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

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

Design of a 4-bit Binary to Gray Code Converter

4-bit Binary				4-bit Gray			
B_4	B_3	B_2	B_1	G_4	G_3	G_2	G_1
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

$G_4 = B_4$

$G_3 = B_4 \text{ XOR } B_3$

$G_2 = B_3 \text{ XOR } B_2$

$G_1 = B_2 \text{ XOR } B_1$

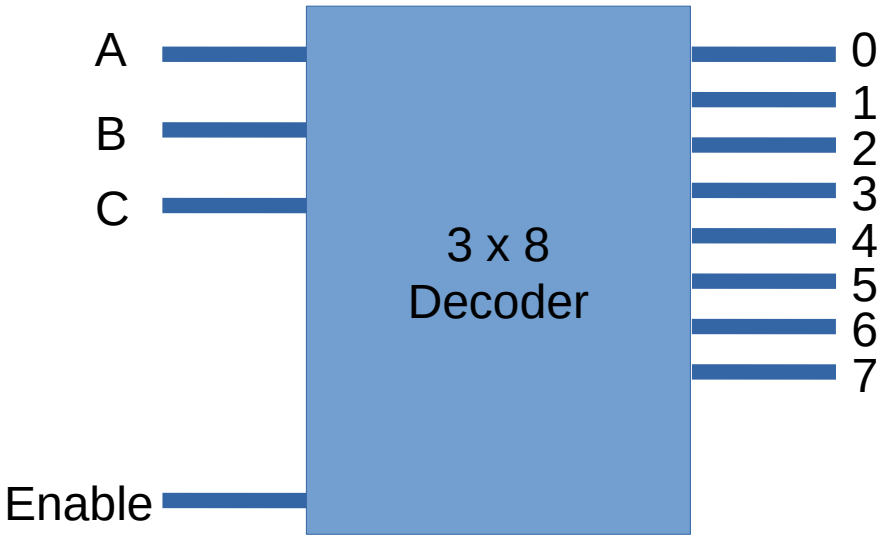
$B_4 = G_4$

$B_3 = G_4 \text{ XOR } G_3$

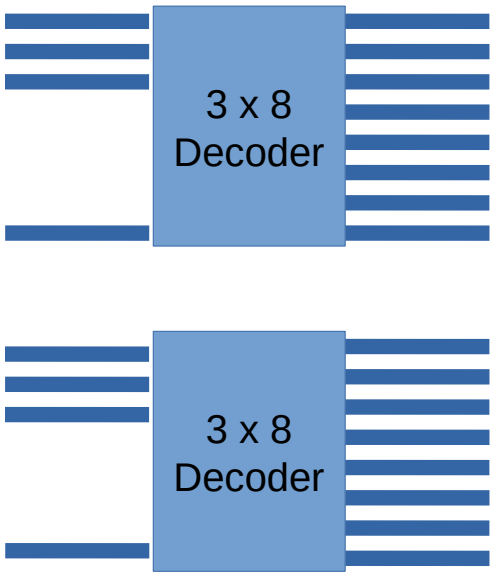
$B_2 = B_3 \text{ XOR } G_2$

$B_1 = B_2 \text{ XOR } G_1$

Decoder



Two 3 x 8 → 4 x 16



BCD to 7-segment Display