BBM233: Logic Design Lab
2024 Fall
Lab Experiment 2-3 Report

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1 Question 1

Q: What is a 7-segment display and how it works? A: A 7-segment display is an electronic display used to show decimal numbers and some letters. It consists of seven LED segments (labeled from "a" to "g") arranged in an "8" shape. Each segment can light up individually, allowing various numbers and some letters to be displayed by turning specific segments on or off.

Q: How many types of 7-segment display are there and what differentiates them from one another? A: There are two types of 7-segment displays: common cathode and common anode. Common Cathode: All negative terminals are connected, and segments light up by applying positive voltage. Common Anode: All positive terminals are connected, and segments light up by applying negative voltage.

Q: Why do we need a decoder to use 7-segment displays? A: Without a decoder, each segment would have to be controlled individually, which is complex and inefficient.

Q: If this assignment were about designing a common anode instead of common cathode, would there be any change in truth table and if yes what kind of change? A: Yes, all logic values in the truth table would be inverted. In a common cathode display, segments light up when given a high (1) signal but their counterpart, common anode displays, segments light up when given a low (0) signal.

Q: What happens if you apply inputs for which you used don't cares (X), i.e., inputs 10-15? A:

2 Question 2

Decimal Digits	Output Lines				Input Lines						
	A	B	C	D	a	b	c	d	e	f	g
0	0	0	0	0	1	1	1	1	1	1	0
1	0	0	0	1	0	1	1	0	0	0	0
2	0	0	1	0	1	1	0	1	1	0	1
3	0	0	1	1	1	1	1	1	0	0	1
4	0	1	0	0	0	1	1	0	0	1	1
5	0	1	0	1	1	0	1	1	0	1	1
6	0	1	1	0	0	0	1	1	1	1	1
7	0	1	1	1	1	1	1	0	0	0	0
8	1	0	0	0	1	1	1	1	1	1	1
9	1	0	0	1	1	1	1	0	0	1	1

Figure 1: Truth Table

AB \ CD	00	01	11	10
00	1	0	1	1
01	0	1	1	1
11	X	X	X	X
10	1	1	X	X

Result

$$F = A + C + BD + \overline{B}\,\overline{D}$$

Figure 2: Karnaugh map for output a

AB \ CD	00	01	11	10
00	1	1	1	1
01	1	0	1	0
11	X	X	X	X
10	1	1	X	X

Result

$$F = \overline{B} + C\,D + \overline{C}\,\overline{D}$$

Figure 3: Karnaugh map for output b

AB \ CD	00	01	11	10
00	1	1	1	0
01	1	1	1	1
11	X	X	X	X
10	1	1	X	X

Result

$$F = B + D + \overline{C}$$

Figure 4: Karnaugh map for output c

AB \ CD	00	01	11	10
00	1	0	1	1
01	0	1	0	1
11	X	X	X	X
10	1	1	X	X

Result

$$F = A + C\overline{D} + \overline{B}C + \overline{B}\,\overline{D} + B\overline{C}D$$

Figure 5: Karnaugh map for output d

AB \ CD	00	01	11	10
00	1	0	0	1
01	0	0	0	1
11	X	X	X	X
10	1	0	X	X

Result

$$F = C\overline{D} + \overline{B}\,\overline{D}$$

Figure 6: Karnaugh map for output e

AB \ CD	00	01	11	10
00	1	0	0	0
01	1	1	0	1
11	X	X	X	X
10	1	1	X	X

Result

$$F = A + B\overline{D} + B\overline{C} + \overline{C}\,\overline{D}$$

Figure 7: Karnaugh map for output f

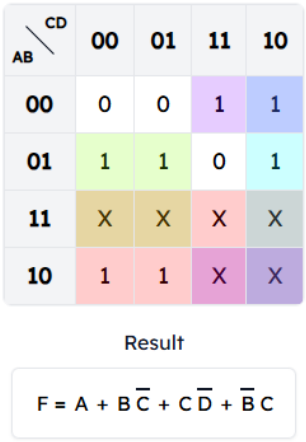

Figure 8: Karnaugh map for output g