

HW2 Solutions ECE2060 Spring 2019

Lectures Covered: Lesson5 - Lesson9

Show all relevant steps. Don't just write down the answers.

Late HWs will not be accepted. Turn in the HWs in class. **HWs turned-in anywhere else will not be accepted.**

Show your work on these pages, attach additional pages if necessary.

- Be sure to organize the pages **in order** and **staple** them all together, **otherwise you will lose one point**
- Fill out the following. **You will lose an additional point if you fail to provide these details**

Your Last Name _____ Your First Name _____

Problems start from next page. All the problems will be graded.

W2 ECE2060 Page 2

H

The problem numbers are from your text book (both the 6th and 7th edition will work)

- 1) Problem 5.14 c. Instead of the expression give in the book use $f_3 = rs' + rt + st'$. Use K-Maps to answer this question.

	r	s	t	f3
m0	0	0	0	0
m1	0	0	1	0
m2	0	1	0	1
m3	0	1	1	0
m4	1	0	0	1
m5	1	0	1	1
m6	1	1	0	1
m7	1	1	1	1

		st			
		00	01	11	10
r	0	0	1	3	2
	1	4	5	7	9

After simplification, the expression of f_3 is:

$$f_3 = r + st'$$

HW2 ECE2060 Page 3

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2) Problem 5.14 f. Use K-Maps. Use $f_6(x, y, z) = M_1M_5$

	X	Y	Z	f ₆	m	M
m0	0	0	0	0	1	0
m1	0	0	1	1	0	1
m2	0	1	0	0	1	0
m3	0	1	1	0	1	0
m4	1	0	0	0	1	0
m5	1	0	1	1	0	1
m6	1	1	0	0	1	0
m7	1	1	1	0	1	0

$$f_6(x, y, z) = \prod M(1,5)$$

$$= \sum m(0,2,3,4,6,7)$$

		YZ			
		00	01	11	10
X	0	1	0	1	1
	1	1	0	1	1

After simplification, the expression of f_6 is:

$$f_6 = Y + Z'$$

3) Problem 5.17. Use $F(A,B,C,D)=A'B'+ABC+A'BD'+AC'D+A'BD+AB'CD'$

A	B	C	D	A'B'	ABC	A'BD'	AC'D	A'BD	AB'CD'	F
0	0	0	0	1						1
0	0	0	1	1						1
0	0	1	0	1						1
0	0	1	1	1						1
0	1	0	0			1				1
0	1	0	1					1		1
0	1	1	0			1				1
0	1	1	1					1		1
1	0	0	0							0
1	0	0	1				1			1
1	0	1	0						1	1
1	0	1	1							0
1	1	0	0							0
1	1	0	1				1			1
1	1	1	0		1					1
1	1	1	1		1					1

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

a) To have the sum of products, simplify the expression based on the 1s.

$$F = A' + C'D + CD' + BC$$

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

b) To have the product of sums, simplify the expression based on the 0s.

$$F = \sum m(0,1,2,3,4,5,6,7,9,10,13,14,15) \\ = \prod M(8,11,12)$$

$$\text{As } F' = AC'D' + AB'CD$$

$$F = (A'+C+D)(A'+B+C+D')$$

HW2 ECE2060 Page 5

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- 4) Problem 5.24 b. Use K-maps (d represents don't care). Use $\sum m(2, 4, 8) + \sum d(0, 3, 6)$

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

After simplification, the expression is:

$$F = A'D' + B'C'D'$$

HW2 ECE2060 Page 6

- 5 The problem numbers are from your text book (both the 6th and 7th edition will work)
 Problem 5.29 a (ignore the part of the problem statement that says "express your answer in both decimal and algebraic notation". Just express your answer as an algebraic expression)
 Use $F = ABD + A'B + A'C + CD$

A	B	C	D	ABD	A'B	A'C	CD	F
0	0	0	0					0
0	0	0	1					0
0	0	1	0			1		1
0	0	1	1			1	1	1
0	1	0	0		1			1
0	1	0	1		1			1
0	1	1	0		1	1		1
0	1	1	1		1	1	1	1
1	0	0	0					0
1	0	0	1					0
1	0	1	0					0
1	0	1	1				1	1
1	1	0	0					0
1	1	0	1	1				1
1	1	1	0					0
1	1	1	1	1			1	1

Just considering the 0s, the maxterm expression for F is,

$$\begin{aligned}
 F &= \Pi M(0,1,8,9,10,12,14) \\
 &= (A+B+C+D)(A+B+C+D')(A'+B+C+D) \\
 &\quad *(A'+B+C+D')(A'+B+C'+D)(A'+B'+C+D) \\
 &\quad *(A'+B'+C'+D)
 \end{aligned}$$

		CD			
		00	01	11	10
AB	00	0 ⁰ 0	1 ¹ 0	3 ³ 1	2 ² 1
	01	4 ⁴ 1	5 ⁵ 1	7 ⁷ 1	6 ⁶ 1
	11	12 ¹² 0	13 ¹³ 1	15 ¹⁵ 1	14 ¹⁴ 0
	10	8 ⁸ 0	9 ⁹ 0	11 ¹¹ 1	10 ¹⁰ 0