

EE 2381 DIGITAL COMPUTER LOGIC

Homework #3 Revised
30 Jan 2007

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Due: 06 Feb 2007

Review Mano Text: Chapter 2, sections 5-8; Chapter 3, sections 1, 2, 4 and 5.

1. Determine *all possible* consensus term in the Boolean function F

$$F = XZ + WXY + WXZ + WZ + \bar{W}\bar{Y} + \bar{Y}Z.$$

Indicate which terms are consensus terms that actually appear in F .

2. For the Boolean functions E and F , as given in the following truth table:

X	Y	Z	E	F
0	0	0	1	0
0	0	1	1	1
0	1	0	0	0
0	1	1	0	1
1	0	0	0	1
1	0	1	1	1
1	1	0	0	0
1	1	1	1	1

- (a) List the minterms and maxterms of each function.
- (b) List the minterms of \bar{E} and \bar{F} .
- (c) List the minterms of $E + F$ and EF .
- (d) Express E and F in sum-of-minterms algebraic form.
- (e) Simplify E and F to expressions with a minimum number of literals. *Hint:* Use a Karnaugh map.
3. Convert the following expression into sum-of-products (SOP) form:
 $(AC + D)(\bar{A}\bar{B} + \bar{A}\bar{B}\bar{C} + D).$
4. Simplify the following Boolean function by means of a three-variable Karnaugh map:
 $F(X, Y, Z) = \sum m(0, 4, 5).$
5. Simplify the following Boolean function by means of a three-variable Karnaugh map:
 $BC + \bar{A}\bar{B} + \bar{A}C + B\bar{C}.$

6. Simplify the following Boolean function by means of a four-variable Karnaugh map:

$$F(W, X, Y, Z) = \sum m(2,5,6,7,8,10,12,13,14,15).$$

7. Find all the prime implicants for the following Boolean function, and determine which are essential:

$$F(W, X, Y, Z) = \sum m(1,7,8,9,11,14,15).$$

8. Simplify the following function into minimal sum-of-products (SOP) form:

$$F(W, X, Y, Z) = \prod M(0,1,2,4,5,6,8,9,10).$$

9. Simplify the following Boolean function F

$$F(W, X, Y, Z) = \sum m(1,11,15)$$

together with the don't care conditions

$$d(W, X, Y, Z) = \sum m(0,6,7,9,14)$$

into minimal sum-of-products (SOP) forms.