

CoE/EE 460

Spring 2001 : Lockwood

Homework #3: Due Wednesday, February 28, 2001
at 5:00pm, in EE homework box

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| Name: | |
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1. Apply the iterated consensus theorem to find the complete sum of the following function. Apply the absorptive property to eliminate unnecessary terms. Show your work.

$$wxy + w'z + wy$$

2. Apply the recursive computation to find the prime implicants for sum of the following function. Show your work.

$$wxy + w'z + wy$$

3. Use The tabular method to find the Prime Implicants of:

$$f_A(w, x, y, z) = wxy + wyz + wxy' + w'yz + w'x$$

Identify the essential prime implicants. Show your work!

4. Use The tabular method to find the Prime Implicants of:

$$f_B(w, x, y, z) = wxyz' + xyz + w'xy'z$$

Identify the essential prime implicants. Show your work!

5. Use the tabular method to generate the set of prime implicants and to obtain all minimal expressions for the following functions:

$$f_A(w, x, y, z) = \sum(0, 1, 4, 5, 6, 7, 9, 11, 15) + \sum_d(10, 14)$$

6. Use the tabular method to generate the set of prime implicants and to obtain all minimal expressions for the following functions:

$$f_B(a, b, c, d, e) = \sum(0, 2, 8, 9, 20, 24) + \sum_d(4, 10, 14, 26, 30)$$

1) For the following function:

$$f(v, w, x, y, z) = \sum m(1, 4, 6, 9, 14, 17, 22, 27, 28) + d(12, 15, 20, 30, 31)$$

- (a) Use the Quine-McClusky algorithm to find the prime implicants of f .
- (b) Show the prime implicant chart for f . List the essential prime implicants.
- (c) Give a minimal sum of products expression for f .

7. Using any computer programming language that you desire, write a program which can generate an array of minterms from an expression of n -variables function .

- Your program should allow for functions with as many as 32 variables. Assume that n is specified on the first line of the input file. It should *not* be coded as a constant.
- Assume that $f(x_0, x_2, \dots, x_{n-1})$ is specified with terms that are: true (1), false (0), or unspecified (-).
- For example
 - A 5-variable function, $f(x_0, x_1, \dots, x_4) = x_0x_1'x_4$ would be specified as:
5
10--1
 - Your program should generate a list of minterms like:
10001
10011
10101
10111
- Hint. If you happen to program the program in C++, you *might* find the following helpful.

```
int n; // Number of variables in function

class sop_term {
private:
    unsigned int value; // up to 32-bits: 0=false, 1=true
    unsigned int mask; // up to 32-bits: 0=Care, 1=DontCare
};
```

- Submit your original source code.
- Submit the output of your program for the following 25-variable function:
25
11--00--1010-00001010---0

8. Extend the program so that it can generate minterms from a list of terms like the ones above. Assume that each additional term appears on new line. Assume that the end of the expression is denoted with an empty line.

- For example,

– For the function, $f(x_0, x_1, x_2, x_3, x_4) = x_0x_1'x_4 + x_1x_2x_3$, the given input of:

```
5
10--1
-111-
```

– Should produce output from your program of:

```
10001
10011
10101
10111
01110
01111
11110
11111
```

- Submit your original source code.
- Submit the output of your program for the following 25-variable function.

```
25
11--00--1010-00001010---0
01111111100000000--1-1111
```