King Fahd University of Petroleum and Minerals
Department of Computer Engineering

DIGITAL LOGIC DESIGN COE 202

Section 5

Homework 2, November 17, 2008
(Due on Nov 29, 2008)

Problems	Grading
1	
2	
3	
4	
5	
TOTAL	

Student Name:………………………………………

Student ID:………………………………………

1. Question-1: Answer each of the following three problems:

   I.   Using Algebraic manipulation prove the following algebraic identities:

        a. **X'Y'+X'Y+XY = X'+Y**
        b. **A'B+B'C'+AB+B'C= 1**
        c. **Y+X'Z+XY'=X+Y+Z**
        d. **X'Y'+Y'Z+XZ+XY+YZ'=X'Y'+XZ+YZ'**

   II. Convert the following expressions into (1) Sum-of-Product, and (2) Product-of-Sum forms:

        a. **(AB+C)(B+C'D)**
        b. **X'+X(X+Y')(Y+Z')**
        c. **(A+BC'+CD)(B'+EF)**

   III. Draw the logic diagram for the following logical expressions:

        a. **WX'Y'+W'Z+YZ**
        b. **A(BD'+B'D)+D(BC+B'C')**
        c. **WY'(X+Z)+X'Z(W+Y)+WX'(Y+Z)**

2. Question-2: Write the *sum-of-minterms* and *product-of-maxterms* expressions for both the *true* and the *complement* form of the following Boolean expressions:

   a. $\bar{X}\bar{Z} + Y\bar{Z} + XYZ$
   b. $\bar{A}\bar{B} + A\bar{C}D + \bar{B}C + \bar{A}B\bar{C}\bar{D}$

3. Question-3: For the given truth table and using a K-map:

   a. Find all ***prime implicants*** and ***essential prime implicants*** of *F*.
   b. Write an optimized SOP **and** POS expressions for the function *F*.

A	B	C	D	F
0	0	0	0	1
0	0	0	1	1
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

4. For the Boolean function E and F, as given in the following truth table:

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

a. List the minterms and the maxterms of each function.

b. List the minterms of E' and F'.

c. List the minterms of E + F and E . F.

d. Express E and F in sum-of-minterms and product-of-maxterms algebraic form.