Test 2

1. (25) For the following function,

$$f(x, y, z) = \sum m(0, 2, 4, 6, 7)$$

a) Complete a truth table

b) Write a sum of minterms function in algebraic form (for example, x' y z + ...)

c) Find a minimum sum of products expression (2 terms, 3 literals)

d) Find a PRODUCT OF SUMS expression in product of maxterms form.

e) Find a minimum PRODUCT OF SUMS form (2 terms, 4 literals)

2. Map each of the following functions: (Be sure to label the maps.)

a) (5) $f(x, y, z) = \sum m(0, 3, 6, 7) + \sum d(1, 4)$

b) (10) $g = a\,b\,c\,d + b'\,d + a'\,b\,c' + a\,b'\,c$

Circle each of the terms.

3. (5) Expand the following to sum of minterms (sum of standard product terms). Eliminate any duplicates.

$$f = x\,y\,z + x'\,y + x\,z + x'\,z$$

4. (10) a) Manipulate the following to a sum of products expression.

$$f = (a' + b' + d)\,(a' + c' + d')\,(a + b + c')$$

b) Reduce it to a minimum sum of products (4 terms, 9 literals)

5. Assume all inputs are available both uncomplemented and complemented. Show a two-level implementation of

$g = w x + x z' + w z' + y z' = (w + z')(w + x + y)(x + y + z')$

a) (5) using NAND gates of any size.

b) (5) using NOR gates of any size.

c) (5) using 2-input NAND gates (none of which may be used as a NOT)

6. For the each of the following function find a minimum sum of products expression. Show each algebraic step and show maps corresponding to those steps.

a) (15) $f = a' b' d + a b + a b' d + b' c' d' + a b d'$
(3 terms, 6 literals)

b) (15) $g = w x' + w' y + w y z' + x' y + w' x z + x y' z$
(4 terms, 9 literals)