

You are expected to solve homework problems individually. If needed, you may seek help from your friends. However, do not copy. Show all steps with your solutions for full credit.

Name: \_\_\_\_\_ / 50

1. (5 points) Express the following function

a. As sum of minterms :  $g(x, y, z) = x' + yz + y'z'$

b. As product of Maxterms:  $f(x, y, z) = (x' + y)(x + z)(y + z)$

2. (5 points) Find the complement of the following expressions:

a)  $(a + c)(a + b')(a' + b + c')$

b)  $x'y' + xy'$

3. (5 points) Convert each of the following to the other canonical form:

(a)  $F(x, y, z) = \sum m(1, 3, 5)$

(b)  $F(A, B, C, D) = \prod M(3, 5, 8, 11)$

4. (6 points) Simplify the following Boolean expressions to a minimum number of literals and draw logic diagram of the circuits that implement the simplified expression.

a)  $(a + b + c')(a' b' + c)$

b)  $a' b c + a b c' + a b c + a' b c'$

c)  $(a' + c')(a + b' + c')$

5. For the Boolean function

$$F = XY'Z + X'Y'Z + W'XY + WX'Y + WXY$$

a. (5 points) Obtain the truth table of F.

- b. (4 points) Draw the logic diagram, using the original Boolean expression.
- c. (5 points) Use Boolean algebra to simplify the function to a minimum number of literals.

- d. ( 5 points) Draw the logic diagram from the simplified expression, and compare the total number of gates with the diagram of part (b).

6. (2+2+2+2+2) For the following truth table

$x$	$y$	$z$	Function $f_2$
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

- Show the minterms in numerical form
- Show an algebraic expression in sum of minterms form

- c. Simplify the SOP expression
- d. Show the maxterm in numerical form
- e. Show the algebraic expression in product of maxterm form and draw the logic diagram of the circuit.