CIS 251-001, Exam 1, Fall 2002 Exam #: _____ Name: _____
First Last

Prof. David Nassimi (Time: 1.5 hours) SS #: _____ - _____ - _____

1a) Convert the following decimal number directly to binary. Then, convert the binary to octal.

$A = 59$

| | GRADE | |
|---|---|---|
| 1 | | /25 |
| 2 | | /25 |
| 3 | | /25 |
| 4 | | /25 |
| SUM | | /100 |

b) Convert the following decimal number first to octal. Then, using the octal value, obtain the binary and hex values.

$B = 289$

c) Assuming a 16-bit word size and 2's complement number system, find the binary representation for $-A$. (Hint: Start with the binary value computed above for $A$.)

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2. Consider the Boolean function $f = X \uparrow (Y \uparrow Z)$. (Recall the NAND operation, $A \uparrow B = \overline{AB}$.)

a) Using algebraic manipulations, obtain a simplified sum-of-products expression for $f$

b) Use a truth table to compute the original function $f$, and obtain the sum-of-minterms expression for it.

c) Starting with the above sum-of-minterms expression for $f$, and applying algebraic manipulations, obtain a simplified sum-of-products expression for $f$.

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3. Consider the following Boolean function:

$$f(X, Y, Z) = XY + \overline{X}(YZ + \overline{Y})$$

a) Use a truth table to obtain the sum-of-minterms expression for $f$. (Show the expression both in decimal form and explicit algebraic form.)

b) Use a map to obtain a simplified sum-of-products expression for $f$

c) Use a map to obtain a simplified product-of-sums expression for $f$.

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4a) Draw the 2-level NAND circuit for the following function. Provide a short explanation.

$$f = XY + \overline{X}Z + W$$

b) Obtain a simplified product-of-sums expression for the above function $f$.