Points missed: _____ Student's Name: ___________________________________

Total score: _____ /100 points

East Tennessee State University
Department of Computer and Information Sciences
CSCI 2150 (Tarnoff) – Computer Organization
TEST 1 for Fall Semester, 2001

Section 002

Read this before starting!

- The total possible score for this test is 100 points.
- This test is closed book and closed notes
- You may NOT use a calculator
- **All answers must have a box drawn around them. This is to aid the grader (who might not be me!) Failure to do so might result in no credit for answer. Example:**

$$\boxed{32F1_{16}}$$

- **1 point** will be deducted per answer for missing or incorrect units when required. **No** assumptions will be made for hexadecimal versus decimal, so you should always include the base in your answer.
- If you perform work on the back of a page in this test, indicate that you have done so in case the need arises for partial credit to be determined.

"Fine print"

Academic Misconduct:

ETSU Policy No. 3.13, October 1, 1979:

"All students in attendance at East Tennessee State University are expected to be honorable."

"Academic misconduct will be subject to disciplinary action. Any act of dishonesty in academic work constitutes academic misconduct. This includes plagiarism, the changing or falsifying of any academic documents or materials, cheating, and the giving or receiving of unauthorized aid in tests, examinations, or other assigned school work. Penalties for academic misconduct will vary with the seriousness of the offense and may include, but are not limited to: a grade of "F" on the work in question, a grade of "F" for the course, reprimand, probation, suspension, and expulsion. For a second academic offense, the penalty is permanent expulsion."

Basic Rules of Boolean Algebra:	**1.** $A + 0 = A$	**7.** $A \cdot A = A$
	2. $A + 1 = 1$	**8.** $A \cdot \overline{A} = 0$
	3. $A \cdot 0 = 0$	**9.** $\overline{\overline{A}} = A$
	4. $A \cdot 1 = A$	**10.** $A + AB = A$
	5. $A + A = A$	**11.** $A + \overline{A}B = A + B$
	6. $A + \overline{A} = 1$	**12.** $(A + B)(A + C) = A + BC$
DeMorgan's Theorem:	$\overline{(AB)} = (\overline{A} + \overline{B})$	$\overline{(A + B)} = (\overline{A}\ \overline{B})$

Short-ish Answer (3 points each)

1.) True or False: The number 101011110001000 is a valid BCD number.

2.) True or False: 01101011_2 has the same value in both unsigned and 2's complement form.

3.) True or False: The floating-point number 10011011011010011011001011000010 is negative.

4.) True or False: The resulting product from a 4-cell rectangle in a 4 variable Karnaugh map uses 2 input variables.

5.) True or False: The boolean expression $B\overline{D} + \overline{B}C + \overline{A} + ACD$ is a valid sum of products expression.

6.) Which of the following is the lowest possible value for an 8-bit signed magnitude binary number?

a.) 0 b.) -127 c.) -128 d.) -255 e.) -256 f.) None of the above

7.) Which of the following is the highest possible value for an 8-bit 2's complement binary number?

a.) 256 b.) 128 c.) 127 d.) 255 e.) 512 f.) None of the above

8.) What is the exponent term of the floating-point number 01000110101101010011010000000000?

a.) 01000110 b.) 0 c.) 10001101 d.) 11010100110100000000000 e.) 1

Medium-ish Answer (4 points each)

9.) Convert the 8-bit unsigned binary number 11010010_2 to decimal.

10.) Convert the 8-bit 2's complement binary number 11010010_2 to decimal.

11.) Convert the 8-bit signed magnitude binary number 11010010_2 to decimal.

12.) What is the frequency of a periodic waveform with a period of 5 milliseconds? (You don't need to calculate the equation. Just put the equation with the values in the correct places.)

13.) How can you tell if there's been an overflow error in 2's complement addition?

14.) Convert 1001100101001101101_2 to hexadecimal.

15.) Create a Karnaugh map from the truth table below. Do not worry about making the rectangles.

A	B	C	X
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

16.) Convert $(A + B)(C + \overline{B})$ to a simplified sum-of-products expression.

Longer Answers (Points vary per problem)

17.) Mark each equation as ***true*** or ***false*** depending on whether the right and left sides of the equals sign are equivalent. (4 points each)

a.) $A \cdot \overline{B} \cdot B = A$ Answer: ____________

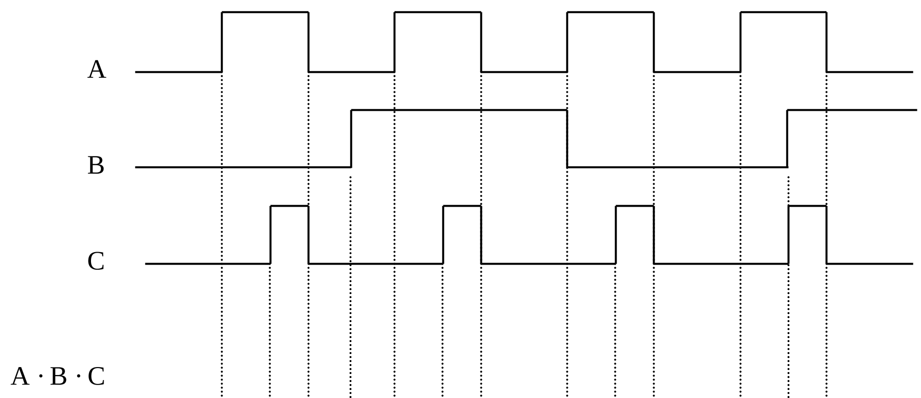
b.) $AB(A + \overline{B}) = A\overline{B}$ Answer: ____________

c.) $\overline{ABC} + AB + ABCD = \overline{ABC} + AB + D$ Answer: ____________

18.) Draw the logic circuit represented by the following expression. Do not simplify. (8 points)

$$\overline{A}B + A(C + \overline{B})$$

19.) Show the output waveform of an **AND gate** with the inputs A, B, and C indicated in the figure below. (8 points)



20.) Apply DeMorgan's Theorem to reduce the following expression to SOP form. (8 points)

$$\overline{A(C + B)}$$

21.) Derive the minimum SOP expression from the Karnaugh map below. (8 points)

AB \ CD	00	01	11	10
00	1	0	0	1
01	0	0	0	0
11	0	1	0	0
10	0	1	1	1