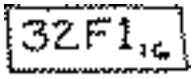
Points missed: _____ Student's Name: _____

Total score: _____ /100 points

East Tennessee State University
Department of Computer and Information Sciences
CSCI 2150/Section 001 (Tarnoff) – Computer Organization
TEST 1 for Spring Semester, 2001

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:**



- **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

$$\overline{(AB)} = (\overline{A} + \overline{B}) \qquad \overline{(A + B)} = (\overline{A}\ \overline{B})$$

1.) Convert the 8 bit unsigned binary number 10010110 to decimal. (5 points)

2.) Convert $E9AC_{16}$ to binary. (5 points)

3.) Convert the 8 bit 2's complement binary number 11011011 to decimal. (5 points)

4.) Convert the BCD number 1001011101010001 to decimal. (5 points)

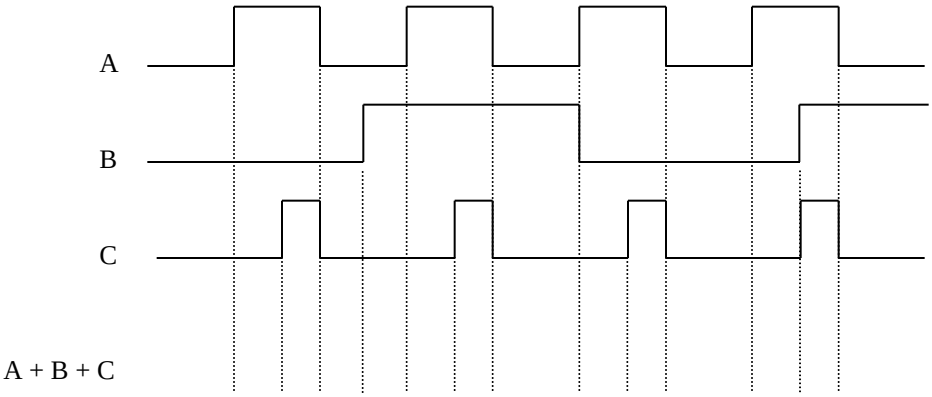
5.) True or False: The number 100100111000001 is a valid BCD number? (3 points)

6.) True or False: 01101011 has the same value in both unsigned and 2's complement form. (3 points)

7.) Perform the decimal arithmetic function 100 – 42 = ? using 8-bit 2's complement addition. Leave the result in binary. (7 points)

8.) Draw the logic circuit represented by the expression (8 points): $\overline{A}(D + \overline{B}C)$

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



10.) Construct the truth table for the Boolean expression (8 points): $A\overline{B}C + \overline{A}(B + C)$

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

$\overline{AB(C + D)}$

12.) Reduce the following expressions as far as you can. (5 points each)

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

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

c) $AC + \overline{A}BC$

13.) Derive the minimum SOP expression from the Karnaugh map below. (10 points)

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

14.) Create the standard POS expression from the truth table below. (10 points)

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