

Points missed: \_\_\_\_\_ Student's Name: \_\_\_\_\_

Total score: \_\_\_\_\_ /100 points

East Tennessee State University  
Department of Computer and Information Sciences  
CSCI 2150/Sections 001 & 002 – Computer Organization  
TEST 1 for Fall Semester, 2000

**Instructor:** David Tarnoff

**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** be placed in blanks provided. Failure to do so will result in no credit for answer.
- **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. $A \cdot \bar{A} = 0$
3. $A \cdot 0 = 0$	9. $\bar{\bar{A}} = A$
4. $A \cdot 1 = A$	10. $A + AB = A$
5. $A + A = A$	11. $A + \bar{A}B = A + B$
6. $A + \bar{A} = 1$	12. $(A + B)(A + C) = A + BC$

### DeMorgan's Theorem

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

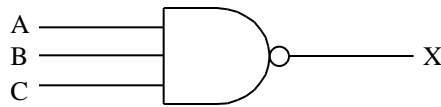
$$\overline{(A + B)} = \bar{A} \bar{B}$$

### Boolean and Hexadecimal Representation

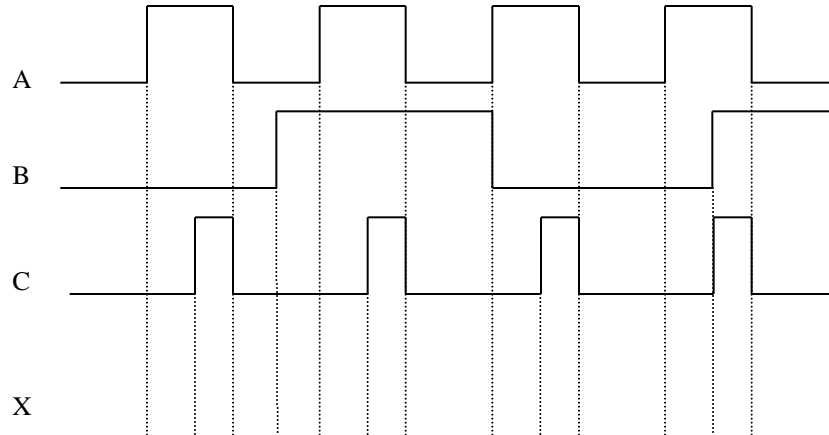
- 1.) Convert the binary number 10110101 to decimal. (5 points)
- 2.) Convert  $56EC_{16}$  to binary. (5 points)
- 3.) Perform the decimal arithmetic function  $56 - 24 = ?$  using 8-bit **signed** binary values. Leave the result in binary. (10 points)

### Logic Gates And Truth Tables

- 4.) Draw the logic circuit for the expression (8 points):  $\bar{A}B(\bar{C} + D)$

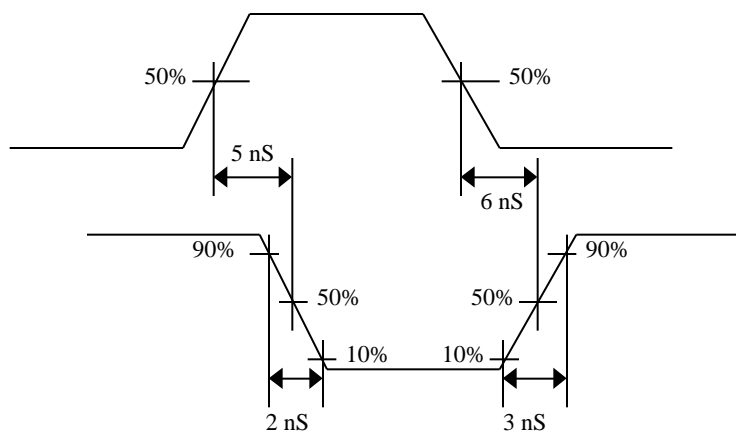


- 5.) Show the output waveform for X for the inputs indicated in the figure below are put into the three input NAND gate shown above. (10 points)



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

### Data Sheets



- 7.) For the timing diagram above, what is the propagation delay for a high to low transition? (4 points)
- 8.) For the timing diagram above, what is the rise time? (4 points)

9.) Which of the rules of boolean algebra (what I want is a number) was used to simplify each of the following expressions? (12 points)

a.)  $\overline{A} + A = 1$

b.)  $\overline{BC} + A\overline{BC} = \overline{BC}$

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

d.)  $\overline{(ABC)} + (BC) + (ABCD) = \overline{(ABC)} + (BC) + D$

10.) Apply DeMorgan's Theorem until you've reduced the expression to a SOP. (10 points)

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

11.) Derive the minimum SOP expression from the Karnaugh map below. (12 points)

		<i>CD</i>			
		00	01	11	10
<i>AB</i>	00	0	0	0	1
	01	1	1	0	1
	11	1	0	0	1
	10	0	0	0	1

12.) Use the truth table below to fill in the cells of the Karnaugh map. (10 points)

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

		<i>C</i>	
		0	1
<i>AB</i>	00		
	01		
	11		
	10		