

CSCI 254: *Introduction to Computer Organization*
Midterm 1 -- 22 February, 1993

Name: _____

Problem 1. (8 points)

Convert the decimal number 331 into binary and hexadecimal numbers.

Problem 2. (4 points)

Convert the decimal number -331 into a 12-bit 2's complement binary number.

Problem 3. (4 points)

Convert the decimal number 8.75 into a binary number.

Problem 4. (4 points)

Convert the binary number 11010101 into a decimal number.

Problem 5. (8 points)

Use truth tables to show that $xy+x'$ equals $x+y$.

Problem 6. (8 points)

Simplify the Boolean expression $ABC+AB'+B+AB'C$.

Problem 7. (8 points)

The content of an eight-bit shift register is initially 10110010. The register is shifted three times with the serial input being 101. What is the content of the shift register after each shift?

Problem 8. (8 points)

Suppose you are given a $32k \times 32$ bit ROM chip.

How many address input lines does the chip have?

How many data input lines does the chip have?

How many data output lines does the chip have?

How many bytes are stored in the chip?

Problem 9. (16 points)

(A) Simply the function F with don't-care conditions d into sum-of-products form and, (B) draw a logic diagram using NAND gates and inverters to compute F .

$$F(x,y,z) = (0, 5, 7)$$

$$F(x,y,z) = d(2, 6)$$

Draw your circuit here!

$$F(x, y, z) =$$

Problem 10. (16 points)

Tabulate the state table for a sequential circuit with a single input x , a single output y , and one D flip-flop A described by the following equations.

$$z = A + x$$

$$D_A = A'x' + Ax$$

x	A	z	D_A

Problem 11. (16 points)

Suppose you ran out of D flip-flops and had to use a JK flip-flop to implement the sequential circuit described in Problem 10. Give the logical equations you'd use to compute J_A and K_A , the inputs to the JK flip-flop.

x	$A(t)$	$A(t+1)$	J_A	K_A

$$J_A =$$

$$K_A =$$