CSCI 254: *Introduction to Computer Organization*

Midterm 3 -- 29 November, 1993

Name:_____

Problem 1. (10 points)

Convert the decimal number 7.5 into a floating point number with an 8 bit exponent, a 23 bit mantissa, and one sign bit.

Problem 2. (15 points)

Translate the following Pascal code into the textbook's assembly language:

```
IF P<0 THEN
    P := -P ;
M := M + P ;
Q := Q + 1 ;
```

Problem 3. (10 points)

Translate the following into machine code:

```
     ORG 100
P,   LDA X
     CIL
     LDA Y
     CIL
     STA Y
     LDA X
     CIL
     STA X
     HLT
X,   HEX 3A98
Y,   HEX BEEF
     HLT
```

Problem 4. (15 points)

Write a textbook assembly language subroutine that multiplies the contents of the accumulator by five.

Also, illustrate how your subroutine is called.

Problem 5. (10 points)

Assume the five words of memory starting at location hexadecimal 100 contain the following values:

```
100 2103
101 C103
102 5103
103 0102
104 7001
```

What happens when the machine starts executing at location 100? Show the contents of the accumulator after each executed instruction. Also, show any changes to memory.

Problem 6. (15 points)

Return again to the five words of memory shown in Problem 5. Using the microoperations of Table 5-6 (p. 159), show the contents of the AC, DR, IR, and PC registers after performing each of the microoperations required to execute the instruction stored in location 100.

Problem 7. (10 points)

Simplify the following Boolean function:

$$F(A, B, C) = A'B + ABC + A'BC$$

Problem 8. (15 points)

First, describe how you can use one 8-to-3 priority encoders (just like those you used in Homework #7) to implement an 8 input NAND gate.

Now, describe how you could use five 8-to-3 priority encoders to implement a 40 input NAND gate.

You aren't allowed to use any logic elements other than the priority encoders in your solution. However, you can tie certain inputs to 0 and 1. And, of course, you are free to ignore outputs.