

UNCA CSCI 255
Exam 2 Fall 2010
30 November, 2010

This is a closed book and closed notes exam. It is to be turned in by 4:25 pm. Calculators, PDA's, cell phones, and any other electronic or communication devices may not be used during this exam.

Name: _____

If you want partial credit for imperfect answers, explain the reason for your answer!

Problem 1 (12 points) Two's complement to decimal conversion

Convert the following four seven-bit two's complement numbers into signed decimal representation.

1100100	0000011
0100100	1000000

Problem 2 (10 points) Adding

Add the following pairs of seven-bit two's complement numbers **and indicate which additions result in an overflow.**

0111101 + 1001010 <u> </u>	0010010 + 0110100 <u> </u>
1101010 + 1100110 <u> </u>	1010001 + 1110000 <u> </u>

Problem 3 (12 points) Memories

A 2 kB memory has a 32-bit word size. How many words are contained in this memory?

A memory has 1k words. Each word contains 16 bits. How many bytes are contained in this memory?

A computer memory has a 24 bit words stored in 2M locations. What is the size of this memory in bytes?

How many bits are required to address the 2M words of this memory?

Problem 4 (16 points) Truth to Gates

Draw a circuit, at the gate level, that will implement the following truth table, where A, B, and C are inputs and where Z is the single output.

A	B	C	Z
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

Problem 5 (10 points)

Describe how the following `while` loop can be expressed in C without using the `while`. Instead use the `if` and the `goto` and a couple of labels.

```
while (n < 320) {  
    n = n + 50 ;  
}
```

Problem 6 (10 points)

Describe how the following `if` statement can be expressed in C without using the `&&` operator. Be sure that the second operand of the `&&` is evaluated only when the first operand is true. In this case, that means that the `%` and `/` operations are never performed when `n` is 0.

```
if (n != 0 && 5%n > 0 ) {  
    n = 5/n ;  
}
```

Problem 7 (10 points)

Suppose `x` refers to a file register (data memory location) on a PIC24, write the PIC24 assembly code needed to set register `R4` to 3 times the value stored in `x`, that is, to perform $R4 = 3 * x$.

Problem 8 (10 points)

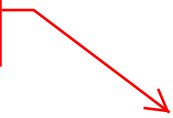
Suppose *x* refers to a file register (data memory location) on a PIC24, write the PIC24 assembly code which sets *x* to the maximum of *x* and 5, that is, which executes the following C sequence.

(Hint, use *cp* and *bra*.)

```

if (x < 5) {
    x = 5;
}
    
```

This should be
24 binary bits



Problem 9 (10 points)

In the left column there are five PIC24 instructions. In the right column write the 16 binary bits needed to encode each instruction in PIC24 instruction set.

add SR	- - - - -
add #30, W8	- - - - -
mov SR, W8	- - - - -
mov SR, WREG	- - - - -
mov #30, W8	- - - - -