CS 312	**Computer Organization & Architecture**	Test 2
Name:	Fall 2002	Max Pts: 63

Important: This is an open book test. You can use any books, notes, or paper, but not exchange anything with other students. You are not allowed to use any electronic/communication devices. *Do not log into the computer during the test.* Any calculations and rough work can be done on the back side of the test pages. You will lose five points for not writing your name.

1. [10 pt] You are given three numbers in registers `$t0`, `$t1`, and `$t2`. Write a function in MIPS assembly language that will return the maximum of the three numbers in register `$v0` and the minimum in register `$v1`.

2. [3 pt] Convert -1023_{10} into a 32-bit 2's complement binary number.

3. [8 pt] Given two numbers 79_{16} and 49_{16}. Convert them to signed 8-bit binary and subtract the second number from the first. Convert the result to hexadecimal. What do you get when you add the two numbers?

4. [4 pt] In the design of our 32-bit ALU, we shared two input bits to ALU_0. What are those bits? Why cannot we transmit them as a single bit since they carry the same signal?

5. [8 pt] Determine the g_i, p_i, P_i, and G_i values of the two 16-bit numbers $A2AA_{16}$ and $48A8_{16}$ as used in carry-lookahead adders. Also, what is the value of C_4?

6. [8 pt] Multiply the following pairs of 4-bit signed numbers using Booth's algorithm.

   (a) -4_{10} and 5_{10}

   (b) -6_{10} and -2_{10}

7. [6 pt] Show the division of 7_{10} by 5_{10} in binary.

8. [8 pt] Convert the numbers $0.56_{10} \times 2^{74}$ and $.15168_{10} \times 2^{76}$ into single precision binary (you can limit the mantissa to 12 bits of precision).

9. [8 pt] Add the two numbers you converted above.

10. [4 pt BONUS] Convert the result from last problem into decimal.