University of Pittsburgh

CS/COE 447 Spring 2007 Exam 1

There are a total of 100 points. You are allowed to use the Green Card (or a copy of it) that comes with the text.

We can't answer questions like *What do you want for this question?* or *I don't understand this question.* It makes the room too loud, and it isn't fair, since some people would get extra information. Please just use your best judgment.

Show your work for partial credit.

Each question is on its own page, to give you plenty of room. Don't feel you need to fill up each page; just write what you need to.

Good luck!!

1. (10 points)

   (a) Translate A092 hex into binary

   (b) Translate 0110110001110011 binary into hex

   (c) Translate 43 decimal into binary

   (d) Translate $2^{13} - 1$ decimal into binary

2. (15 points) Give the machine code for the following instructions, first in binary and then in hex:

```
        add $s0,$s1,$s2
```

Binary:

Hex:

```
        lw  $t1, 4($t0)
```

Binary:

Hex:

```
        andi $t0, $t1, 0xf1f1
```

Binary:

Hex:

3. (26 points) Suppose memory contains the following values.

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)
0x10010000	0x00007f23	0x41424344	0x00000f3e	0x00000001

What value (in hex) is placed into which register or memory location by each of the following instructions?

Be sure to show the correct number of hex digits. For example, if a full 8 hex digits are loaded into a register, show all 8 digits.

instruction	register or memory location	hex value
li $t0,0x10010004	$t0	10010004
lw $s0,0($t0)	$s0	41424344
lw $s1,8($t0)	$s1	00000001
lb $s2,4($t0)	$s2	0000003e
addi $s3,$zero,0x1234	$s3	00001234
sw $s3,0($t0)	0x10010004	00001234
sb $s3,12($t0)	0x10010010	34
lui $t0,0x1001	$t0	10010000
ori $t1,$t0,0x0008	$t1	10010008
addi $t4,$zero,5	$t4	00000005
sw $t4,0($t1)	0x10010008	00000005
addi $t4,$zero,0x1bcd	$t4	00001bcd
andi $t5,$t4,0x000f	$t5	0000000d
sll $t6,$t4,8	$t6	001bcd00

4. (8 points) Consider the following instructions:

```
addi $t1,$zero,0x5e4d

addi $t2, $t1, 0x287

ori $t3,$t1, 0x3333
```

What (hex) values are placed in $t1, $t2, and $t3 by this code segment? Please label your answers clearly, and show your work.

5. (11 points) Below is the posted solution to Prog. Asign 1 Part 2.

   Please answer the questions marked by #Q: There are 7 of them.

   NOTE: question is deleted because it would give too much information
   about this year's programming assignment 1.   The questions are
   comments among the code, such as this:

```
        #Q: The first time through the loop, what is $t4 now?
```

6. (5 points) On the green card, the OPERATION entry for addi is

   `R[rt] = R[rs] + SignExtImm (2)`

   `(2) SignExtImm = {16{immediate[15]},immediate}`

   What specific binary value is SignExtImm for the instruction

   `addi $t0,$t1,13`

7. Suppose that $t0, $t1, and $t2 have already been assigned values (it doesn't matter which ones). Write MIPS assembly-language instructions to accomplish the following pseudo-code segments.

(a) (10 points)

```
if ($t0 == $t1)
    $t2 = $t0 + $t1;
$t0 = 3;
```

(b) (15 points)

```
if ($t0 >= $t1)
    $t2 = $t2 - $t1;
else
    $t2 = $t2 + $t1;
$t0 = 55;
```