Computer Organization and Structure

Homework #2
Due: 2007/10/30

1. What binary number does this hexadecimal number represent: 7fff $fffa_{hex}$? What hexadecimal number does this binary number represent: 1100 1010 1111 1110 1111 1010 1100 1110_{two}? What decimal number do they represent, respectively?

2. Add comments to the following MIPS code and describe in one sentence what it computes. Assume that `$a0` and `$a1` are used for the input and both initially contain the integers *a* and *b*, respectively. Assume that `$v0` is used for the output.

```
          add   $t0, $zero, $zero
loop:     beq   $a1, $zero, finish
          add   $t0, $t0, $a0
          addi  $a1, $a1, -1
          j     loop
finish:   addi  $t0, $t0, 100
          add   $v0, $t0, $zero
```

3. The following code fragment processes two arrays and produces an important value in register `$v0`. Assume that each array consists of 2500 words indexed 0 through 2499, that the base addresses of the arrays are stored in `$a0` and `$a1` respectively, and their sizes (2500) are stored in `$a2` and `$a3`, respectively. Add comments to the code and describe in one sentence what this code does. Specifically, what will be returned in `$v0`?

```
          sll   $a2, $a2, 2
          sll   $a3, $a3, 2
          add   $v0, $zero, $zero
          add   $t0, $zero, $zero
outer:    add   $t4, $a0, $t0
          lw    $t4, 0($t4)
          add   $t1, $zero, $zero
inner:    add   $t3, $a1, $t1
          lw    $t3, 0($t3)
          bne   $t3, $t4, skip
          addi  $v0, $v0, 1
skip:     addi  $t1, $t1, 4
          bne   $t1, $a3, inner
          addi  $t0, $t0, 4
          bne   $t0, $a2, outer
```

4. Find the shortest sequence of MIPS instructions to determine if there is a carry out from the addition of two registers, say registers `$t3` and `$t4`. Place a 0 or 1 in register `$t2` if the carry out is 0 or 1, respectively. (Hint: It can be done in two instructions.)