Computer Science 304
Computer Organization
Spring 2025
Assignment 8

Due: noon, Wednesday, 4/16/2025

Answer the following questions and submit solutions by the due date. Show your work for full credit. All submissions must be completely your own work.

1. [16 points] Given the following memory, register, and immediate values, state the value of the operand.

Address	Value
0x200	0xAC
0x204	0x2F
0x208	0x73
0x20C	0x02

Register	Value
%eax	0x200
%ecx	0x02
%edx	0x03

   a. `%eax`
   b. `$0x20C`
   c. `0x20C`
   d. `(%eax)`
   e. `8(%eax)`
   f. `(%eax,%edx,4)`
   g. `4(%eax,%ecx,2)`
   h. `0x1FC(%ecx,%edx,2)`

2. [10 points] For each of the following, state the equation that the instruction represents. The first result has been done for you. Provide all values in decimal.

Assume: %eax = x; %ecx = y; %edx = z;	
INSTRUCTION	**RESULT**
`leal 6(%eax), %edx`	`z = 6 + x`
`leal 2(%ecx), %ecx`	(a)
`leal (%ecx, %edx, 4), %eax`	(b)
`leal 11(%ecx, %ecx, 4), %edx`	(c)
`leal 0xCC(, %eax, 8), %ecx`	(d)
`leal 14(%eax, %edx, 4), %eax`	(e)

3. [16 points] Consider the C function listed below.

```
void mystery (int a, int b) {

   int i, d, flag;

   while (a <= b) {

      for (i = 1; i <= a; ++i)

         if (!(a % i) && !(b % i))
            d = i;

      printf("%d %d: %d\n", a, b, d);

      ++a;
   }
}
```

   a. [3 points] Write a clear statement as to what this function actually does (not how it is implemented, but its purpose when called).
   b. [5 points] Rewrite the entire function with **a** and **b** passed by reference.
   c. [5 points] If we declared **int** variables **c** and **d** in the calling function, and initialized them to **10** and **50**, respectively, how would mystery be called using the modified code from (b)? What would be the values of **c** and **d** upon return? Is passing by reference a good idea for **a** or **b** to save space, avoid copying, or for permanently updating the arguments?
   d. [3 points] What, if any, restrictions or conditions need to be placed on the arguments passed to the **int** parameters **a** and **b**?

4. [8 points] Answer the following given the Y86 code on the right:

   a. [2 points] Assuming the value stored in **%eax** is 12, write a binary expression that represents the computation in line 6. What is the result?
   b. [4 points] Assuming that **%eax**, **%ebx**, **%ecx**. and **%edx** are represented by variables **a**, **b**, **c**, and **d**, respectively, write equivalent C code for lines 6-12.
   c. [2 points] What does this code do (not how it is implemented, but its purpose)?

```
 1          irmovl  $1,   %ecx   #
 2          irmovl  arr,  %ebx   #
 3
 4 loop:    irmovl  $3,   %edx   #
 5          rrmovl  %ecx, %eax   #
 6          andl    %edx, %eax   #
 7          jne     xxxx         #
 8
 9          rmmovl  %ecx, (%ebx) #
10
11 xxxx:    irmovl  $4,   %eax   #
12          addl    %eax, %ebx   #
13
14          irmovl  $1,   %eax   #
15          addl    %eax, %ecx   #
16          irmovl  $100, %eax   #
17          subl    %ecx, %eax   #
18          jge     loop
19          halt
20
21 .align 4
22 arr:
```