# CS1356 Introduction to Information Engineering

# Homework 3

*Due*:  Nov 4, 2009 in class
*Remember to write your name and student ID*

1. Translate the following C program into the machine
   language of the textbook (Appendix C).
   Suppose the translated program is loaded into memory
   started at address **A0**, and variable a, b, c are assigned to
   main memory with address **6E**, **6D**, and **6C** respectively.
   Give a short explanation for each instruction.
   (*No credit will be given without explanation.*) **30%**

```
int main(){
   int a, b=5, c=3;

   if (b==c) a = b+10;
   else a = c|0x13;
}
```

2. Suppose the following program, written in the machine language of the textbook
   (Appendix C), is stored in main memory beginning at address **30** (hexadecimal).
   
   (a) If you trace the program, you will find out this program modifies itself.
       Self-modifying program, though not encouraged in ordinary use, is an
       important feature of the stored-program concept.  Please indicate which
       instructions are modified during the program execution? And how are
       they changed?  **20%**
   
   (b) A disassembler is a computer program that translates machine language
       into assembly language.  Your job is to disassemble the code into a C
       program.  First, use a sentence to describe what task the program
       performs? And then write a C program to perform the same function as
       this code does.  Use integer arrays A[?] and B[?] for the memory
       location 00-03 and 10-13.  **20%**
   
   (c) If we want to place the program in main memory beginning at address
       **A0** (hexadecimal), how the program should be modified?  Please write
       down the modified program with explanations.  **30%**
   
   (d) **BONUS QUESTION**: Memory operations (load/store) are slower than
       arithmetic/logic operations.   Can you rewrite this program to perform the same action
       with faster instructions? The program size should be less than 15 instructions.
       Explain the correctness of your program.  **20%**

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|---|
| 2003 |
| 2101 |
| 2200 |
| 2310 |
| 1400 |
| 3410 |
| 5221 |
| 5331 |
| 3239 |
| 333B |
| B248 |
| B038 |
| C000 |