TCSS371 – Machine Organization
Homework 5 – Machine & Assembly Languages

20 Points

This homework will test your understanding of Machine & Assembly Languages that we covered in lecture from Chapters 5, 6 & 7 of your textbook. Submit your homework on Canvas before the due date and time with your name(s) in the program header at the top of each file. Name your files, **PrintLetters.bin**, **Guess.asm** and **Count.asm (if attempting extra credit)**.

No late work or email submissions will be accepted.

Instructions

- Write down the steps before you start with the Simulator and editor. You don't need to submit these but will help greatly in completing the work.
- Start your program at x3000 so that it will be easier for me to grade it.
- Each program must include a header comment that has your name(s) and a brief description of the program.
- Make sure to comment each line of code in the case of machine code and have adequate comments in case of assembly code. You will be graded on comments.

1. (7 Points) Write a **machine language** program for the LC3. It should print out the letters: ZYX..DCBAABCD....XYZ. That's a total of 26 *2 = 52 letters. You must use one or two loops.

   Name your file **PrintLetters.bin**.

   Rubric:
   Machine code compiles - 3 Points
   Works correctly – 2 Points
   Commented adequately – 2 Points
   Named incorrectly – (-1 Point)

2. (13 points) Write an **assembly language** program to simulate a simple guessing game. The program has stored the value 6. The program will continually ask the user to guess a number between 0 and 9 (see sample program input/output below.). If your program encounters any non-digit character, the program should output Invalid input. Invalid input should still count as a guess. *User enters input and hits enter*. The ASCII code x0A causes the cursor to go to the next line (Newline). Name your file **Guess.asm**. *Assume that the user gets it right within 9 guesses.*

Sample Output

Guess a number: 5
Too small.
Guess again: 9
Too big.
Guess again: a
Invalid input.
Guess again: 6
Correct! You took 4 guesses.

Rubric:
Assembly code compiles - 3 Points
Works correctly for all cases – 6 Points
Output matches above sample – 2 Points
Commented adequately – 2 Points
Named incorrectly – (-1 Point)

Extra Credit (10%): Write an LC-3 assembly language program that counts the number of 1s stored in R5 and stores the result into R4. For example, if R5 contains 0001 0011 0111 0000, then after the program executes, the result stored in R4 would be 0000 0000 0000 0110. Name your file **Count.asm**.