COMPSCI 210 Assignment 2

Due date: 21:00 20/09/2015

The objectives of this assignment are (a) practicing writing assembly language programs, (b) understanding the conversion between hexadecimal and binary numbers, and, (c) manipulating information at bit level.

Part 1 (20 marks)

You are required to write an LC3 assembly language program to accept a number entered by the user and to print out the number entered by the user. Your program should carry out the following tasks:

1. Prompts the user to input a number.
2. Accepts the user's input and echoes each character typed in by the user. For example, if the user typed in "abc", the LC3 console should show "abc". The user's input is ended with a LF character (the ASCII value of LF is x0A). The LF character corresponds to the "enter" key on a PC running Windows. It should be assumed that the user will type in at most 20 characters
3. Displays the number entered by the user on a new line.

The example below shows the screenshot of the execution of the program.

```
Please enter a number: 1234
The input is: 1234
----- Halting the processor -----
```

Name this program as p1.asm.

Part 2 (30 marks)

Expand the program in part 1 to write a LC3 assembly language program to (a) read in a hexadecimal number, (b) convert the number to a 16-bit binary number, and, (c) display the 16-bit binary number. It should be assumed that (a) the number entered by the user is a valid unsigned hexadecimal number consisting of at least one hexadecimal digit and at most four hexadecimal digits, (b) the hexadecimal number is within range [0 .. 0x7FFF], and, (c) the hexadecimal digits entered by the user come from set {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F}. The example below shows some screenshots of the execution of the program.

```
Please enter a number: 1234
0001001000110100
----- Halting the processor -----
Please enter a number: 56
0000000001010110
----- Halting the processor -----
Please enter a number: 789A
0111100010011010
----- Halting the processor -----
```

Name this program as p2.asm.

Hint: Each hexadecimal digit can be converted to a 4-bit binary number.

Part 3 (15 marks)

Expand the program in part 2 to write a LC3 assembly language program to (a) read in two hexadecimal numbers, and, (b) show the result of the subtraction of the two numbers as a 16-bit binary number. The assumption about the two hexadecimal numbers being entered by the user are the same as in part 2. The example below shows some screenshots of the execution of the program.

```
Please enter number A: 5678
Please enter number B: 1234
The result of A - B is 0100010001000100
----- Halting the processor -----
Please enter number A: 789A
Please enter number B: 7899
The result of A - B is 0000000000000001
----- Halting the processor -----
Please enter number A: 1234
Please enter number B: 1235
The result of A - B is 1111111111111111
----- Halting the processor -----
```

Name this program as p3.asm.

Part 4 (5 marks)

The answer to this part should be saved in a PDF file named p4.pdf.

Which part of this assignment is the most difficult one for you? Briefly describe your reasons.

Submission

1. You **MUST** thoroughly test your program in the lab before submission. Programs that cannot be assembled or run on a lab machine will **NOT** get any mark.
2. Submit p1.asm, p2.asm, p3.asm, and, p4.pdf using the assignment drop box. You should submit all the files as one submission.
3. **NO** email submission will be accepted.