**CSCI 360-1/PE1 Assignment 3 – Basic Assembler Spring 2022**

**70 points**

**This assignment is in three parts. Each of parts B and C is worth 35 programming points.**

**Part A**

First, copy your ASSIGNS PDSE member named ASSIGN1 and name the new member ASSIGN3A. You can do this by a right mouse click on the member ASSIGN1 on the right side of your IDz session, clicking COPY and then right mouse click on the ASSIGNS PDSE itself and then click on PASTE. You can now open your new ASSIGN3A member to begin this assignment. When you are finished with Part A, you will then copy ASSIGN3A to create the new member ASSIGN3B, etc.

Now open the new member named ASSIGN3A and carefully delete the following four lines that are left over from your Assignment 1 program:

LA 4,13 LOAD 13 INTO REG 4

LA 8,6 LOAD 6 INTO REG 8

AR 4,8 ADD REG 8'S CONTENTS TO REG 4'S

XDUMP , DUMP CONTENTS OF ALL 16 REGS

Finally, you may now begin making the following changes to the program:

* Change the label representing the program's name to the left of the CSECT statement to ASSIGN3A.
* Change the USING statement to USING ASSIGN3A,15
* Change the program's name to the right of the END statement at the end of the program to ASSIGN3A.
* Declare a fullword variable in storage with label VAR1 with the value 350.
* Declare a fullword variable in storage with label VAR2 with the value 141.
* Subtract VAR1 from VAR2. To do this, load these VARs into two separate registers using the Load instruction (L) for each and then use Subtract Register (SR).
* Add VAR2 to VAR1. To do this, load both into registers (a different pair of registers than for the previous bullet point) and use Add Register (AR).
* Finally, use an XDUMP to dump out just the registers and look at the register values to see your answers and verify that they are correct. Remember that XDUMP with or without a comma in column 16 will only dump the registers. The comma in col. 16 is necessary if you want to do line documentation on the line with the XDUMP.

**Part B**

Copy your program from Part A and name it ASSIGN3B.

Modify the new assembler program as follows:

* Change the program's name to the left of CSECT to ASSIGN3B.
* Change the USING statement to USING ASSIGN3B,15
* Change the program's name to the right of the END statement at the end of the program to ASSIGN3B.
* Declare two new consecutive fullwords in storage with labels VAR3 and VAR4.
* Store (ST) the VAR1 answer (VAR2 subtracted from VAR1) into VAR3. **🡨 YES, this is a change from above!**
* Store (ST) the VAR2 answer (VAR1 added to VAR2) into VAR4.
* XDUMP that area of storage (containing VAR3 and VAR4) using XDUMP. You can use a **single** XDUMP to display the two fullwords, VAR3 and VAR4, in storage by using the label followed by the length of the field like this:

XDUMP VAR3,8 DUMP 8 BYTES BEGINNING AT LABEL VAR3

* Go into the XDUMP output and verify your math is correct and stored at the correct locations in memory.

**Part C**

Now copy your program from Part B and name it ASSIGN3C. Modify the new assembler program as follows:

* Change the program's name to the left of CSECT to ASSIGN3C.
* Change the USING statement to USING ASSIGN3C,15
* Change the program's name to the right of the END statement at the end of the program to ASSIGN3C.
* You may not use the label names VAR1, VAR2, VAR3 and VAR4 in this version of the Part B program.
* Rewrite the instructions referencing the labels using *explicit addressing*. This means on the L and ST, remove the labels as the VAR2 operands and fill in the D(X,B) addresses of the various fullword variables.
* Remove the labels from storage too! Note that you can get the information to form a proper D(X,B) address for the VAR2 operand of each of the instructions by reviewing your program listing from Part B.
* Be sure you still have the **single** XDUMP that dumps the contents of what were VAR3 and VAR4.

**Other Notes**

**Be sure to follow the documentation standards described in *Documentation and Coding Guidelines* found in Course Documents on Blackboard.**

***You will only submit parts B and C****.* Submit your ***two*** output .txt files representing your successful runs of your jobs for Parts B and C on Blackboard.