CS413 Lab 1

ARM Program using Auto-Indexing - ADD

Objective: The objective of this lab is to have the students use the ARM Auto-Indexing to access array elements and to do nested subroutine calls. Reference text book sections 3.7, 3.8 and 3.10.

Write an ARM assembly program that performs the following:

1. Declare three arrays that will contain integers. Array one will be initialized in the code. The values of array one will be determined by the student.
2. Half of array two will be initialized in the code and the other half will be populated with user inputs via the scanf C library function. The reading of these user input values must be performed using a for loop construct and auto-indexing.
3. Array three will be calculated to be equal to the Array one[i] + Array two[i] and must be performed using a for loop construct and auto-indexing.
4. The program is to print a welcome message with instructions to the user.
5. The program is to print the elements of all three arrays with text on which array is being printed.
6. The array print must be performed by a subroutine and accessed by using the ARM Assembly instruction BL. The starting address of the array to be printed will be passed into the subroutine. The address may be passed via a register or the stack via the PUSH and POP commands. Since this print subroutine is not a leaf routine code must be in place to properly save and restore the link register (r14).
7. The array sizes have to be 20 elements.
8. Numbers should be selected to produce negative, zero and positive results.
9. Assume all inputs are valid and no overflow conditions will occur.

The GTA will review your assembly code to ensure you are using the required Auto-Indexing modes and printing of arrays is performed using a subroutine

The general outline for your code should look like:

```
main:
     Print welcome message and instructions to start entering 10
     numbers
     For i=1 to 10 use scanf to read user input;
     For i=1 to 20 sumarray[i] = array1[i] + array2[i];
     Printarray(array1)
     Printarray(array2)
     Printarray(sumarray)
End main

Function Printarray(inarray)
     For i = 1 to 20 print inarray[i]
```

```
End function Printarray
```

Students need to have a file which, at the very least contain the following:

1. Proper header information that include commands that assemble, link, run the file and run the file using the debugger that is specific for their file.
2. Data section that defines all the output strings.
3. Data section that defines the three arrays. One array is initialized with zero, positive and negative integer values. The first half of another array is initialized with zero, positive and negative values that will ensure when added to the first array will product zero, positive and negative values.
4. Code comment sections that describe the major sections of the code with the functions for the print array clearly identified.

This lab was assigned

Fall 2019
Spring 2021
Fall 2022

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Student ________________________ Lab Instructor: ________________________

Total Score: ________________ Late Penalty? No _____ Yes: ______

Feature	Points off
Code Comments/Documentation ● Class, Term, Author, Date. ● Purpose of software ● Documentation for the start of each loop and function (subroutine) ● Documentation for error checking ● In-line comments that explain why the following code exists.	
Welcome and instruction messages are displayed and clear.	
User is prompted to enter 10 integer values.	
Student declared array (initialized in code) is displayed.	
Student declared part of the second array and the user inputs are displayed.	
The sum of array 1 elements and array 2 elements are printed and are correct. Note the output values should contain zero, positive and negative values.	
Examine the code and verify the array printing is performed using a subroutine and accessed via a BL instruction and completes execution by loading the correct return address into the PC.	
Is the address of array to print passed via the stack to the printing subroutine.	