

Assignment IV: Loops and Arrays in ARM Assembly

Purpose: The purpose of this assignment is to help you to improve your knowledge and skills in using conditional execution, loops and arrays in ARM assembly language.

Skills: This assignment will help you to practice and improve the following skills:

- Understand and use cmd instruction
- Understand and use branching instructions (b, beq, bne, blt, bgt, bge, ble)
- Perform modulus operation in ARM assembly
- Create and manipulate array in ARM assembly language
- Create loops in ARM assembly language
- Convert a simple C program into an ARM assembly language
- Create a Makefile to easily build an executable that might take many commands to create
- Use Raspberry Pi to assemble and execute programs written in ARM assembly language
- Use basic Unix commands
- Use a text editor in terminal to create and save files
- Remotely connect and work in another device on the same network

This assignment has two parts.

PART-1 [50 points] Nested Loops

You are asked to write an ARM assembly program, **nestedloop.s**, to implement the same task as the following C program.

```
int i = 1;
int j = 0;
int x = 0;
int main(){
    for( ; i<10; i+=2){
        for( j = i; j<10; j++){
            x += i + j;
        }
    }
    return x;
}
```

PART-2 [50 points] Arrays

In this part, you are asked to write an ARM assembly program **array.s** to implement the same task as the following C program.

```
int a[10];

int b[10];

int i = 1;

int sum = 0;

int main(){

    for(; i<10; i++){

        a[i] = i;

        b[i] = i<<2;

        if(b[i] % 8 == 0)

            b[i] = a[i/2];

        sum += a[i] + b[i];

    }

    return sum;

}
```

How to submit:

You are asked to submit your work as a single zip file via CANVAS. Zip file will include the following two archive files for each part:

- SerceFatmaCS351_3.zip
 - Part1.zip
 - nestedloop.s
 - Makefile
 - Part2.zip
 - array.s
 - Makefile

Please use the following file format while naming the zip file: LastNameFirstnameX_Y.zip where LastNameFirstname is your last name with the first letter in capital, followed by your first name with the first letter in capital; the X is the course code; the Y is the assignment #. (ex: SerceFatmaCS351_4.zip)

How to grade:**Part1 [50 points]**

- (10pts) The data section.
- (20pts) The code section.
- (10pts) correctness.
- (10pts) Makefile should perform the build and clean tasks without any issue.

Part2 [50 points]

- (10pts) The data section.
- (20pts) The code section.
- (10pts) correctness.
- (10pts) Makefile should perform the build and clean tasks without any issue.