

## CS351 winter 2021 Assignment 3

This assignment consists two parts.

### (50pts) Part 1: Fibonacci number $F_6$

In this assignment, you will use ARM assembly language to write a program to calculate the 6<sup>th</sup> Fibonacci number  $F_6$

In mathematics, the **Fibonacci numbers**, commonly denoted  $F_n$ , form a sequence, called the **Fibonacci sequence**, such that each number is the sum of the two preceding ones, starting from 0 and 1. That is

$$\begin{aligned} F_0 &= 0, F_1 = 1 \\ F_n &= F_{n-1} + F_{n-2} \\ &\text{for } n > 1. \end{aligned}$$

The beginning of the sequence is thus:

0, 1, 1, 2, 3, 5, 8, 13, 21, ...

Your program will start with two values in data section:  $F_0=0$ , and  $F_1=1$ . You will write ARM assembly code using only what we learned in this week to calculate  $F_6$ .

Requirements:

1. Only use what we learned so far. (ADD, MOV, LDR, STR, etc.)
2. Your data section should contain  $F_0$  and  $F_1$  values.
3. Use only two registers in your code section: R0 and R1.
4. No other numbers are allowed in code section.
5. Create a makefile to manage the build and clean tasks.
6. The program will be named **fib6.s**
7. The output of your program should be like this:  

```
$ ./fib6; echo $?
```

```
8
```

Submission:

Please submit a zip file named **part1.zip** including your fib6.s and makefile.

### (50pts) Part2: From C to ARM assembly

You will write an ARM assembly program **c2arm.s** to implement the same task as the following C program.

```
int a = 10;
int b = 5;
int c = 3;

int main(){
    a = b++ + c++;
    b = --c + a;
    c += a + b++;
    return a + b + c;
}
```

Hint: You can use gcc to compile this C code (assuming saved as program.c file) on Raspberry Pi by running

```
gcc -o program program.c
```

Then you can run the program by:

```
./program
```

Submission:

Please submit a zip file named **part2.zip** which will contain your c2arm.s and makefile.

Grading:

(20pts) The data section.

(40pts) The code section.

(20pts) correctness.

(20pts) Your two makefiles should perform the build and clean tasks without any issue.