University of Dhaka

Department of Computer Science and Engineering

CSE-3113:

Microprocessor and Assembly Language Lab

Lab Report 3

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1 Objectives

The objectives of this lab is to understand and have familiarize with register based assembly programming for Cortex M4 processor for arithmetic operation.

2 Lab Tasks

2.1 Question 1

Write a simple program to calculate: P = Q + R + S. Let Q = 2, R = 4, S = 5. Assume that r1 = Q, r2 = R, r3 = S. The result P will go in r0.

Listing 1: Adding 3 Numbers

```
    AREA lab3, CODE, READONLY
    ENTRY
    EXPORT main
main
        MOV r1, #2      ;Move value 2 to r1
        MOV r2, #4      ;Move value 4 to r2
        MOV r3, #5      ;Move value 5 to r3
        ADD r0,r1,r2    ;ADD the value of r1 and r2 and storing it in r0
        ADD r0,r0,r3    ;ADD the value of r0 and r3 and storing it in r0
STOP B STOP
    END
```

2.2 Question 2

Write a simple program to calculate: P = Q - R . Assume that r1 = Q, r2 = R, and Q¿R. The result P will go in r0.

Listing 2: Subtracting 2 Numbers

```
    AREA lab3, CODE, READONLY
    ENTRY
    EXPORT main
main
        MOV r1, #8      ;Move value 2 to r1
        MOV r2, #4      ;Move value 4 to r2
        SUB r0,r1,r2    ;Subtracting the value of r2 from r3 and storing in r0
STOP B STOP
    END
```

2.3 Question 3

Write a simple program to calculate: P = Q - R- S. Let Q = 12, R = 4, S = 5. Assume that r1 = Q, r2 = R, r3 = S. The result P will go in r0.

Listing 3: Subtracting 3 Numbers

```
    AREA lab3, CODE, READONLY
    ENTRY
    EXPORT main
main
        MOV r1, #12      ;Move value 12 to r1
        MOV r2, #4       ;Move value 4 to r2
        MOV r2, #5       ;Move value 5 to r2
        SUB r0,r1,r2     ;Subtracting the value of r2 from r3 and storing in r0
        SUB r0,r0,r3     ;Subtracting the value of r3 from r0 and storing in r0
STOP B STOP
    END
```

2.4 Question 4

Write a simple program to calculate: P = Q x R . The result P will go in r0.

Listing 4: Multiplying 2 Numbers

```
    AREA lab3, CODE, READONLY
    ENTRY
    EXPORT main
main
        MOV r1, #8       ;Move value 8 to r1
        MOV r2, #4       ;Move value 4 to r2
        MUL r0,r1,r2     ;Multiplying the value of r1 and r2 and storing in r0
STOP B STOP
    END
```

2.5 Question 5

This problem is same as the problem 1. W = X + Y + Z . Once again, let X = 9, Y = 8, Z = 5 and we assume that r4 = X, r3 = Y, r2 = Z. In this case, you will put the data in memory in the form of constants before the program runs.

Listing 5: Adding 3 Numbers

```
    AREA lab3, CODE, READONLY
    ENTRY
    EXPORT main
X EQU 9
Y EQU 8
Z EQU 5
            ;data in memory in the form of constants before the program runs.
main
        MOV r4, #X      ;Move value of X to r4
        MOV r3, #Y      ;Move value Y to r3
        MOV r2, #Z      ;Move value Z to r2
        ADD r0,r3,r4    ;ADD the value of r3 and r4 and storing it in r0
        ADD r0,r0,r2    ;ADD the value of r0 and r2 and storing it in r0
STOP B STOP
    END
```

References

[1] Documentation – arm developer. https://developer.arm.com/documentation/ddi0439/b/CHDDIGAC. [Online; accessed 2023-01-31].

[2] Nucleo-F446RE. https://www.st.com/en/evaluation-tools/nucleo-f446re.html. [Online; accessed 2023-01-31].