

Lab Assignment-1

[Weightage - 10%]

Assignment Instructions:

1. Assignment should be solved individually.
2. No marks will be awarded if plagiarism is detected.
3. Questions can be performed in simulation mode.
4. Please take some suitable screen shots of the KEIL IDE-in debug mode to demonstrate the desired output. Ensure that the screenshot captures **system time & day**.

Submission instructions:

Upload a single zipped folder named based on your BITS-ID number and name (**ID-No_Full-Name**) containing the following on Course Website (<http://taxila-aws.bits-pilani.ac.in>) during **August 16-30, 2022**.

1. One PDF document should consist of answer of questions and relevant snapshots.
2. Separate folder for each code.

Q.1. Assembly Language Programs (ALP) for an ARMv4T processor to implement following IF-ELSE statement are given below:

```
if ( a<b)
{
    x=5
    y=c+d
}
else
    y=c-d
```

Code-1:

```
        AREA RESET, CODE, READONLY
        ENTRY
START
        ADR R4, SRC
        LDR R5, =DST
        BL SUB1
STOP    B STOP
SUB1    LDR R0, [R4], #4
        LDR R1, [R4], #4
        CMP R0, R1
        BGE FB1
        LDR R0, [R4], #4
        LDR R1, [R4], #4
        ADD R0, R0, R1
        MOV R2, #5
        STR R2, [R5], #4
        STR R0, [R5]
        B AFT
FB1     LDR R0, [R4], #4
```

```

        LDR R1,[R4]
        SUB R0,R0,R1
        STR R0,[R5,#4]
AFT    MOV PC,LR
SRC    DCD 0x20, 0x40, 0x30, 0x10
        AREA RESULT, DATA, READWRITE
DST    DCD 0, 0
        END

```

Code-2:

```

        AREA RESET, CODE, READONLY
        ENTRY
START
        ADR R4,SRC
        LDR R5,=DST
        BL SUB1
STOP    B STOP
SUB1    LDR R0,[R4],#4
        LDR R1,[R4],#4
        CMP R0,R1
        LDR R0,[R4],#4
        LDR R1,[R4]
        MOVL R2,#5
        STRLT R2,[R5]
        ADDLT R0, R0, R1
        SUBGE R0, R0, R1
        STR R0,[R5,#4]

AFT    MOV PC,LR
SRC    DCD 0x20, 0x40, 0x30, 0x10
        AREA RESULT, DATA, READWRITE
DST    DCD 0, 0
        END

```

Simulate the above given Code-1 and Code-2 using Keil uVision5 software and answer the following questions.

- On reset what is the ARM7TDMI processor's mode of operation? [1 Mark]
- How many states are taken for the execution of an Arithmetic instruction, Load and Store instruction respectively? [1 Mark]
- Are the number of states taken for completion same for BGE instruction if the branch – (1) is taken (2) not taken? [1 Mark]
- Measure the performance of code-1 and code-2 for the following conditions [1 Mark]

Condition	Code-1- States	Code-2- States
a<b		
a>b		
a=b		

Q.2. Assume that the controller is in Supervisor mode. Write an assembly language program (ALP) to implement the following.

Switch the processor to user mode. In user mode use an instruction SWI 0x20. Write an SWI Handler (in ALP) that will multiply the contents of R0 register [05] by 10 when a supervisor call instruction SWI 0x20 is executed by ARMv4 processor. For all other SWI calls the R0 register will be filled with 0x00000000. The processor should also return to the User mode of operation after exception handling.

Also take a suitable snap shot of the KEIL IDE-in debug mode to demonstrate the desired output. Ensure that the screenshot captures system time & day. [6 Marks]