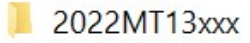
Lab Assignment-1

[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. It is mandatory to create a uVision Project folder in D:/ or E:/ or any other drive of your computer and give name to that folder as your BITS_ID e.g. 2022MT13xxx.

   Under this folder, you will do assignment wise folders and save Keil project in that folder.
5. Please take complete (without cropping) 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 PDF document (named based on your BITS-ID number and name (**ID-No_Full-Name**)) which consist of answers of questions and relevant screenshots on Course Website (http://taxila-aws.bits-pilani.ac.in) during **February 19,2023 to March 8,2023**.

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]
        MOVLT 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.

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

d) 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. Write an ALP program for ARM Cortex M3/4 to perform the following

(1) SVC is to be called from an application task running at Thread unprivileged mode.
(2) Two parameters are passed to the handler via R1, R2.
(3) If the SVC number is 0x20, then the addition of the data in R1,R2 should be performed
(4) Return and resume application task

Give suitable screen shots of the KEIL IDE-in debug mode to demonstrate the desired outputs. Ensure that the screenshot captures system time & day.

[6 Marks]