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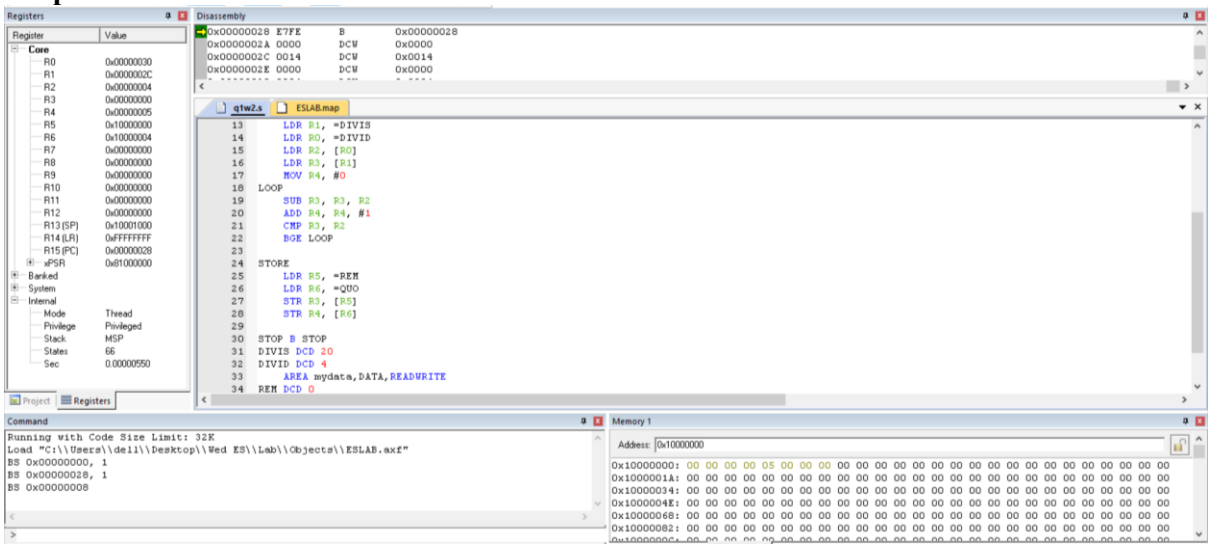
LAB 3

Lab Exercises:

1. Write an assembly language program to implement division by repetitive subtraction.
Program:

```
        AREA RESET,DATA,READONLY
        EXPORT __Vectors

__Vectors

        DCD 0X10001000
        DCD Reset_Handler
        AREA mycode,CODE,READONLY
        ENTRY
        EXPORT Reset_Handler

Reset_Handler
        LDR R1, =DIVIS
        LDR R0, =DIVID
        LDR R2, [R0]
        LDR R3, [R1]
        MOV R4, #0
LOOP
        SUB R3, R3, R2
        ADD R4, R4, #1
        CMP R3, R2
        BGE LOOP

STORE
        LDR R5, =REM
        LDR R6, =QUO
        STR R3, [R5]
        STR R4, [R6]

STOP B STOP
DIVIS DCD 20
DIVID DCD 4
        AREA mydata,DATA,READWRITE
REM DCD 0
QUO DCD 0
        END
```

Output:

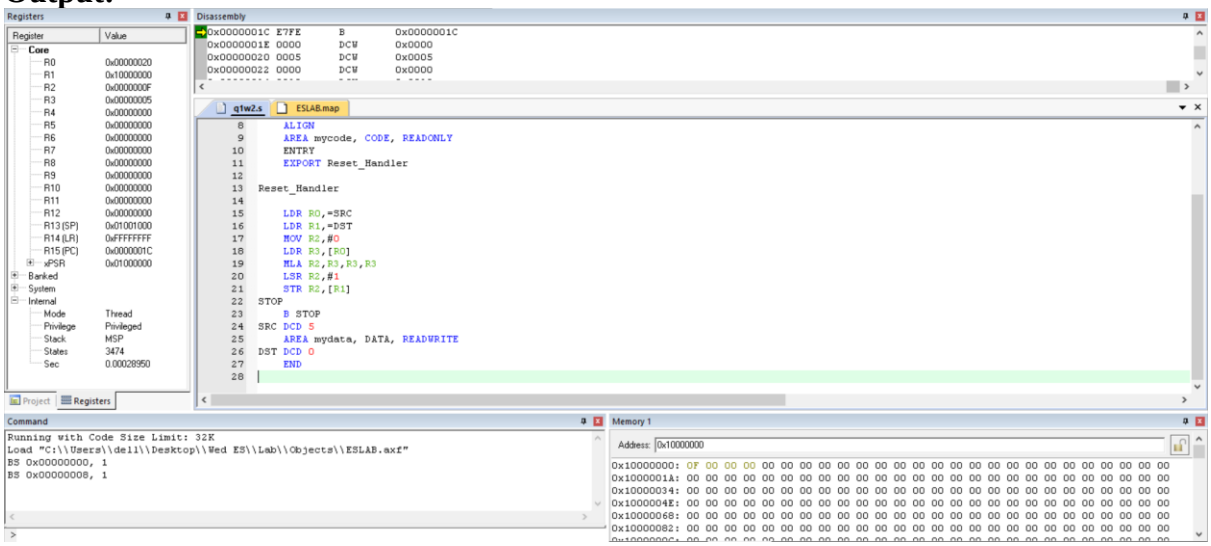


2. Find the sum of ‘n’ natural numbers using MLA instruction.

Program:

```
        AREA RESET, DATA, READONLY
        EXPORT __Vectors

__Vectors

        DCD 0x1001000
        DCD Reset_Handler
        ALIGN
        AREA mycode, CODE, READONLY
        ENTRY
        EXPORT Reset_Handler

Reset_Handler

        LDR R0,=SRC
        LDR R1,=DST
        MOV R2,#0
        LDR R3,[R0]
        MLA R2,R3,R3,R3
        LSR R2,#1
        STR R2,[R1]
STOP
        B STOP
SRC DCD 5 ;n
        AREA mydata, DATA, READWRITE
DST DCD 0
        END
```

Output:



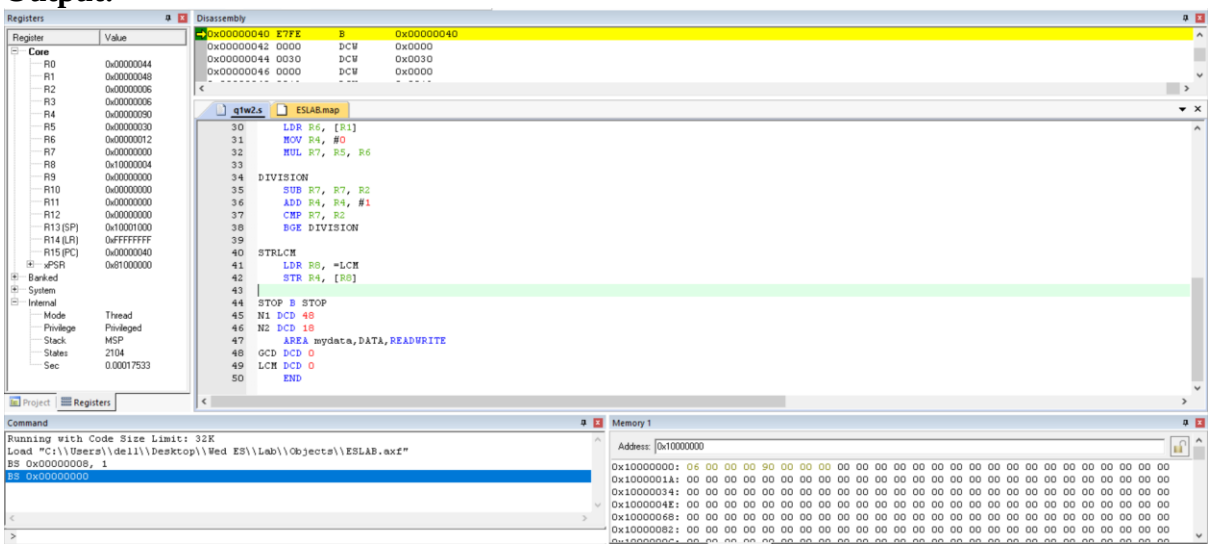
3. Write an assembly language program to find GCD and LCM of two 8 bit numbers.

Program:

```
        AREA RESET, DATA, READONLY
        EXPORT __Vectors

__Vectors

        DCD 0X10001000
        DCD Reset_Handler
        AREA mycode,CODE,READONLY
        ENTRY
        EXPORT Reset_Handler

Reset_Handler
        LDR R0, =N1
        LDR R1, =N2
        LDR R2, [R0]
        LDR R3, [R1]

GCDT
        CMP R2, R3
        SUBLT R3, R3, R2
        SUBGT R2, R2, R3
        BNE GCDT

STRGCD
        LDR R4, =GCD
        STR R2, [R4]

LCMT
        LDR R5, [R0]
        LDR R6, [R1]
        MOV R4, #0
```

```
        MUL R7, R5, R6

DIVISION
        SUB R7, R7, R2
        ADD R4, R4, #1
        CMP R7, R2
        BGE DIVISION

STRLCM
        LDR R8, =LCM
        STR R4, [R8]

STOP B STOP
N1 DCD 48
N2 DCD 18
        AREA mydata,DATA,READWRITE
GCD DCD 0
LCM DCD 0
        END
```

Output:



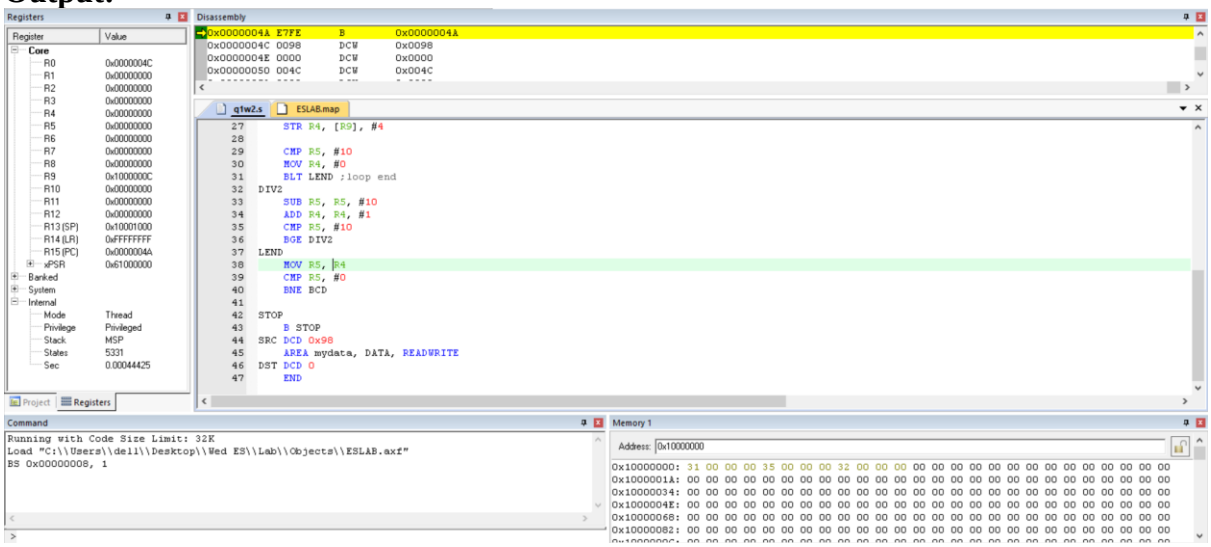
4. Write an ARM assembly language program to convert 2-digit hexadecimal number into ascii format.

Program:

```
        AREA RESET,DATA,READONLY
        EXPORT __Vectors

__Vectors
        DCD 0X10001000
        DCD Reset_Handler
        ALIGN
        AREA mycode,CODE,READONLY
        ENTRY
        EXPORT Reset_Handler
```

```
Reset_Handler
        LDR R0, =SRC
        LDR R1, [R0]
        LDR R9, =DST
        MOV R5, #100
BCD
        CMP R1, R5
        BLT DIV2
        MOV R4, #0
DIV1
        SUB R1, R1, R5
        ADD R4, R4, #1
        CMP R1, R5
        BGE DIV1
        ADD R4, R4, #48
        STR R4, [R9], #4

        CMP R5, #10
        MOV R4, #0
        BLT LEND ;loop end
DIV2
        SUB R5, R5, #10
        ADD R4, R4, #1
        CMP R5, #10
        BGE DIV2
LEND
        MOV R5, R4
        CMP R5, #0
        BNE BCD

STOP
        B STOP
SRC DCD 0x98
        AREA mydata, DATA, READWRITE
DST DCD 0
        END
```

Output:



5. Write an ARM assembly language program to convert a 32-bit BCD number in the unpacked form into packed form.

Program:

```
        AREA RESET,DATA,READONLY
        EXPORT __Vectors

__Vectors
        DCD 0X10001000
        DCD Reset_Handler
        ALIGN
        AREA mycode,CODE,READONLY
        ENTRY
        EXPORT Reset_Handler

Reset_Handler
        LDR R0, =SRC
        LDR R1, =0x01
        MOV R4, #4
UP      STR R1,[R0],#1
        ADD R1, #2
        SUBS R4,#4
        BNE UP ;POPULATING UNPACKED

        LDR R0,=SRC
        LDR R7,=DST
        MOV R3,#2

LOOP LDRB R1,[R0],#1
        ROR R1,#28
        LDRB R2,[R0],#1
        ORR R2,R2,R1
        STRB R2,[R7],#1
        SUBS R3,#1
        BNE LOOP
```

```
STOP
        B STOP
        AREA mydata, DATA, READWRITE
SRC DCD 0
DST DCD 0
        END
```

Output: