Microprocessor and Computer Architecture

UE21CS251B

4th Semester, Academic Year 2022-23

Date:

Name: Nihal T M	SRN: PES2UG21CS333	Section: F

Week#____3_____ Program Number: ____1__

Title of the Program

Generate Fibonacci Series and store them in an array.

I. ARM Assembly Code

code:

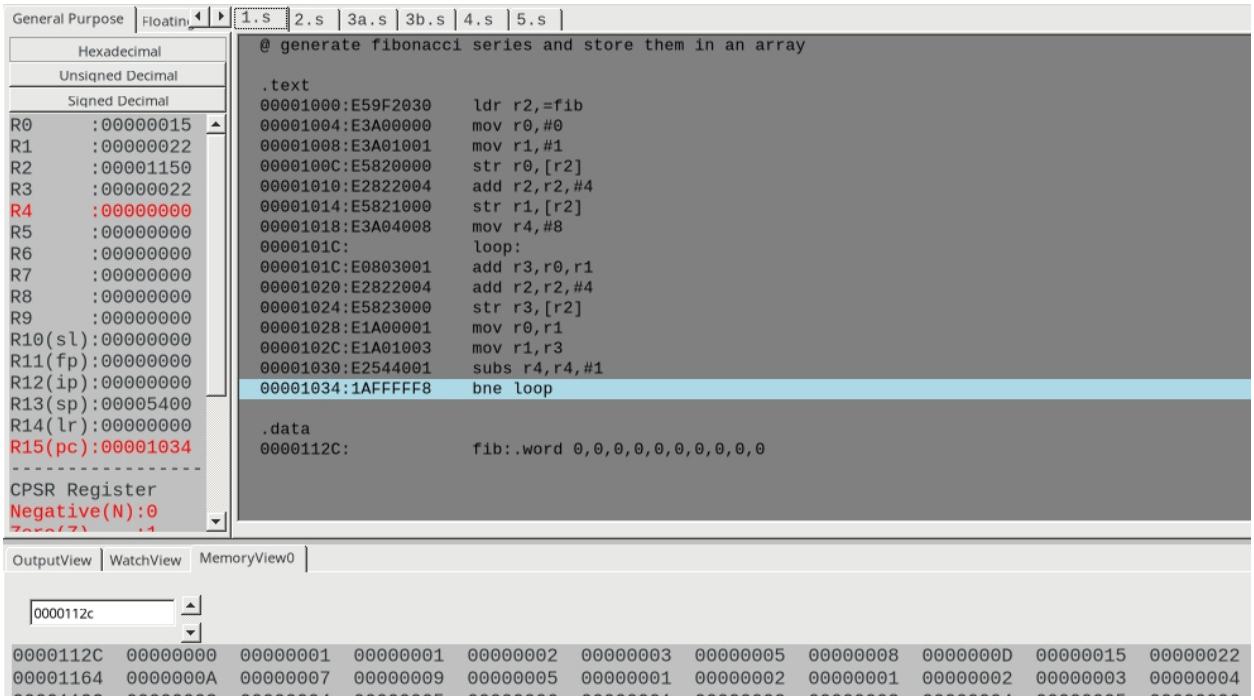
@ generate fibonacci series and store them in an array

```
.text
 ldr r2,=fib
 mov r0,#0
 mov r1,#1
 str r0,[r2]
 add r2,r2,#4
 str r1,[r2]
```

```
 mov r4,#8
 loop:
        add r3,r0,r1
        add r2,r2,#4
        str r3,[r2]
        mov r0,r1
        mov r1,r3
        subs r4,r4,#1
        bne loop
.data
 fib:.word 0,0,0,0,0,0,0,0,0,0
```

II. Output Screen Shots (One)

Output is along memory location:
0000112c



Week#____3_____ Program Number: ____2___

Title of the Program

Write an ALP to find smallest number in an array of n 32-bit numbers

I. ARM Assembly Code

code:

```
@ find the smallest nummber in an array os 32 bit numbers
.text
 ldr r4,=arr
 ldr r1,[r4],#4
 mov r2,#9
 loop:
        ldr r3,[r4]
        cmp r3,r1
        bmi swap
        add r4,r4,#4
        subs r2,r2,#1
        bne loop
        b end

 swap:
        mov r1,r3
        b loop
```

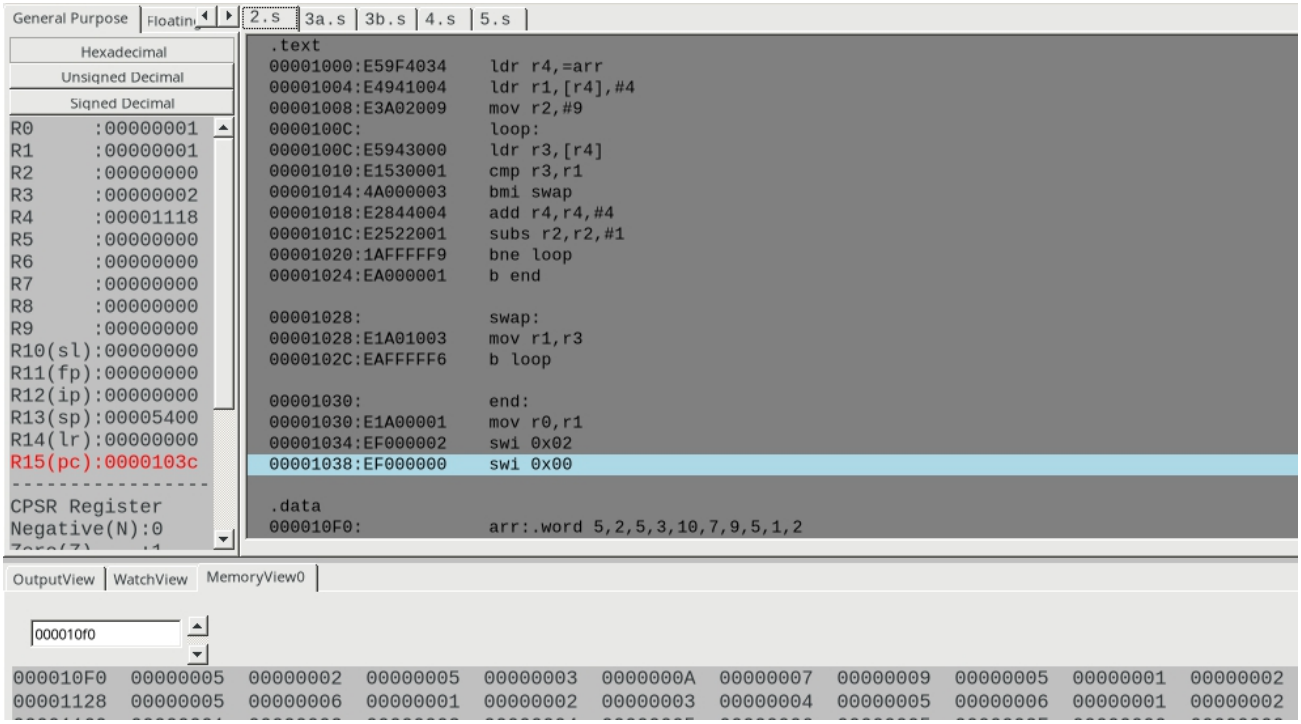
```
end:
        mov r0,r1
        swi 0x02
        swi 0x00

.data
 arr:.word 5,2,5,3,10,7,9,5,1,2
```

II. Output Screen Shots (One)

data array present in 000010f0 memory:

1 is the smallest element in the array is stored in r0 at the end of the program.



Week#____3_____ Program Number: ____3__

Title of the Program

To perform Convolution using MUL instruction (Addition of multiplication of respective numbers of loc A and loc B)

I. ARM Assembly Code

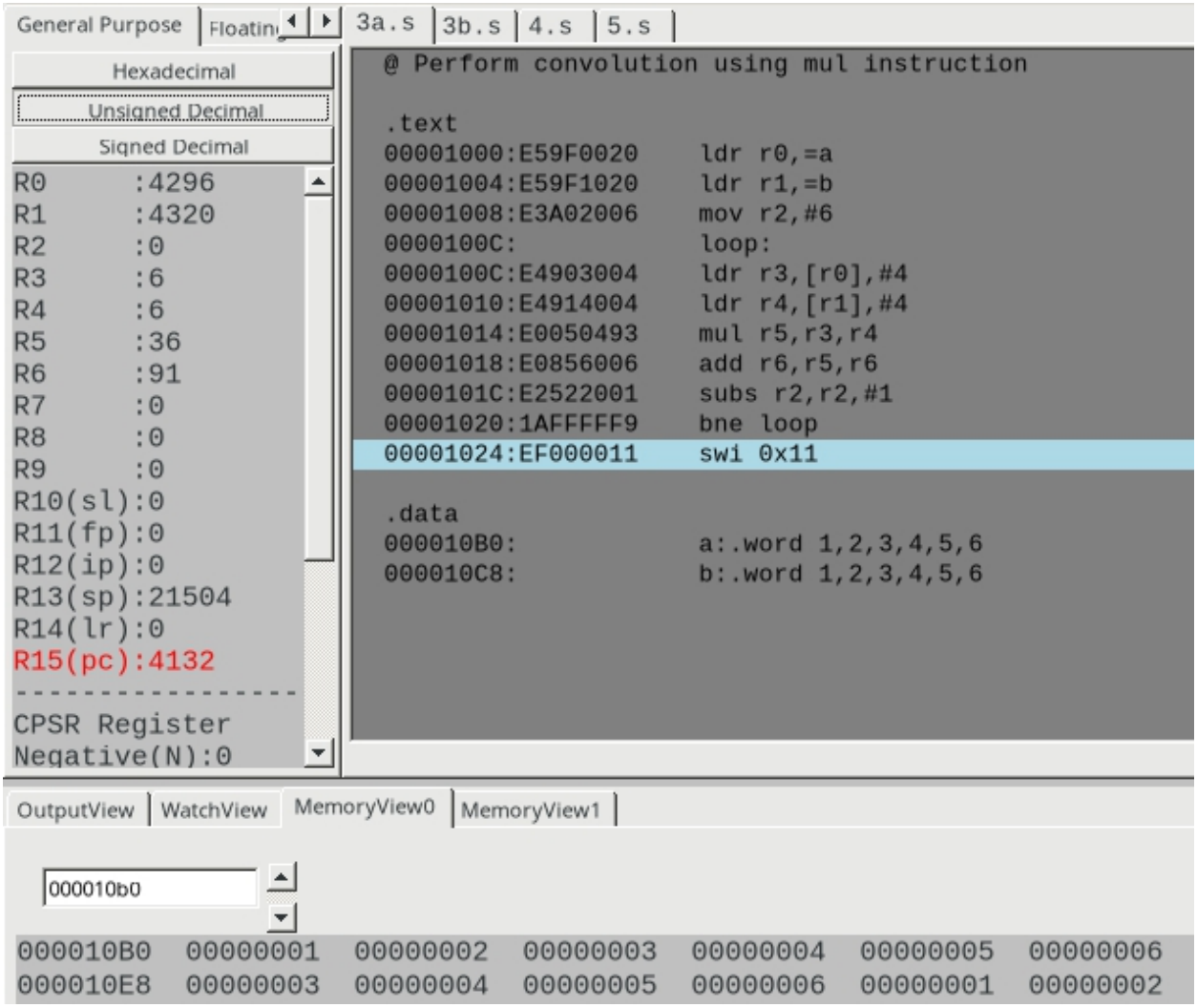
code:

```
@ Perform convolution using mul instruction
.text
    ldr r0,=a
    ldr r1,=b
    mov r2,#6
    loop:
        ldr r3,[r0],#4
        ldr r4,[r1],#4
        mul r5,r3,r4
        add r6,r5,r6
        subs r2,r2,#1
        bne loop
        swi 0x11

.data
    a:.word 1,2,3,4,5,6
    b:.word 1,2,3,4,5,6
```

II.Output Screen Shot (One)

output is present in r6 register and is displayed in unsigned decimal to enable ease of correction



Week#____3_____ Program Number: ____4___

Title of the Program

To perform Convolution using MLA instruction (Addition of multiplication of respective numbers of loc A and loc B).

I. ARM Assembly Code

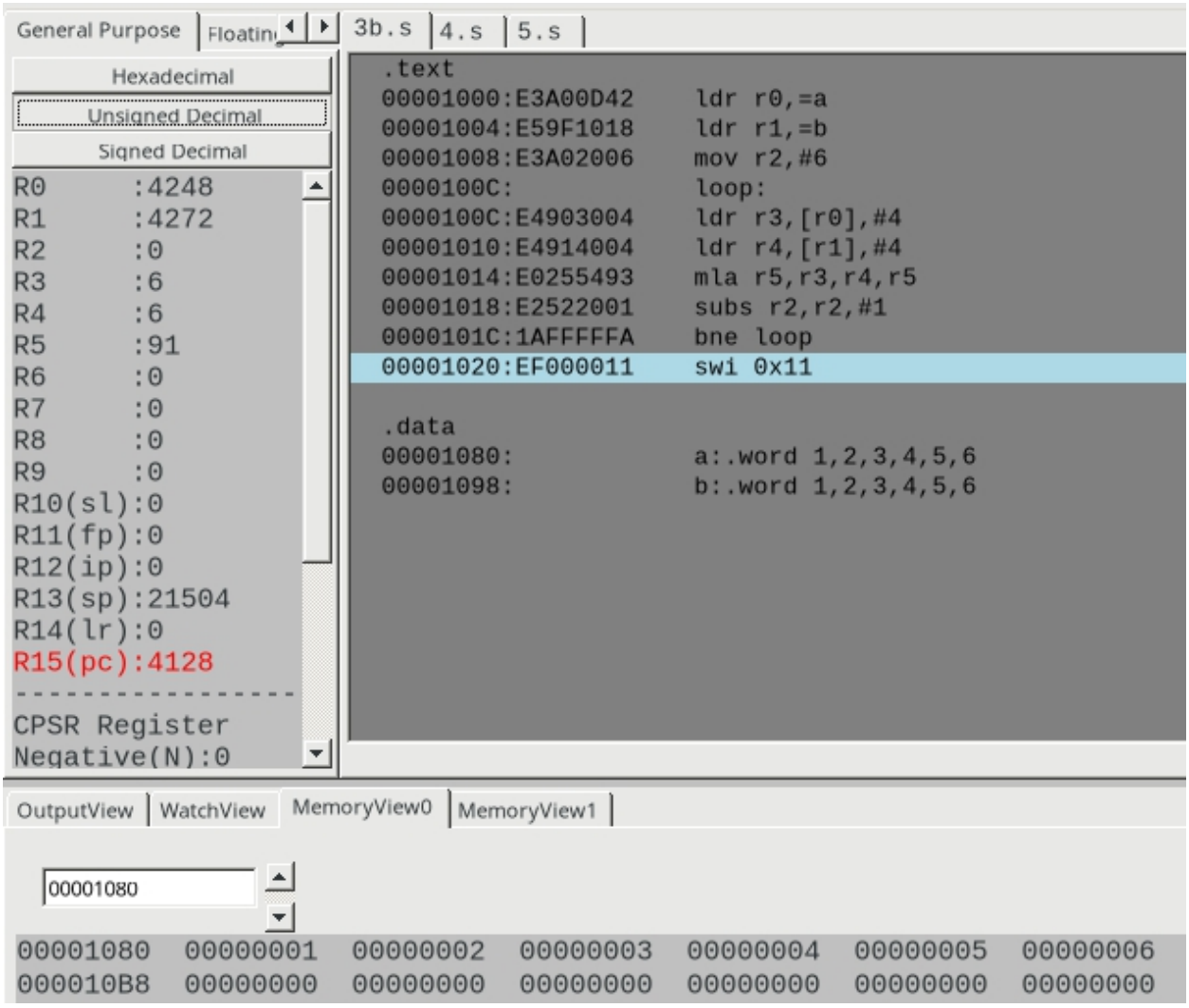
code:

```
@ doing the same as 3a but by using mla instruction
.text
	ldr r0,=a
	ldr r1,=b
	mov r2,#6
	loop:
		ldr r3,[r0],#4
		ldr r4,[r1],#4
		mla r5,r3,r4,r5
		subs r2,r2,#1
		bne loop
		swi 0x11

.data
	a:.word 1,2,3,4,5,6
	b:.word 1,2,3,4,5,6
```

II.Output Screen Shot (One)

output is present in r5 register and is displayed in decimal to enable ease of correction.



Week#____3_____ Program Number: ____5__

Title of the Program

Write an ALP to find mul (add(a,b),c)

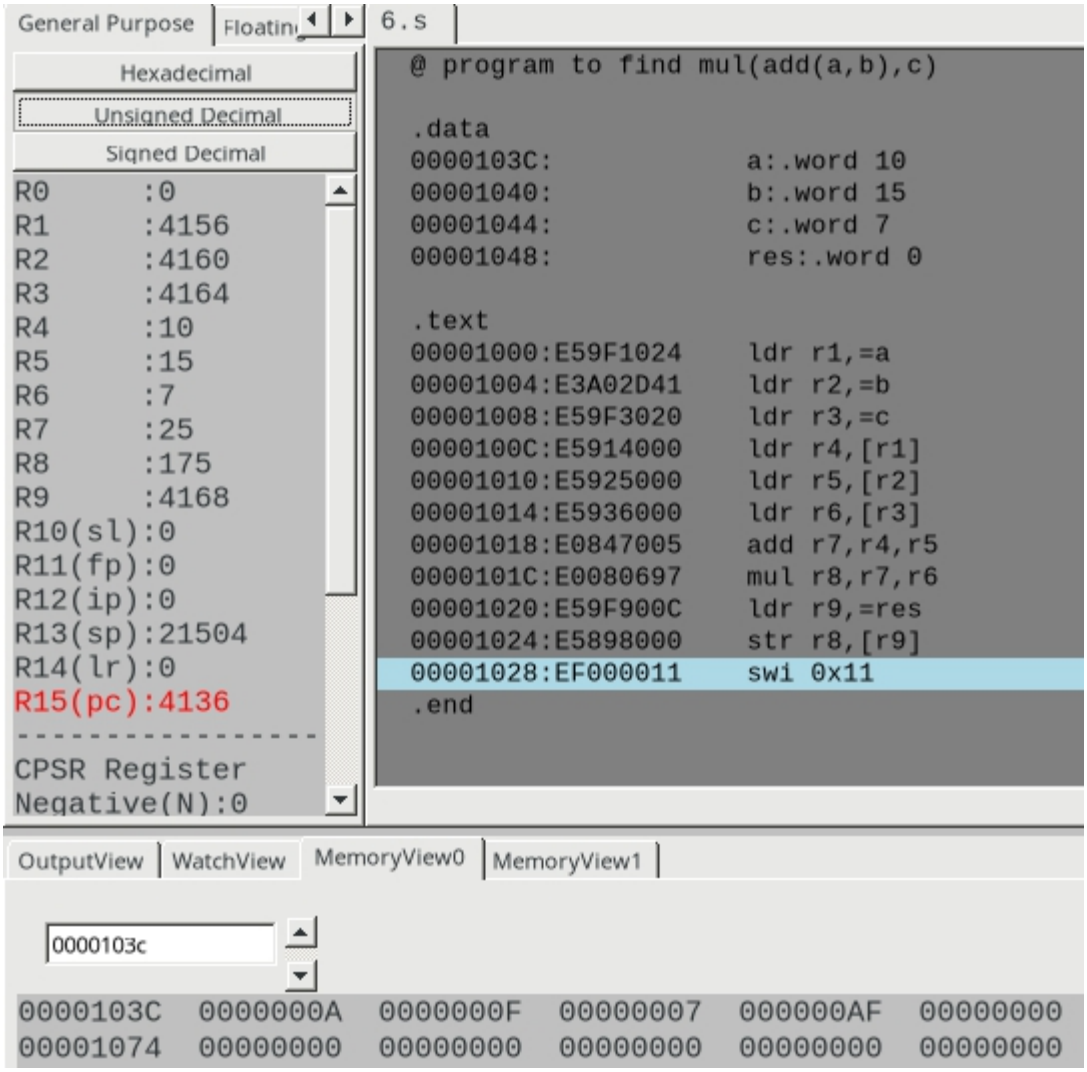
I. ARM Assembly Code

code:

```
@ program to find mul(add(a,b),c)
.data
        a:.word 10
        b:.word 15
        c:.word 7
        res:.word 0
.text
        ldr r1,=a
        ldr r2,=b
        ldr r3,=c
        ldr r4,[r1]
        ldr r5,[r2]
        ldr r6,[r3]
        add r7,r4,r5
        mul r8,r7,r6
        ldr r9,=res
        str r8,[r9]
        swi 0x11
.end
```

II.Output Screen Shot (One)

output is present in r8 register and is displayed in decimal. It is also stored into memory.



Week#____3_____ Program Number: ____6__

Title of the Program

Write an ALP to find factorial using subroutine

I. ARM Assembly Code

code:

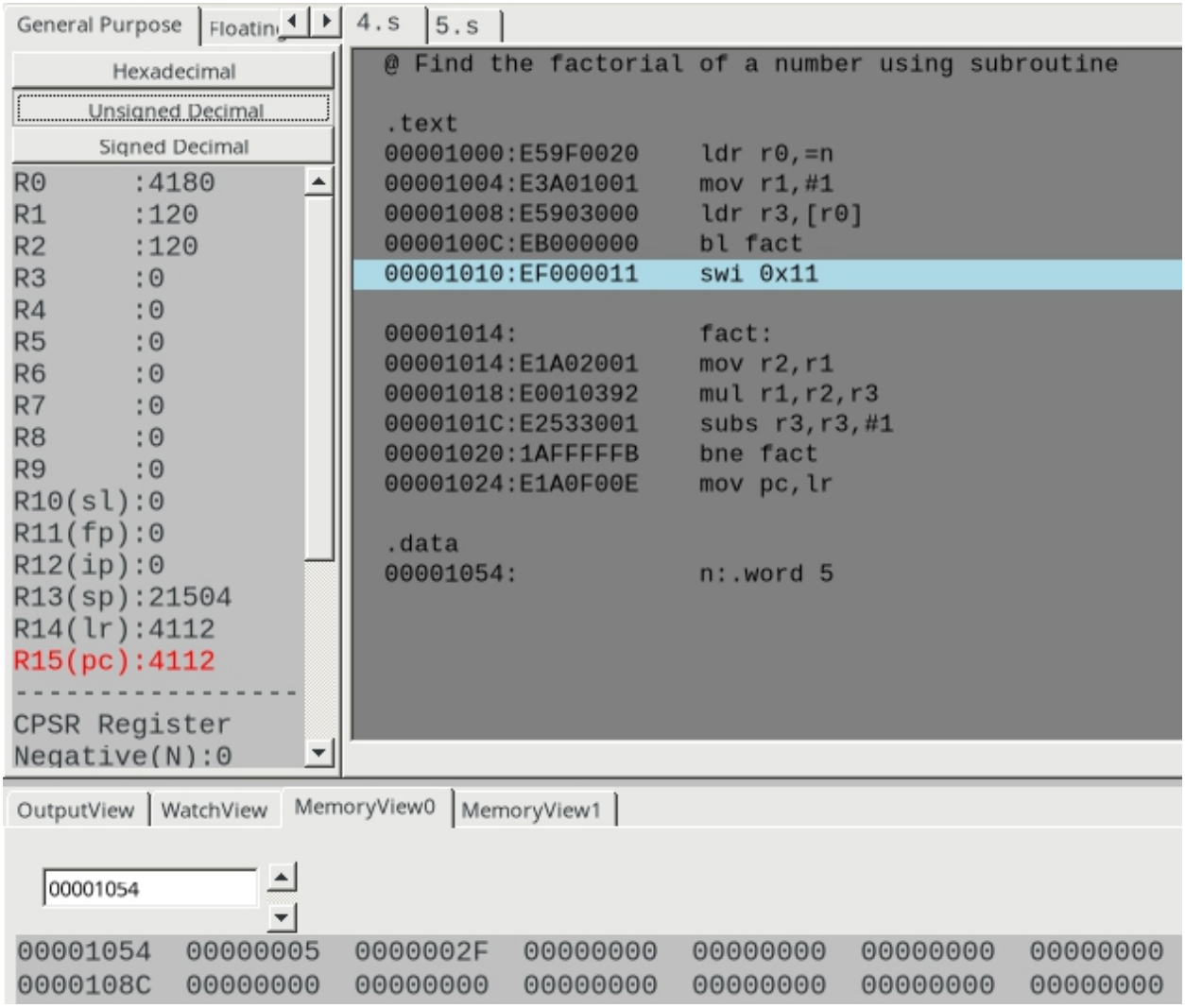
```
@ Find the factorial of a number using subroutine
.text
        ldr r0,=n
        mov r1,#1
        ldr r3,[r0]
        bl fact
        swi 0x11

        fact:
                mov r2,r1
                mul r1,r2,r3
                subs r3,r3,#1
                bne fact
                mov pc,lr

.data
        n:.word 5
```

II. Output Screen Shot (One)

output is present in r1 register and it is in decimal:



Week#____3_____ Program Number: ____7__

Title of the Program

Write an ALP to perform multiplication using shift method (without using MUL)

I. ARM Assembly Code

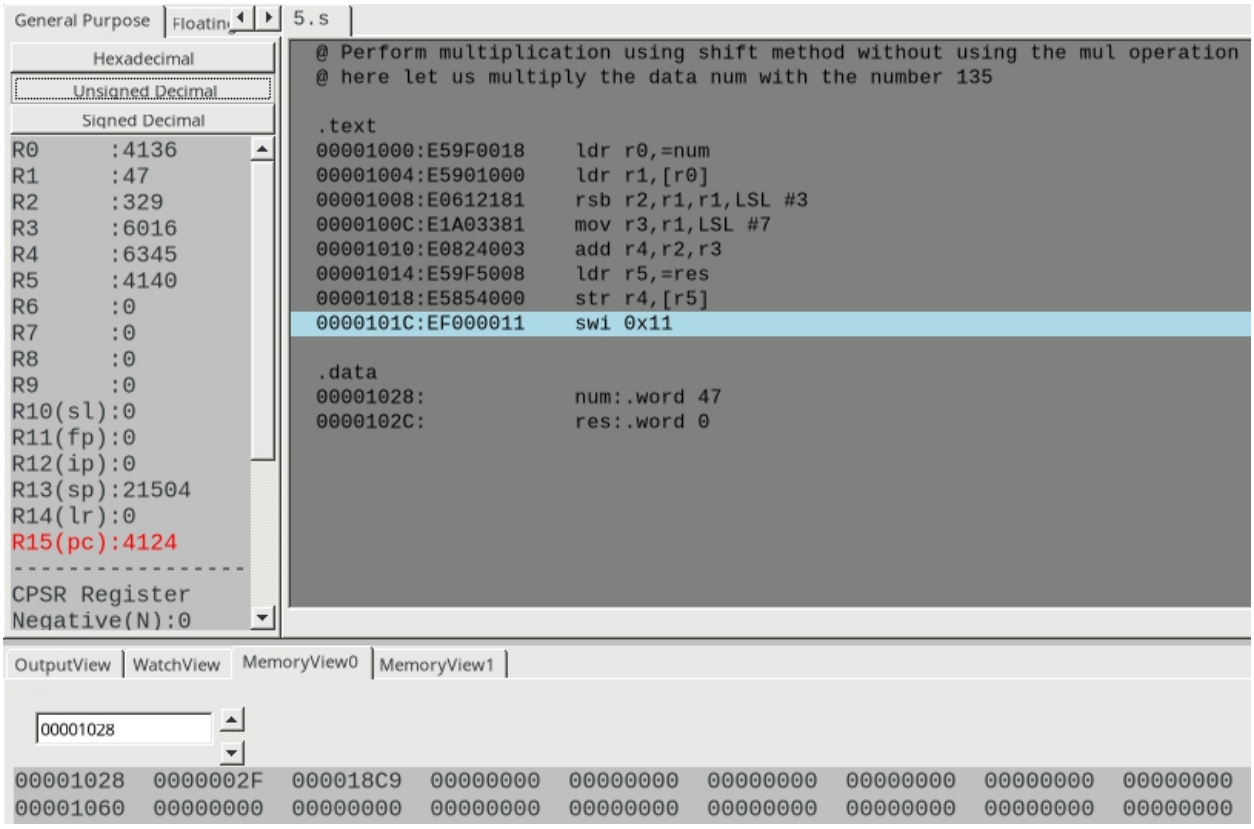
code:

```
@ Perform multiplication using shift method without using the mul operation
@ here let us multiply the data num with the number 135
.text
        ldr r0,=num
        ldr r1,[r0]
        rsb r2,r1,r1,LSL #3
        mov r3,r1,LSL #7
        add r4,r2,r3
        ldr r5,=res
        str r4,[r5]
        swi 0x11

.data
        num:.word 47
        res:.word 0
```

II. Output Screen Shot (One)

output is present in r4 register and is displayed in decimal



Disclaimer:

The programs and output submitted is duly written, verified and executed by me.

I have not copied from any of my peers nor from the external resource such as internet.

If found plagiarized, I will abide with the disciplinary action of the University.

Signature:
Name: Nihal T M
SRN: PES2UG21CS333
Section: F
Date: 31/01/2023