

# Microprocessor and Computer Architecture Laboratory

UE19CS256

4th Semester, Academic Year 2020-21

Name: R Sharmila	SRN: PES2UG19CS309	Section: E
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Date: 19-02-2021

Week: 4

Program Number: 1

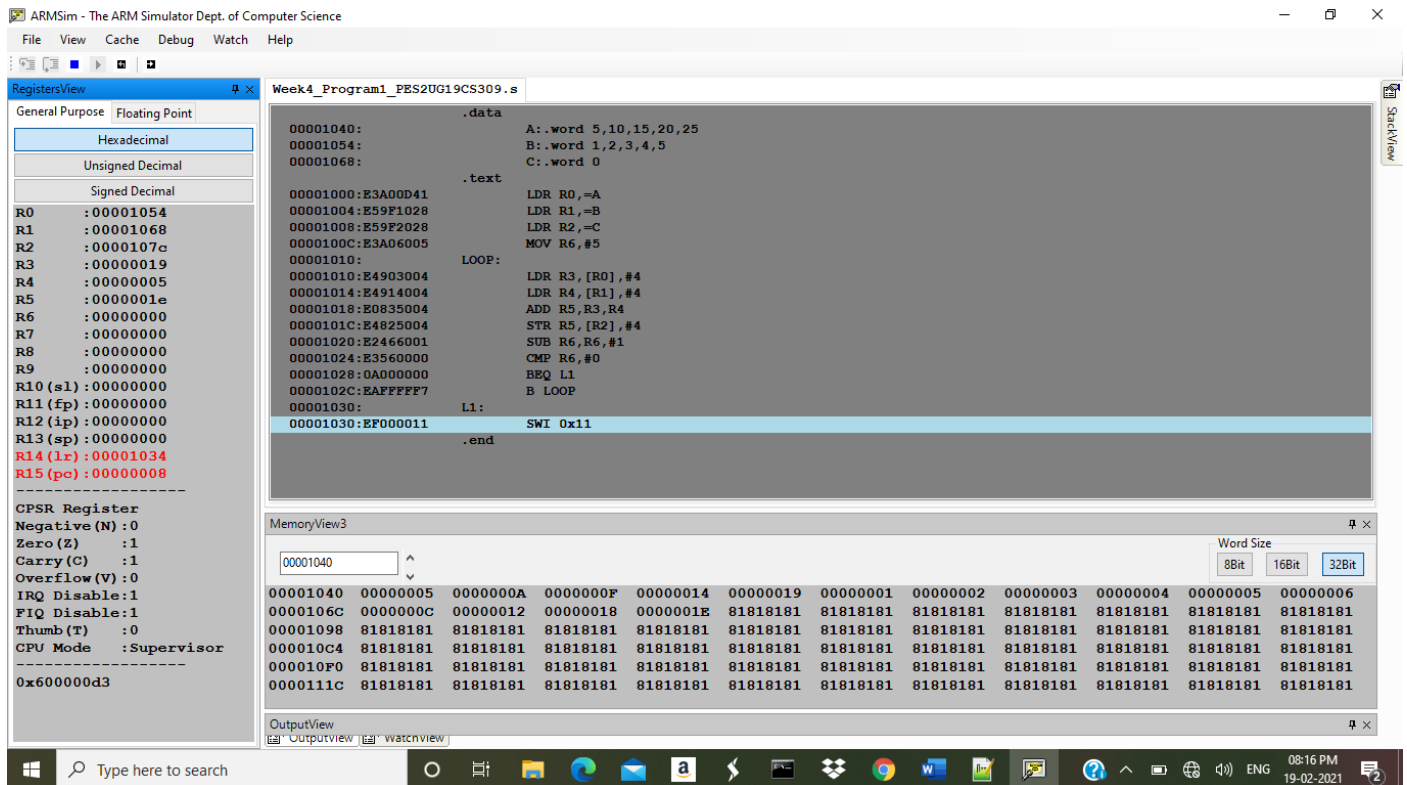
Title of the Program :

**Write an ALP to implement  $c[i]=a[i]+b[i]$**

## ARM Assembly Code for Program

```
C:\Users\sharm\Desktop\4th sem\Micropr...
File Edit Search View Encoding Language Settings Tools
Macro Run Plugins Window ?
Week4_Program1_PES2UG19CS309.s Week4_Program2_PES2
1 .data
2 A:.word 5,10,15,20,25
3 B:.word 1,2,3,4,5
4 C:.word 0
5 .text
6 LDR R0,=A
7 LDR R1,=B
8 LDR R2,=C
9 MOV R6,#5
10 LOOP:
11 LDR R3,[R0],#4
12 LDR R4,[R1],#4
13 ADD R5,R3,R4
14 STR R5,[R2],#4
15 SUB R6,R6,#1
16 CMP R6,#0
17 BEQ L1
18 B LOOP
19 L1:
20 SWI 0x11
21 .end
```

# Output Screenshot (Code, Register, Memory window)



## Output Table

**A: .word 5, 10, 15, 20, 25**

**B: .word 1,2,3,4,5**

**C: .word 0, 0, 0, 0, 0**

After Execution The content of array C is

6	00000006
12	0000000C
18	00000012
24	00000018
30	0000001E

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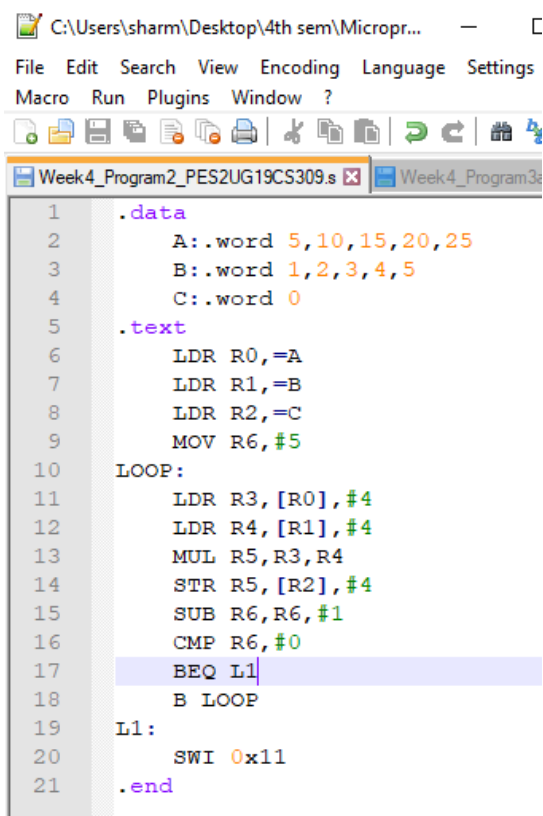
Week: 4

Program Number: 2

Title of the Program :

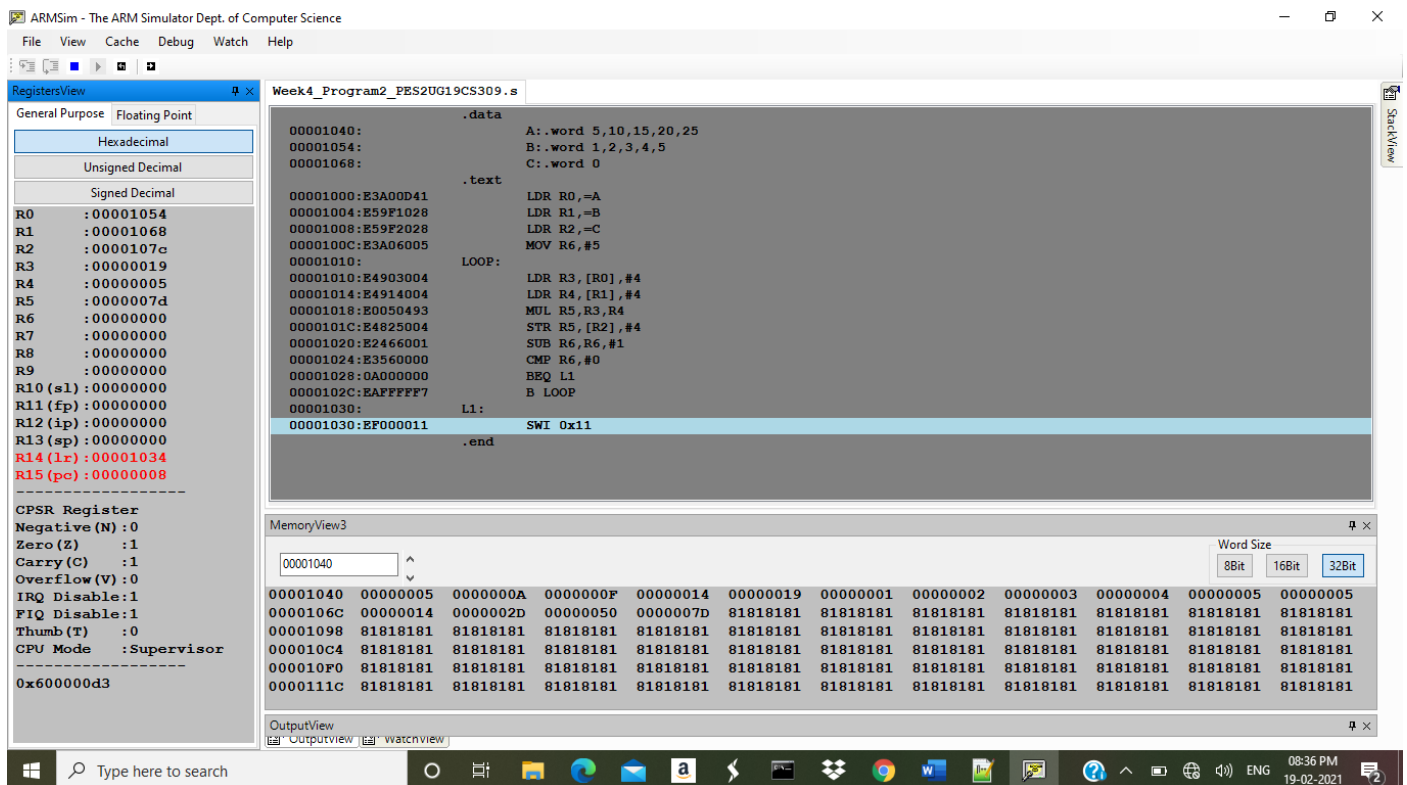
**Write an ALP to implement  $c[i] = a[i] * b[i]$**

## ARM Assembly Code for Program



```
1  .data
2      A:.word 5,10,15,20,25
3      B:.word 1,2,3,4,5
4      C:.word 0
5  .text
6      LDR R0,=A
7      LDR R1,=B
8      LDR R2,=C
9      MOV R6,#5
10     LOOP:
11         LDR R3,[R0],#4
12         LDR R4,[R1],#4
13         MUL R5,R3,R4
14         STR R5,[R2],#4
15         SUB R6,R6,#1
16         CMP R6,#0
17         BEQ L1
18         B LOOP
19     L1:
20         SWI 0x11
21     .end
```

### Output Screenshot (Code, Register, Memory window)



## Output Table

**a: .word 5, 10, 15, 20, 25**

**b: .word 1,2,3,4,5**

```
c: .word 0, 0, 0, 0, 0
```

After Execution The content of array C is

5	00000005
20	00000014
45	0000002D
80	00000050
125	0000007D

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Name: R Sharmila	SRN: PES2UG19CS309	Section: E
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Date: 19-02-2021

Week: 4

Program Number: 3a

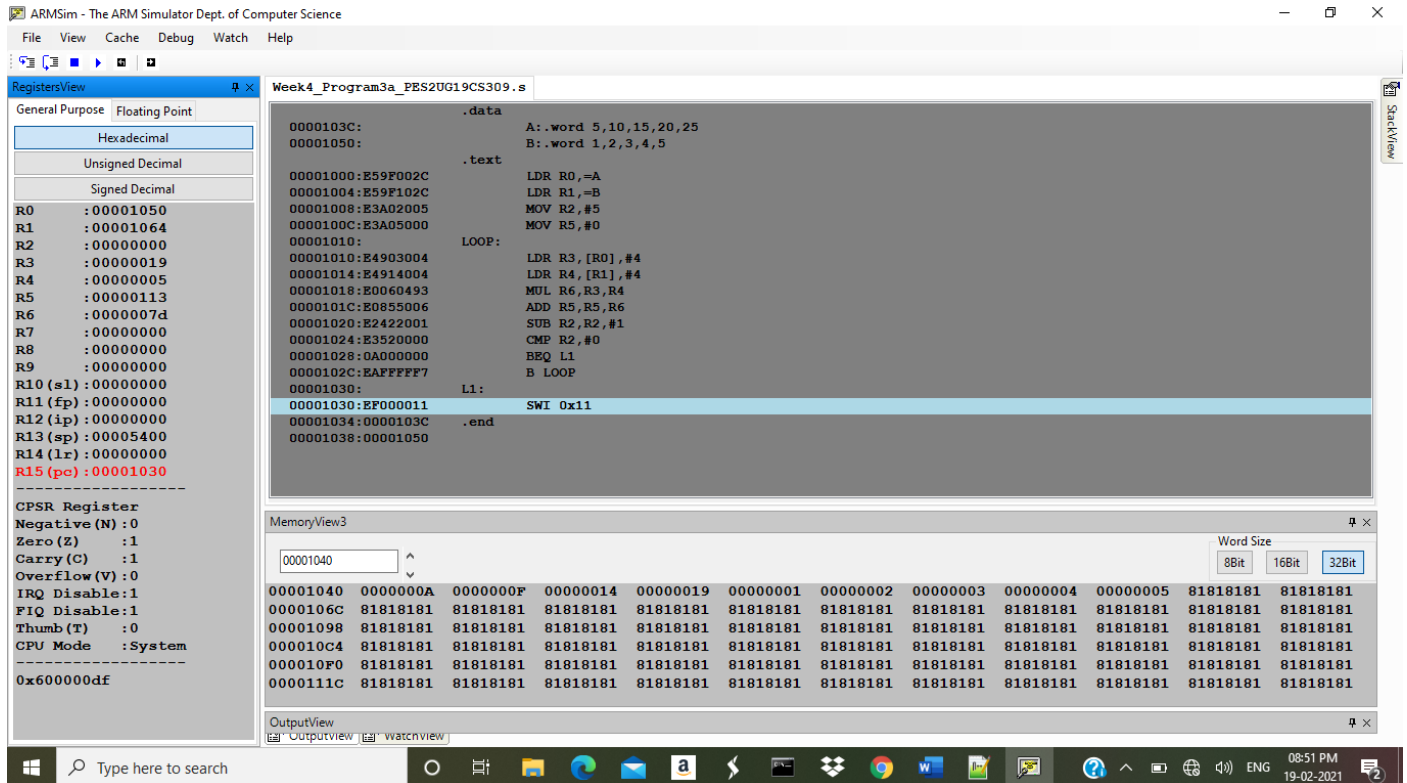
Title of the Program :

**Write an ALP to perform Convolution using MUL instruction (Addition of multiplication of respective numbers of loc A and loc B) such that the value  $\sum(a[i]*b[i])$  is computed.**

**ARM Assembly Code for Program**

```
C:\Users\sharm\Desktop\4th sem\Micropr...
File Edit Search View Encoding Language Settings To
Macro Run Plugins Window ?
Week4_Program3a_PES2UG19CS309.s Week4_Program3b_P
1 .data
2 A:.word 5,10,15,20,25
3 B:.word 1,2,3,4,5
4 .text
5 LDR R0,=A
6 LDR R1,=B
7 MOV R2,#5
8 MOV R5,#0
9 LOOP:
10 LDR R3,[R0],#4
11 LDR R4,[R1],#4
12 MUL R6,R3,R4
13 ADD R5,R5,R6
14 SUB R2,R2,#1
15 CMP R2,#0
16 BEQ L1
17 B LOOP
18 L1:
19 SWI 0x11
20 .end
21
```

# Output Screenshot (Code, Register, Memory window)



## Output Table

	<b>a: .word 5, 10, 15, 20, 25</b>
	<b>b: .word 1,2,3,4,5</b>
R5	$(5*1)+(10*2)+(15*3)+(20*4)+(25*5)$ $= 275 = 0x0113$

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Name: R Sharmila	SRN: PES2UG19CS309	Section: E
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Date: 19-02-2021

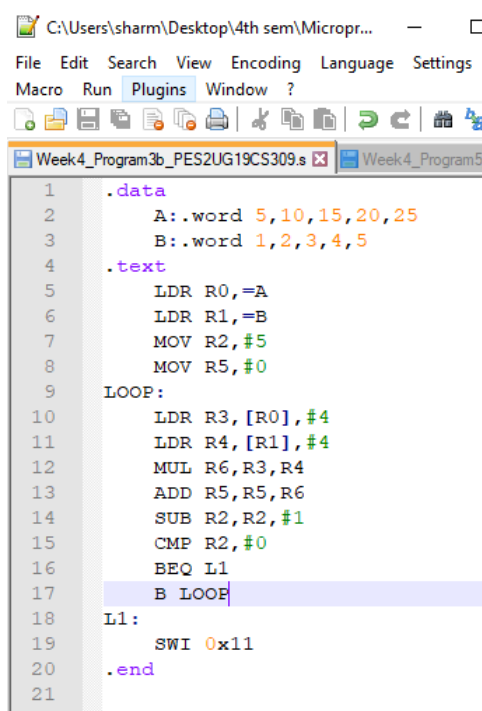
Week: 4

Program Number: 3b

Title of the Program :

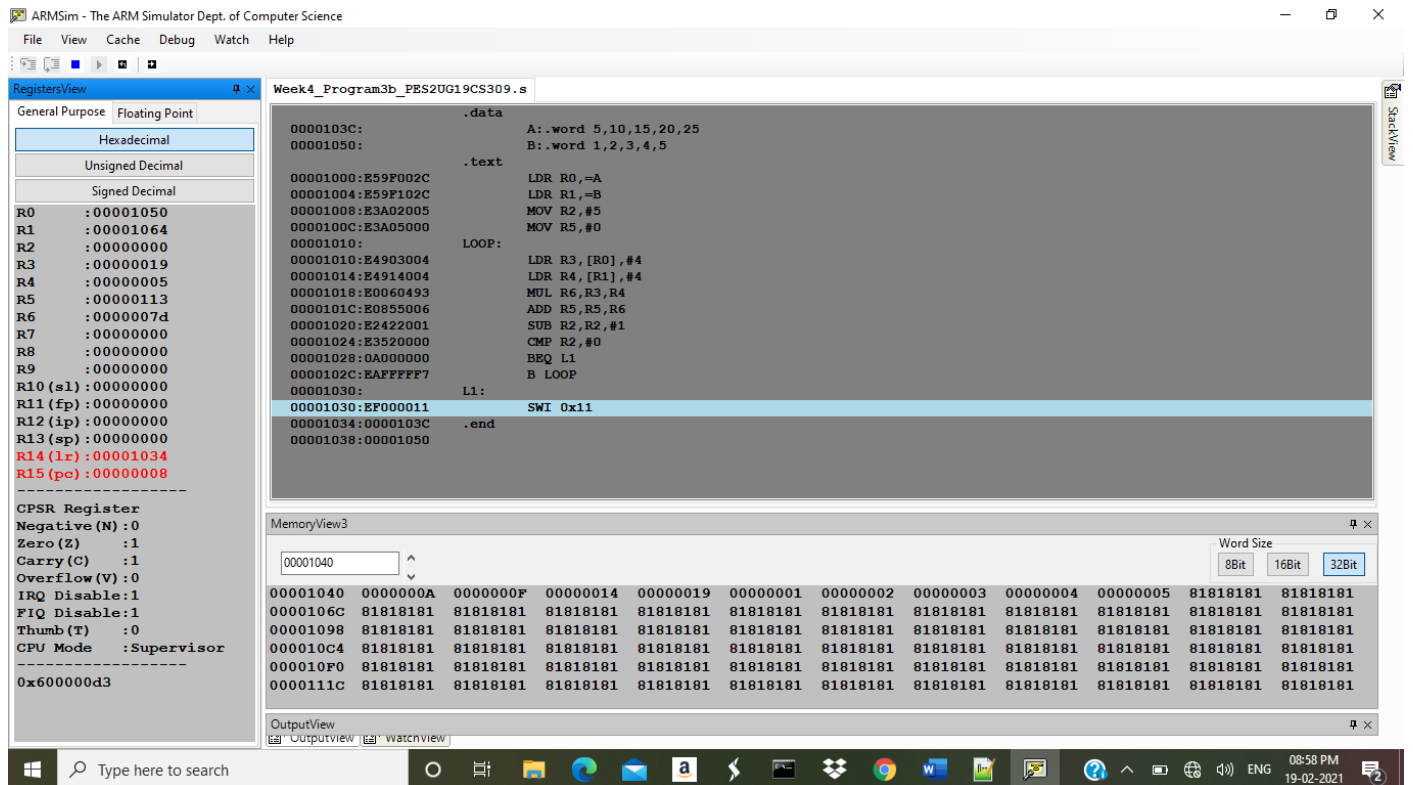
**Write an ALP to perform Convolution using MLA instruction  
(Addition of multiplication of respective numbers of loc A and  
loc B).**

## ARM Assembly Code for Program



```
1  .data
2      A:.word 5,10,15,20,25
3      B:.word 1,2,3,4,5
4  .text
5      LDR R0,=A
6      LDR R1,=B
7      MOV R2,#5
8      MOV R5,#0
9  LOOP:
10     LDR R3,[R0],#4
11     LDR R4,[R1],#4
12     MUL R6,R3,R4
13     ADD R5,R5,R6
14     SUB R2,R2,#1
15     CMP R2,#0
16     BEQ L1
17     B LOOP
18 L1:
19     SWI 0x11
20 .end
21
```

# Output Screenshot (Code, Register, Memory window)



## Output Table

	<b>a: .word 5, 10, 15, 20, 25</b>
	<b>b: .word 1,2,3,4,5</b>
R5	$(5*1)+(10*2)+(15*3)+(20*4)+(25*5)$ $= 275 = 0x0113$



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Date: 19-02-2021

Week: 4

Program Number: 4

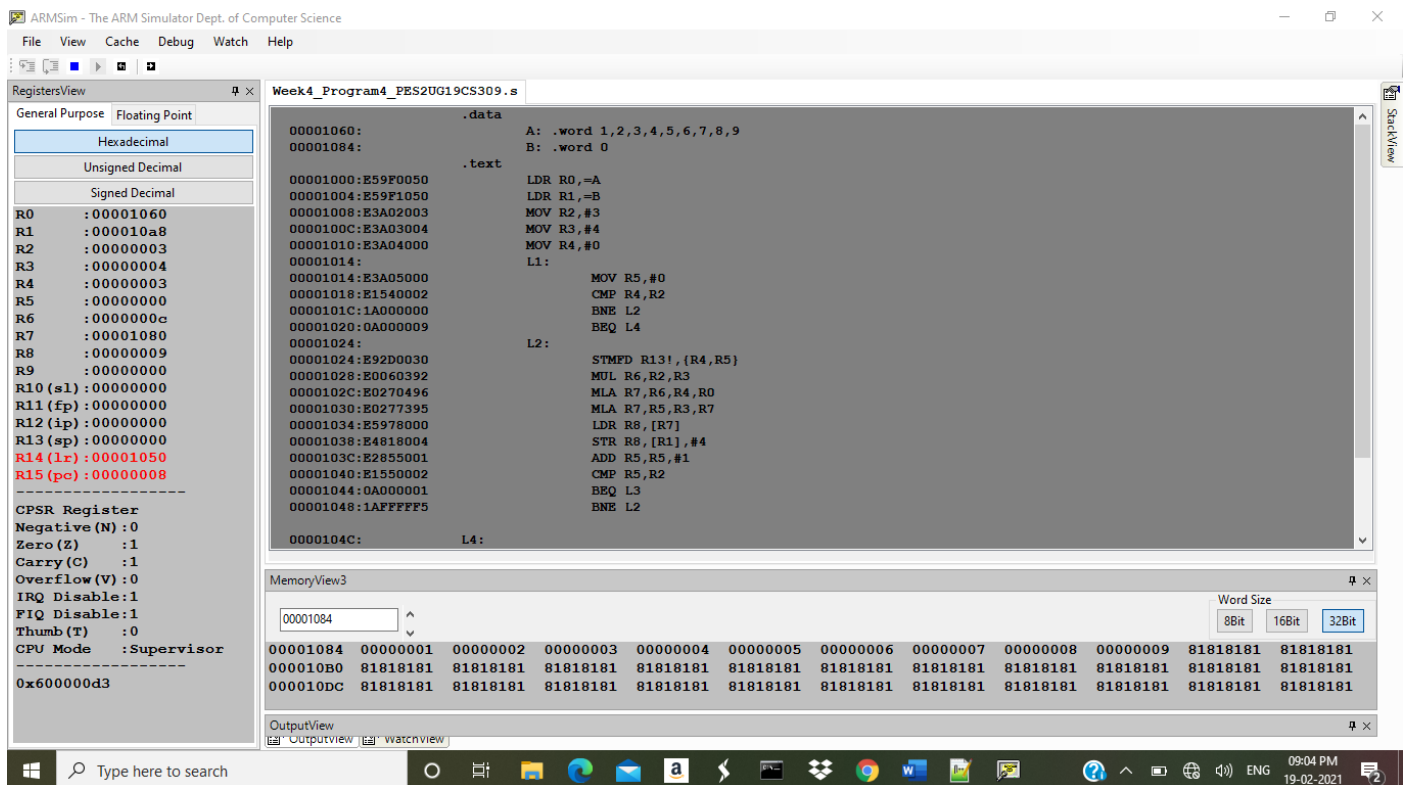
Title of the Program :

**Write an ALP to read from a 2D array such that  $B=a[i][j]$**

## ARM Assembly Code for Program

```
C:\Users\sharm\Desktop\4th sem\Micropr...
File Edit Search View Encoding Language Settings Too
Macro Run Plugins Window ?
Week4_Program4_PES2UG19CS309.s Week4_Program1_PES2
1 .data
2 A: .word 1,2,3,4,5,6,7,8,9
3 B: .word 0
4 .text
5 LDR R0,=A
6 LDR R1,=B
7 MOV R2,#3
8 MOV R3,#4
9 MOV R4,#0
10 L1:
11 MOV R5,#0
12 CMP R4,R2
13 BNE L2
14 BEQ L4
15 L2:
16 STMFD R13!,{R4,R5}
17 MUL R6,R2,R3
18 MLA R7,R6,R4,R0
19 MLA R7,R5,R3,R7
20 LDR R8,[R7]
21 STR R8,[R1],#4
22 ADD R5,R5,#1
23 CMP R5,R2
24 BEQ L3
25 BNE L2
26
27 L4:
28 SWI 0x011
29 L3:
30 ADD R4,R4,#1
31 B L1
32 .end
```

# Output Screenshot (Code, Register, Memory window)



## Output Table

Before execution	a:.word 1,2,3,4,5,6,7,8,9	b:.word 0
After Execution	00000001	00000001
	00000002	00000002
	00000003	00000003
	00000004	00000004
	00000005	00000005
	00000006	00000006
	00000007	00000007
	00000008	00000008
	00000009	00000009

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Date: 19-02-2021

Week: 4

Program Number: 5

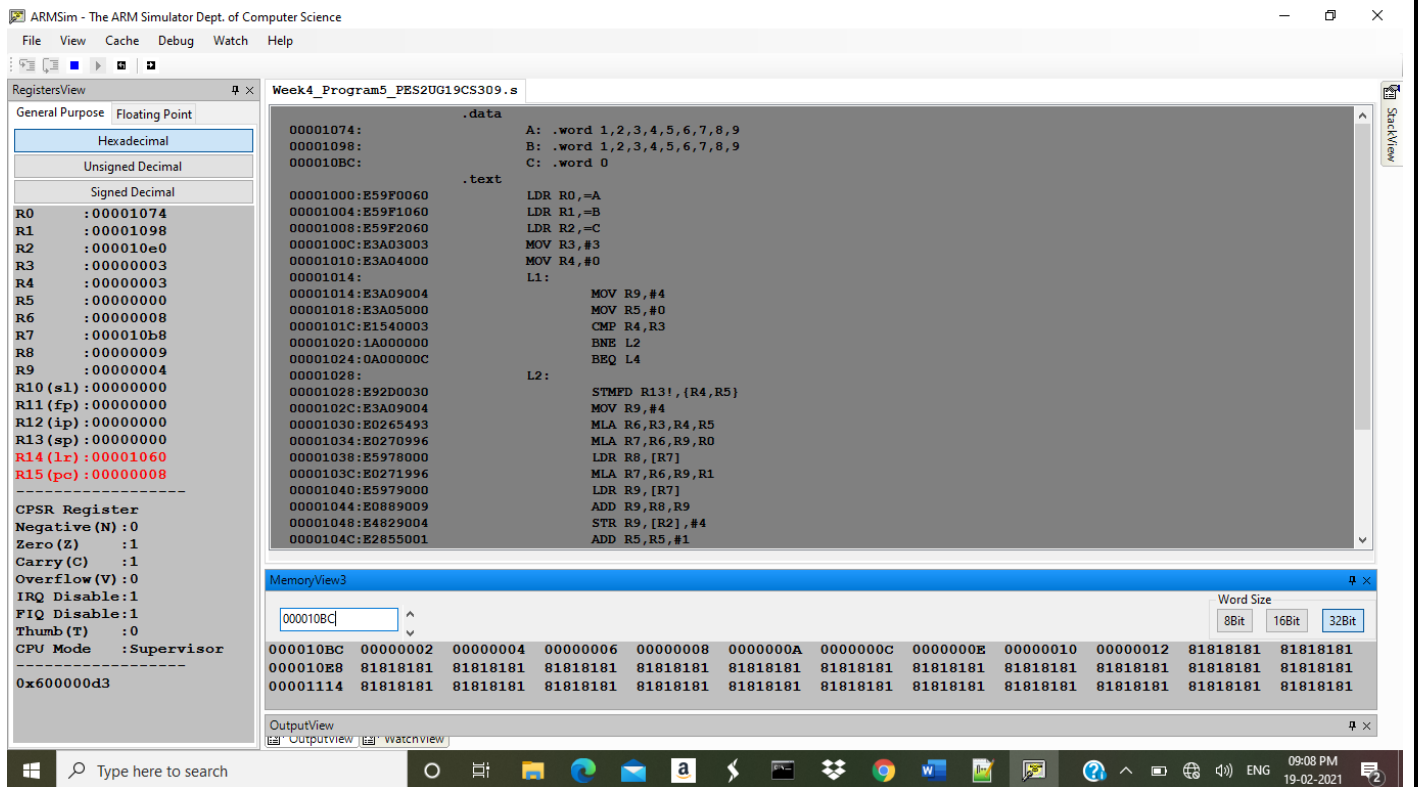
Title of the Program :

**Write an ALP to implement  $C[i][j] = a[i][j] + b[i][j]$**

## ARM Assembly Code for Program

```
C:\Users\sharm\Desktop\4th sem\Microprocessor\Lab work\MPC
File Edit Search View Encoding Language Settings Tool:
Week4_Program5_PES2UG19CS309.s Week4_Program6_PES2
1 .data
2 A: .word 1,2,3,4,5,6,7,8,9
3 B: .word 1,2,3,4,5,6,7,8,9
4 C: .word 0
5 .text
6 LDR R0,=A
7 LDR R1,=B
8 LDR R2,=C
9 MOV R3,#3
10 MOV R4,#0
11 L1:
12 MOV R9,#4
13 MOV R5,#0
14 CMP R4,R3
15 BNE L2
16 BEQ L4
17 L2:
18 STMFD R13!,{R4,R5}
19 MOV R9,#4
20 MLA R6,R3,R4,R5
21 MLA R7,R6,R9,R0
22 LDR R8,[R7]
23 MLA R7,R6,R9,R1
24 LDR R9,[R7]
25 ADD R9,R8,R9
26 STR R9,[R2],#4
27 ADD R5,R5,#1
28 CMP R5,R3
29 BEQ L3
30 BNE L2
31 L4:SWI 0x011
32 L3:ADD R4,R4,#1
33 B L1
34 end
```

# Output Screenshot (Code, Register, Memory window)



## Output Table

Before execution	a:.word 1,2,3,4,5,6,7,8,9	b:.word 1,2,3,4,5,6,7,8,9	c:.word 0
After Execution	00000001	00000001	00000002
	00000002	00000002	00000004
	00000003	00000003	00000006
	00000004	00000004	00000008
	00000005	00000005	0000000A
	00000006	00000006	0000000C
	00000007	00000007	0000000E
	00000008	00000008	00000010
	00000009	00000009	00000012

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Date: 19-02-2021

Week: 4

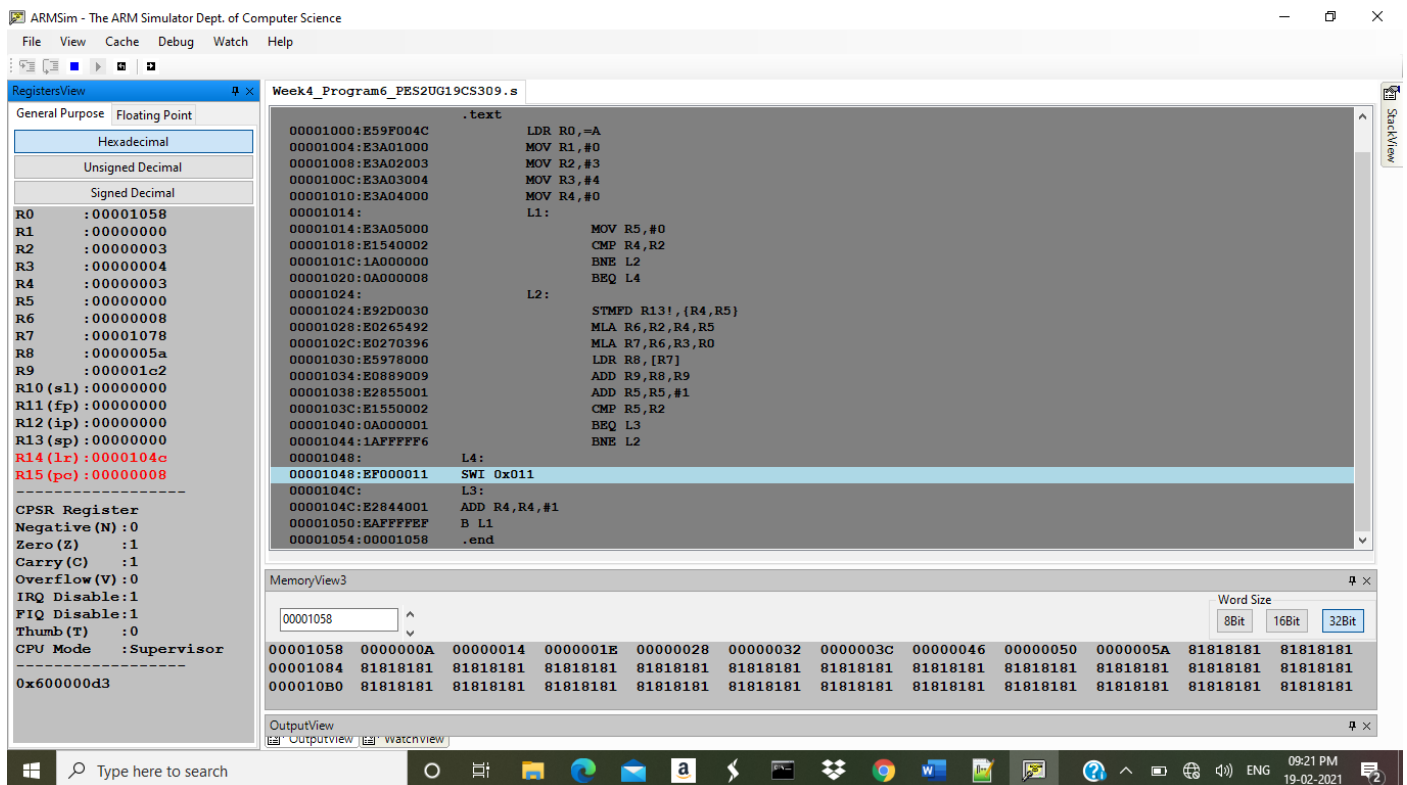
Program Number: 6

Title of the Program :

## ARM Assembly Code for Program

```
C:\Users\sharm\Desktop\4th sem\Microprocessor\Lab w...
File Edit Search View Encoding Language Settings Tools Ma
Plugins Window ?
Week4_Program6_PES2UG19CS309.s
1 .data
2 A: .word 10,20,30,40,50,60,70,80,
3 .text
4 LDR R0,=A
5 MOV R1,#0
6 MOV R2,#3
7 MOV R3,#4
8 MOV R4,#0
9 L1:
10 MOV R5,#0
11 CMP R4,R2
12 BNE L2
13 BEQ L4
14 L2:
15 STMFD R13!,{R4,R5}
16 MLA R6,R2,R4,R5
17 MLA R7,R6,R3,R0
18 LDR R8,[R7]
19 ADD R9,R8,R9
20 ADD R5,R5,#1
21 CMP R5,R2
22 BEQ L3
23 BNE L2
24 L4:
25 SWI 0x011
26 L3:
27 ADD R4,R4,#1
28 B L1
29 .end
```

# Output Screenshot (Code, Register, Memory window)



## Output Table

Before execution	a:.word 10,20,30,40,50,60,70,80,90		
After Execution	Addition result	450	1C2

### **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.

Name: R Sharmila

Signature: Sharmila

SRN: PES2UG19CS309

Section: E

Date: 19-02-2021