Microprocessor and Computer Architecture

UE23CS251B

4th Semester, Academic Year 2024-25

Date: 26/01/2025

Name: Keerthan P.V	SRN: PES2UG23CS272	Section: 4E

Week: 2 Program Number:1

Title of the Program

Write an ALP using ARM7TDMI to perform to multiplication of 16X31 without using mul instructions.

(Hint: barrel shit instructions.)

(Hint: barrel shifter instructions.)

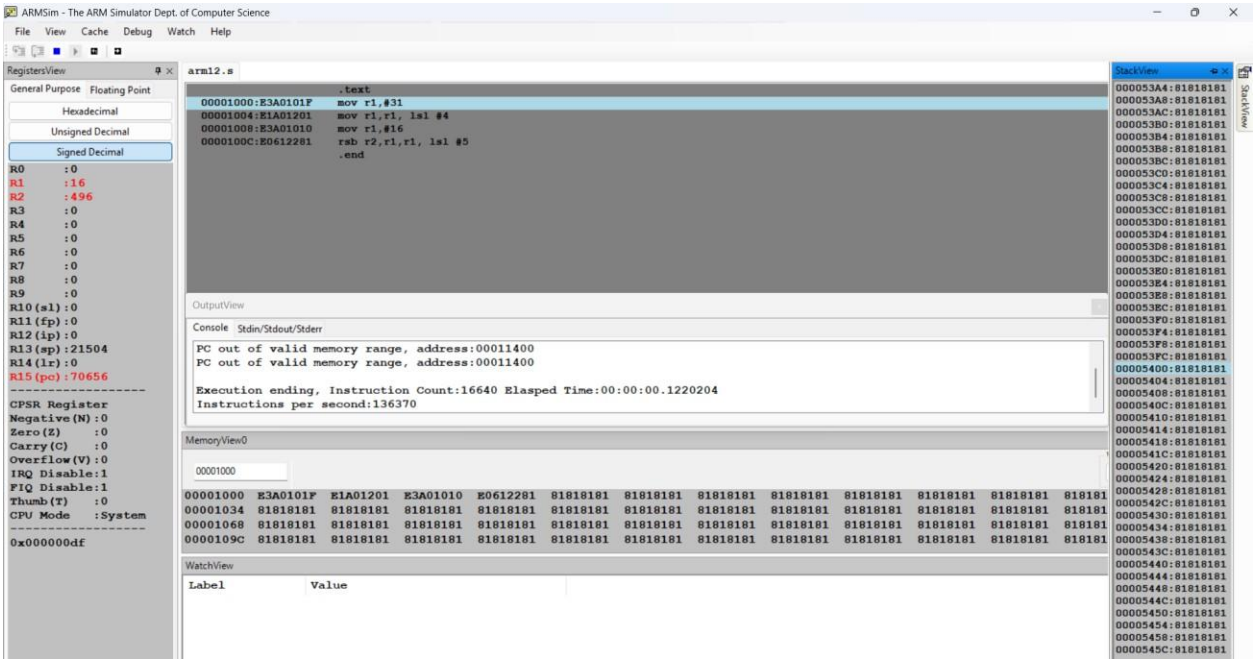
(Note :any number can be considered as multiplier)

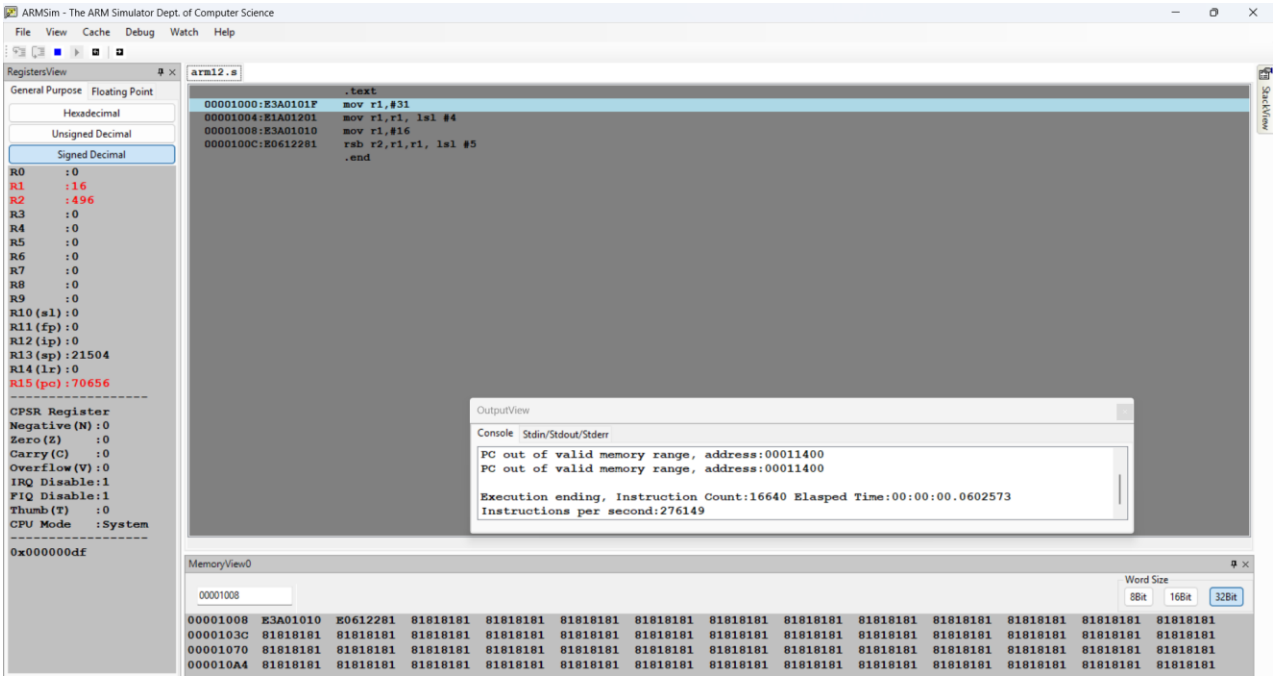
I. ARM Assembly Code(1)

```
.text
mov r1,#31 mov
r1,r1, lsl #4 mov
r1,#16
rsb r2,r1,r1, lsl #5
.end
```

II. Output Screen Shots (2)

- Case 1 16 is the Multiplier
- Case 2 31 is the Multiplier





Week :2 Program Number: 2

Title of the Program

Write an ALP using ARM7TDMI to Classify the given set of numbers as positive OR negative and also store them in different memory locations.

.data

A: .word 1,2,3,4,-1,5,-2,-3,6,0

POS: .word 0,0,0,0,0,0,0,0,0,0

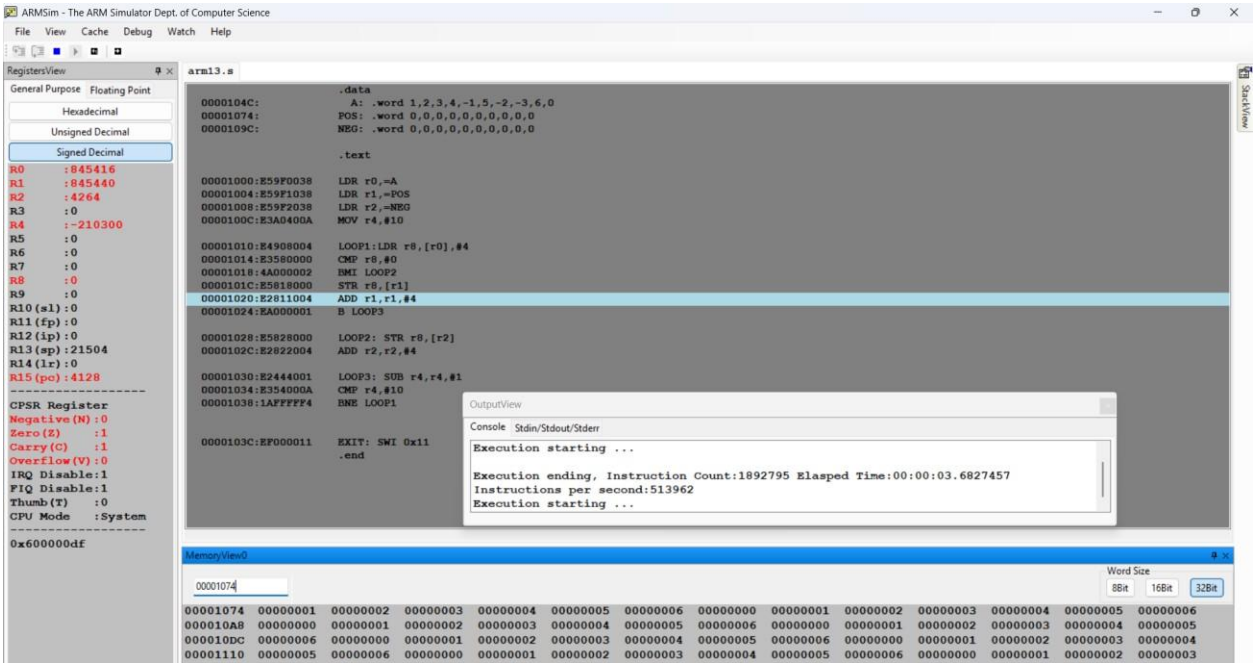
NEG: .word 0,0,0,0,0,0,0,0,0,0

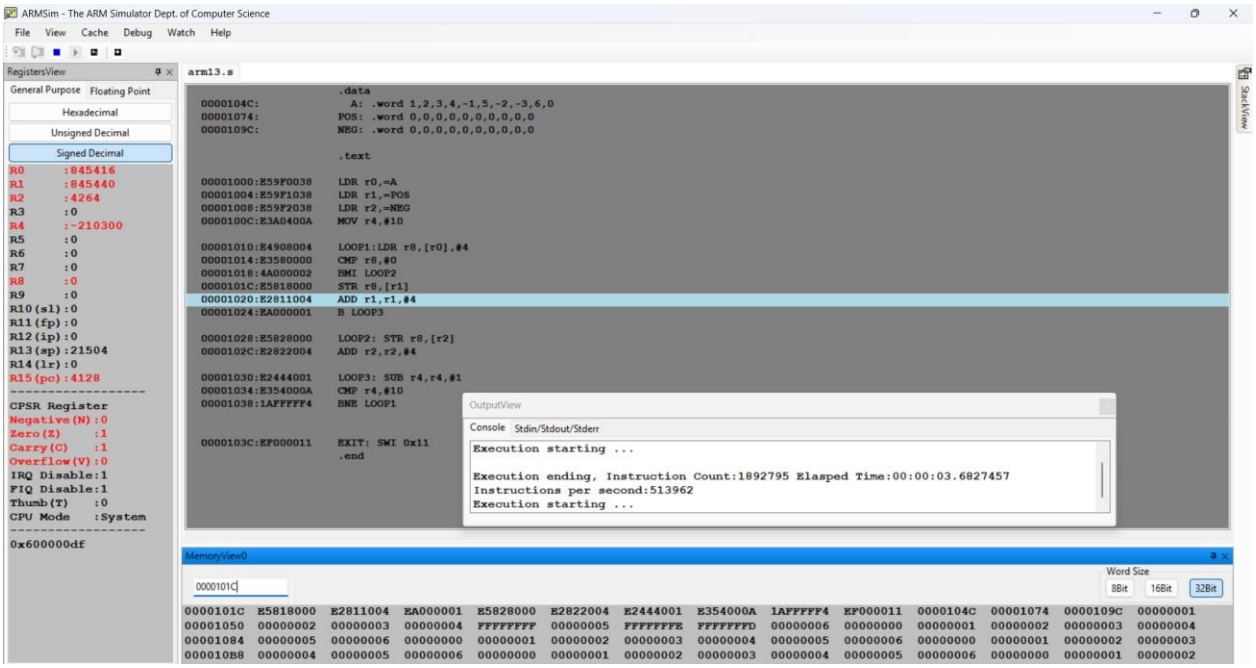
I. ARM Assembly Code(1)

```
.data
 A: .word 1,2,3,4,-1,5,-2,-3,6,0
POS: .word 0,0,0,0,0,0,0,0,0,0
NEG: .word 0,0,0,0,0,0,0,0,0,0
 .text

LDR r0,=A
LDR r1,=POS
LDR r2,=NEG
MOV r4,#10

LOOP1:LDR r8,[r0],#4
CMP r8,#0
BMI LOOP2
STR r8,[r1]
ADD r1,r1,#4
B LOOP3
```

```
LOOP2: STR r8,[r2]
ADD r2,r2,#4

LOOP3: SUB r4,r4,#1
CMP r4,#10
BNE LOOP1


EXIT: SWI 0x11
.end
```

II. Output Screen Shots (1)





Week :2 Program Number: 3

Title of the Program

Write an ALP using ARM7TDMI to add only negative numbers stored in memory location for a given set of numbers(having both positive and negative numbers) and store the sum of negative numbers in the memory location.

.DATA

Array:.WORD 1,2,3,4,-1,5,-2,-3,6,0 negsum:.WORD

I. ARM Assembly Code(1)

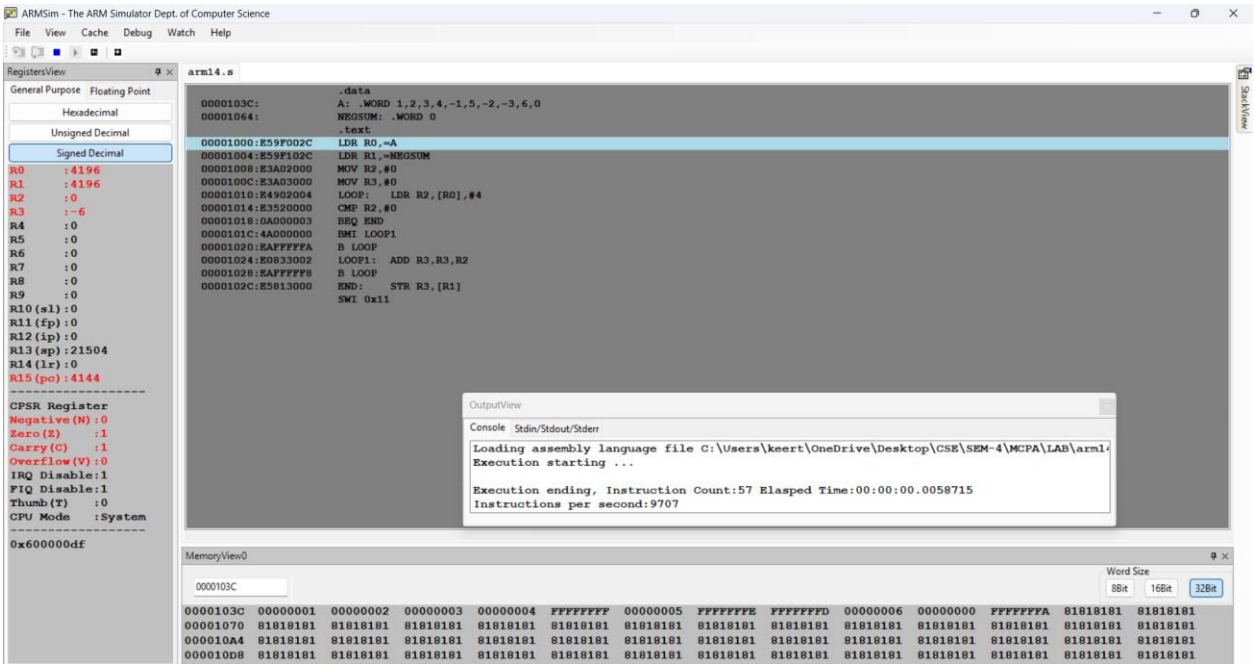
.data

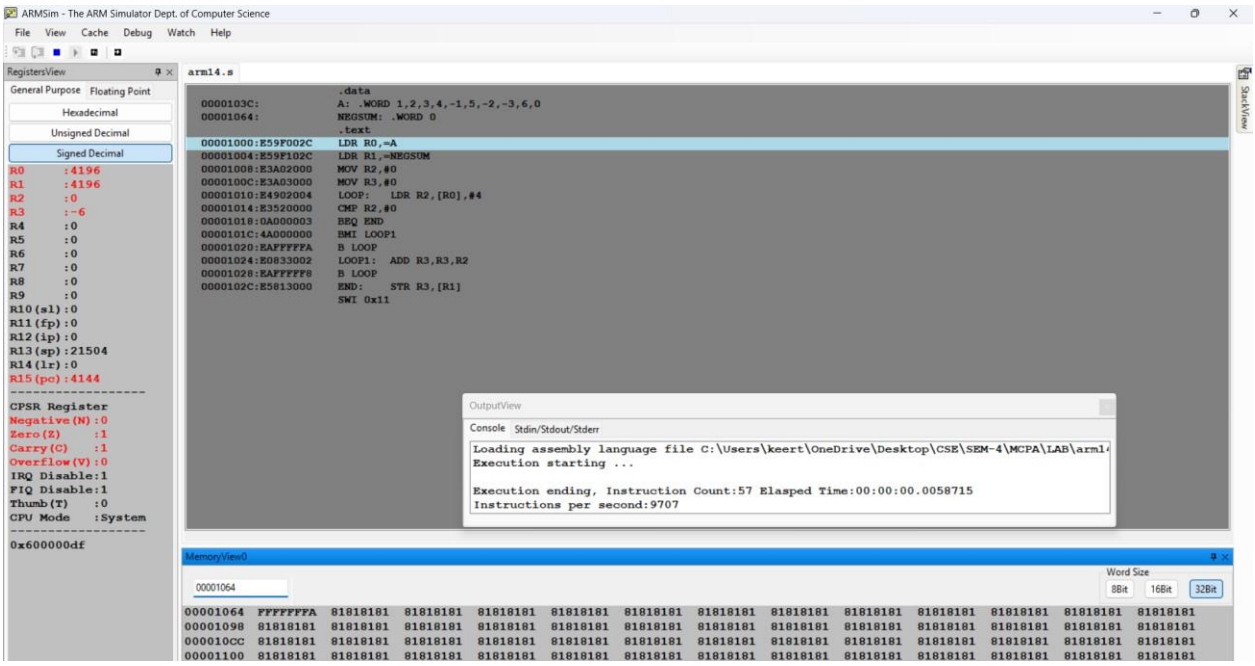
a:.word **1,2,3,4,-1,5,-2,-3,6,0**

negsum:.word 0

```
.text

ldr r0,=a ldr
r1,=negsum
mov r4,#10
mov r2,#0
loop:
ldr  r8,[r0],#4
cmp      r8,#0
bmi   addsum
sub   r4,r4,#1
cmp      r4,#0
bne loop
str r2,[r1]
swi 0x11

addsum: .word 0,0,0,0,0,0,0,0,0,0
.end
```

II. Output Screen Shots (1)


ARMSim - The ARM Simulator Dept. of Computer Science
File View Cache Debug Watch Help
RegistersView
General Purpose Floating Point
Hexadecimal
Unsigned Decimal
Signed Decimal
R0 :4196
R1 :4196
R2 :0
R3 :-6
R4 :0
R5 :0
R6 :0
R7 :0
R8 :0
R9 :0
R10(sl):0
R11(fp):0
R12(ip):0
R13(sp):21504
R14(lr):0
R15(pc):4144
CPSR Register
Negative(N):0
Zero(Z) :1
Carry(C) :1
Overflow(V):0
IRQ Disable:1
FIQ Disable:1
Thumb(T) :0
CPU Mode :System
0x600000df
arm14.s
.data
0000103C: A: .WORD 1,2,3,4,-1,5,-2,-3,6,0
00001064: NEGSUM: .WORD 0
.text
00001000:E59F002C LDR R0,=A
00001004:E59F102C LDR R1,=NEGSUM
00001008:E3A02000 MOV R2,#0
0000100C:E3A03000 MOV R3,#0
00001010:E4902004 LOOP: LDR R2,[R0],#4
00001014:E3520000 CMP R2,#0
00001018:0A000003 BEQ END
0000101C:4A000000 BMI LOOP1
00001020:EAFFFFFA B LOOP
00001024:E0833002 LOOP1: ADD R3,R3,R2
00001028:EAFFFFF8 B LOOP
0000102C:E5813000 END: STR R3,[R1]
SWI 0x11
OutputView
Console Stdin/Stdout/Stderr
Loading assembly language file C:\Users\keert\OneDrive\Desktop\CSE\SEM-4\MCPA\LAB\arm1
Execution starting ...
Execution ending, Instruction Count:57 Elasped Time:00:00:00.0058715
Instructions per second:9707
MemoryView0
0000103C
Word Size
8Bit 16Bit 32Bit
0000103C 00000001 00000002 00000003 00000004 FFFFFFFF 00000005 FFFFFFFE FFFFFFFD 00000006 00000000 FFFFFFFA 81818181 81818181
00001070 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181
000010A4 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181
000010D8 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181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General Purpose Floating Point
Hexadecimal
Unsigned Decimal
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R6 :0
R7 :0
R8 :0
R9 :0
R10(sl):0
R11(fp):0
R12(ip):0
R13(sp):21504
R14(lr):0
R15(pc):4144
CPSR Register
Negative(N):0
Zero(Z) :1
Carry(C) :1
Overflow(V):0
IRQ Disable:1
FIQ Disable:1
Thumb(T) :0
CPU Mode :System
0x600000df
arm14.s
.data
0000103C: A: .WORD 1,2,3,4,-1,5,-2,-3,6,0
00001064: NEGSUM: .WORD 0
.text
00001000:E59F002C LDR R0,=A
00001004:E59F102C LDR R1,=NEGSUM
00001008:E3A02000 MOV R2,#0
0000100C:E3A03000 MOV R3,#0
00001010:E4902004 LOOP: LDR R2,[R0],#4
00001014:E3520000 CMP R2,#0
00001018:0A000003 BEQ END
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00001020:EAFFFFFA B LOOP
00001024:E0833002 LOOP1: ADD R3,R3,R2
00001028:EAFFFFF8 B LOOP
0000102C:E5813000 END: STR R3,[R1]
SWI 0x11
OutputView
Console Stdin/Stdout/Stderr
Loading assembly language file C:\Users\keert\OneDrive\Desktop\CSE\SEM-4\MCPA\LAB\arm1
Execution starting ...
Execution ending, Instruction Count:57 Elasped Time:00:00:00.0058715
Instructions per second:9707
MemoryView0
00001064
Word Size
8Bit 16Bit 32Bit
00001064 FFFFFFFA 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181
00001098 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181
000010CC 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181
00001100 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181 81818181

Week :2 Program Number: 4

Title of the Program

Write an ALP using ARM7TDMI to find the smallest number from a given set of numbers:

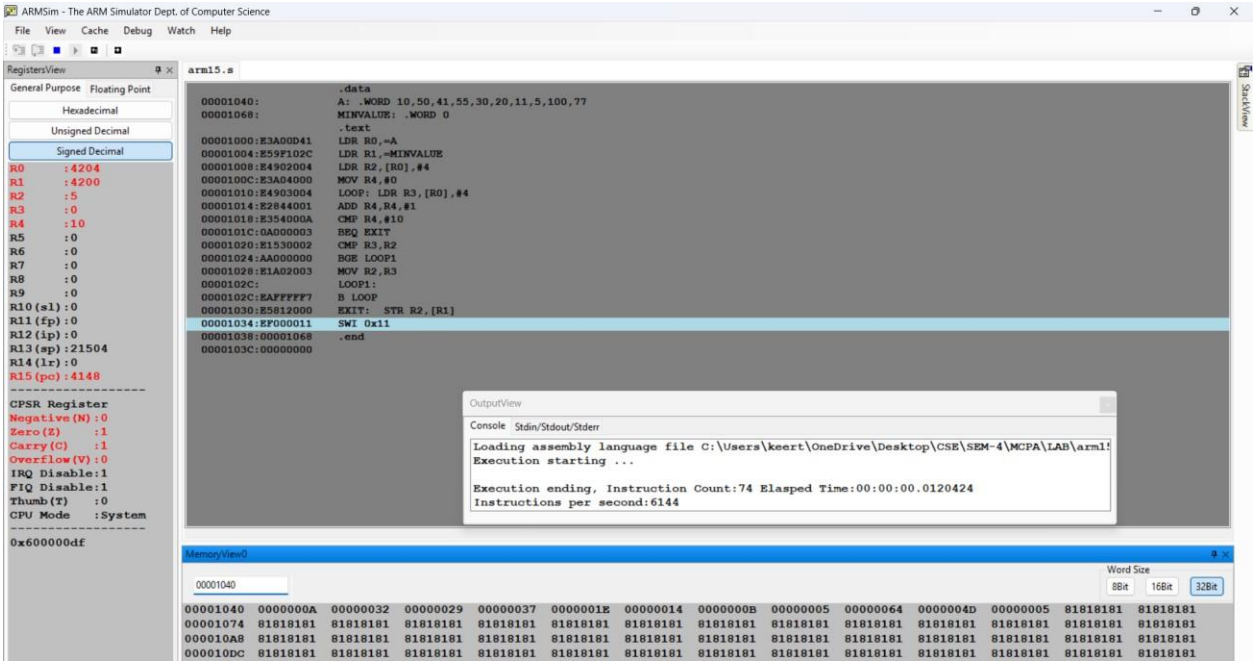
A: .word 10,50,41,55,30,20,11,5,100,77

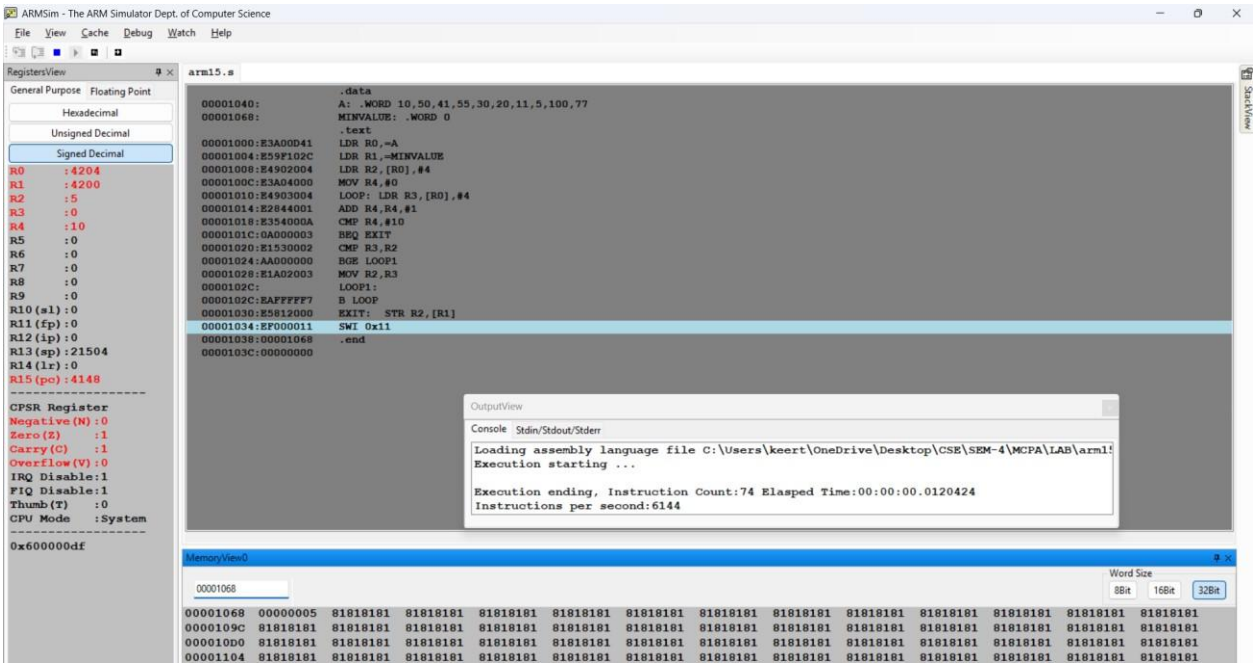
I. ARM Assembly Code(1)

```
.data
A: .WORD 10,50,41,55,30,20,11,5,100,77
MINVALUE: .WORD 0
.text
LDR R0,=A
LDR R1,=MINVALUE
LDR R2,[R0],#4
MOV R4,#0
LOOP: LDR R3,[R0],#4
ADD R4,R4,#1
CMP R4,#10
BEQ EXIT
CMP R3,R2
BGE LOOP1  MOV
R2,R3  LOOP1:
B LOOP
```

```
EXIT:  STR R2,[R1]
SWI 0x11
.end
```

II. Output Screen Shot (1)





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

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Section: 4E

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