Microprocessor and Computer Architecture

UE22CS251B

LAB-5

4th Semester, Academic Year 2023-2024

Date:15-02-2024

Name: V V Mohith	SRN:-PES2UG22CS641	Section:-K

Week#____5_____

PROGRAM :- 1

Write an ALP to multiply 2 matrices. (3X3)

COMMANDS:-

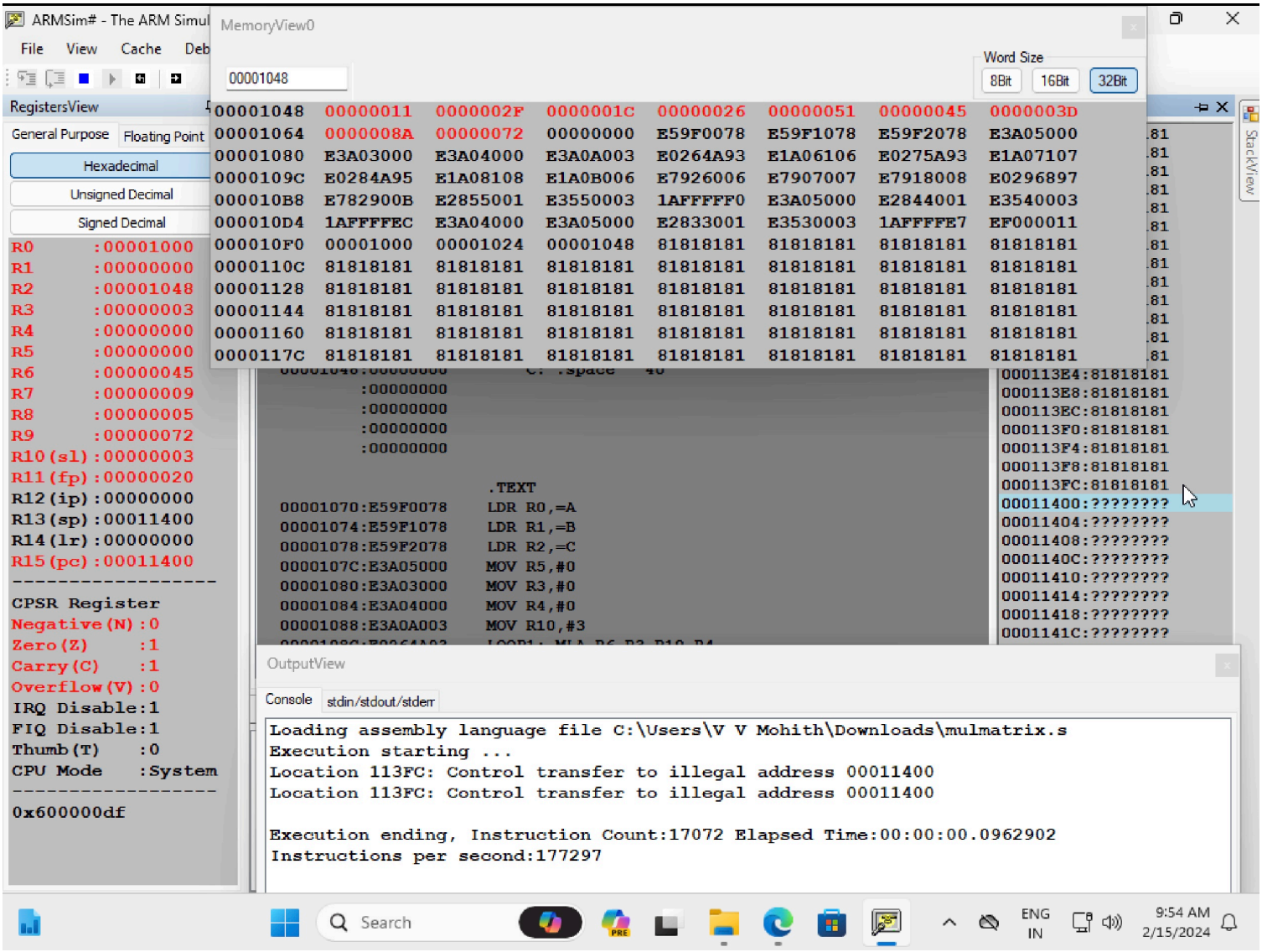
```
.data
    A: .word   1,2,3,4,5,6,7,8,9
    B: .word   1,1,2,2,3,3,4,4,5
    C: .space  40

.TEXT
```

```
    LDR R0, =A
    LDR R1, =B
    LDR R2, =C
    MOV R5, #0
    MOV R3, #0
    MOV R4, #0
    MOV R10, #3
LOOP1:
    MLA R6, R3, R10, R4
    MOV R6, R6, LSL #2
    MLA R7, R3, R10, R5
    MOV R7, R7, LSL #2
    MLA R8, R5, R10, R4
    MOV R8, R8, LSL #2
    MOV R11, R6
    LDR R6, [R2, R6]
    LDR R7, [R0, R7]
    LDR R8, [R1, R8]
    MLA R9, R7, R8, R6
    STR R9, [R2, R11]
    ADD R5, R5, #1
```

```
CMP R5, #3
BNE LOOP1
MOV R5, #0
ADD R4, R4, #1
CMP R4, #3
BNE LOOP1
MOV R4, #0
MOV R5, #0
ADD R3, R3, #1
CMP R3, #3
BNE LOOP1
SWI 0x011
```

OUTPUT SCREENSHOT:



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PROGRAM :-2

Write an ALP using conditional ARM instructions to sort an array of numbers using Bubble Sort Algorithm.

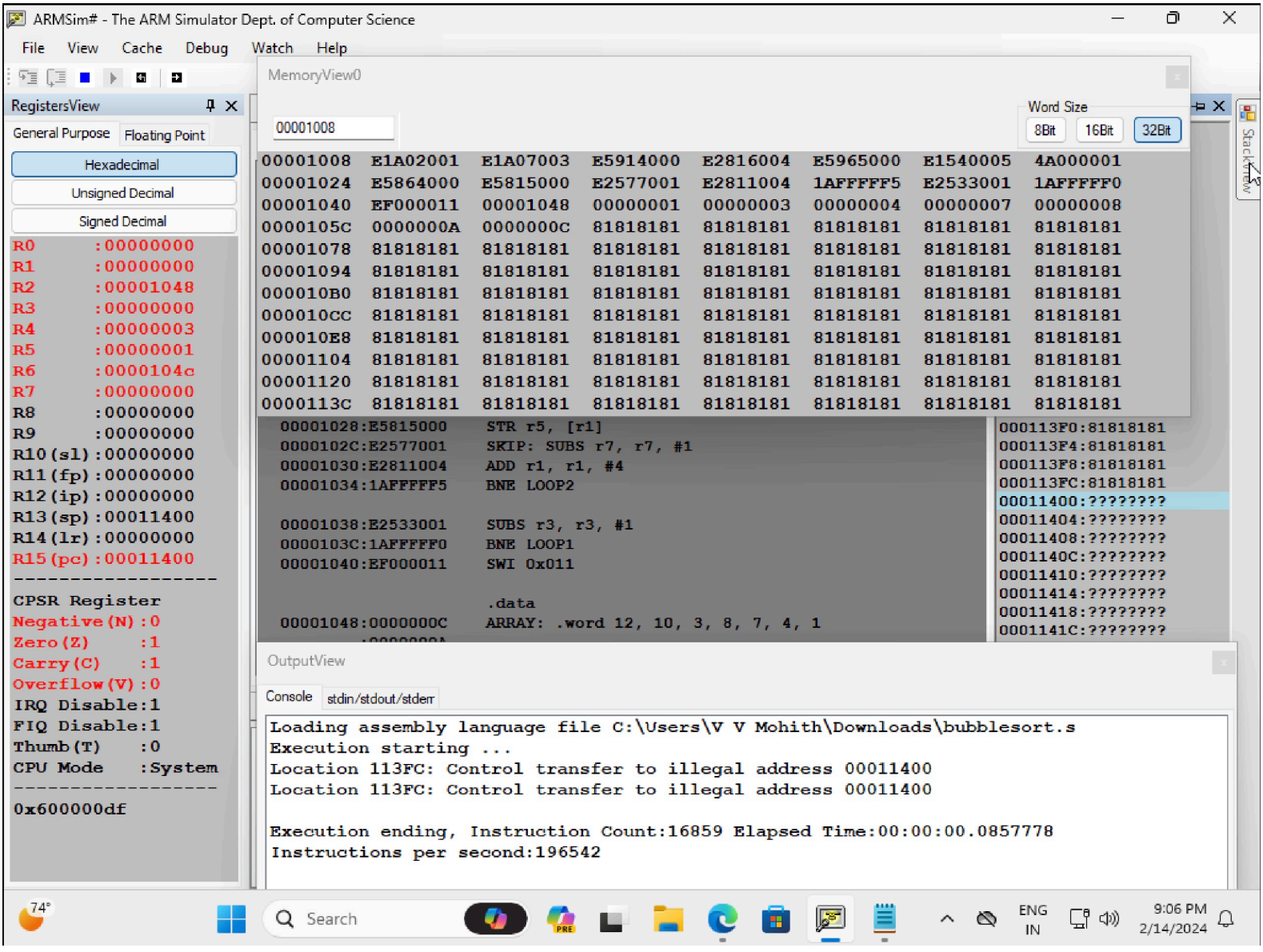
Commands:-

```
.data
ARRAY: .word 12, 10, 3, 8, 7, 4, 1


.text
.global _start
_start:
    MOV r3, #6


LOOP1:
```

```
    LDR r1, =ARRAY
    MOV r2, r1
    MOV r7, r3

LOOP2:
    LDR r4, [r1]
    ADD r6, r1, #4
    LDR r5, [r6]
    CMP r4, r5
    BLE NO_SWAP

    STR r5, [r1]
    STR r4, [r6]

NO_SWAP:
    SUBS r7, r7, #1
    ADD r1, r1, #4
    BNE LOOP2

    SUBS r3, r3, #1
    BNE LOOP1
```

SWI 0x11

OUTPUT SCREENSHOT:



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(assignment question)PROGRAM:-1

Write a program to swap the first and last character of a given string.

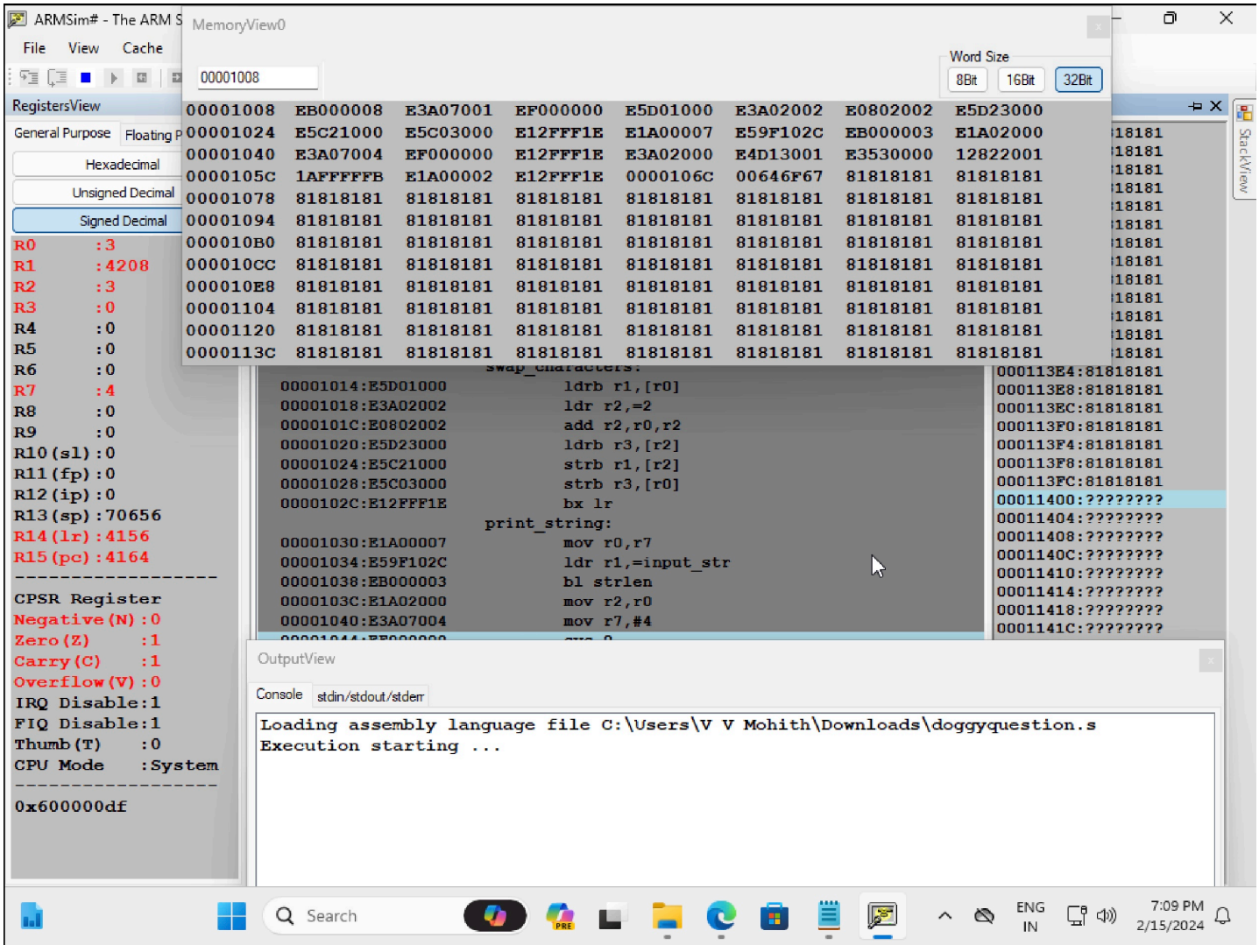
COMMANDS:-

```
        .data
input_str: .asciz “dog”
        .text
        .global main
main:
        ldr r0,=input_str
        bl swap_characters
        bl print_string
        mov r7,#1
        svc 0
swap_characters:
```

```
        ldrb r1,[r0]
        ldr r2,=2
        add r2,r0,r2
        ldrb r3,[r2]
        strb r1,[r2]
        strb r3,[r0]
        bx lr
print_string:
        mov r0,r7
        ldr r1,=input_str
        bl strlen
        mov r2,r0
        mov r7,#4
        svc 0
        bx lr
strlen:
        mov r2,#0
loop:
```

```
ldrb r3,[r1],#1
cmp r3,#0
addne r2,r2,#1
bne loop
mov r0,r2
bx lr
```

OUTPUTSCREESHOT:-



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(assignment question)PROGRAM:-2

Given a c Code convert it in its equivalent Arm Code.

a)x = (a + b) - c;

```
    LDR  r1, [a]
   LDR  r2, [b]
   ADD  r3, r1, r2
   LDR  r4, [c]
   SUB  r0, r3, r4
```

```
STR  r0, [x]
```

b)z = (a << 2) I(b & 15);

```
  LDR  r5, [a]
LSL  r5, r5, #2
LDR  r6, [b]
AND  r6, r6, #15
ORR  r0, r5, r6
STR  r0, [z]
```

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:

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