Department of Computer Science & Engineering
Microprocessor & Computer Architecture
MPCA-Laboratory/Assignment/Hands-on/Project UE20CS252

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WEEK_NO: 05

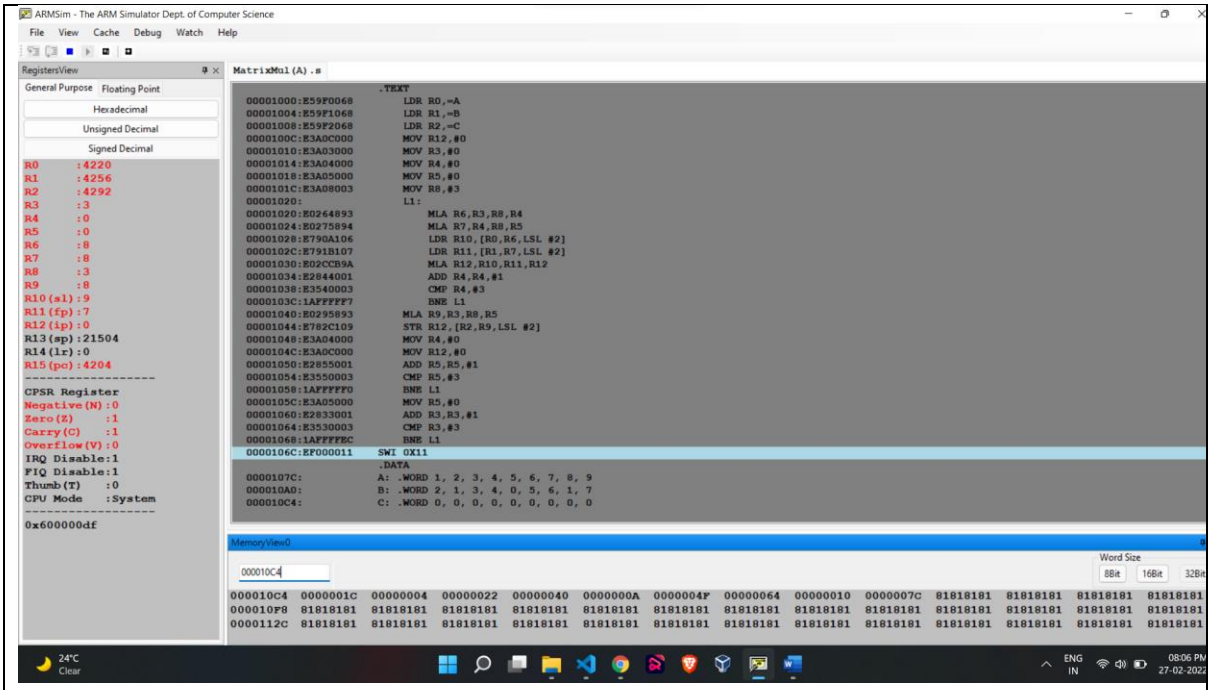
1. Write a program in ARM7TDMI-ISA to multiply 2 matrices of order3.
i.e., implement c[i][j]=c[i][j] + a[i][j] x b[i][j].
a. Use MLA instruction

```
.TEXT
   LDR R0,=A
   LDR R1,=B
   LDR R2,=C
   MOV R12,#0
   MOV R3,#0
   MOV R4,#0
   MOV R5,#0
   MOV R8,#3
   L1:
      MLA R6,R3,R8,R4
      MLA R7,R4,R8,R5
      LDR R10,[R0,R6,LSL #2]
      LDR R11,[R1,R7,LSL #2]
      MLA R12,R10,R11,R12
      ADD R4,R4,#1
      CMP R4,#3
      BNE L1
   MLA R9,R3,R8,R5
   STR R12,[R2,R9,LSL #2]
   MOV R4,#0
   MOV R12,#0
   ADD R5,R5,#1
   CMP R5,#3
   BNE L1
   MOV R5,#0
   ADD R3,R3,#1
   CMP R3,#3
   BNE L1

SWI 0X11

.DATA
A: .WORD 1, 2, 3, 4, 5, 6, 7, 8, 9
B: .WORD 2, 1, 3, 4, 0, 5, 6, 1, 7
C: .WORD 0, 0, 0, 0, 0, 0, 0, 0, 0
```

OUTPUT SCREENSHOT:

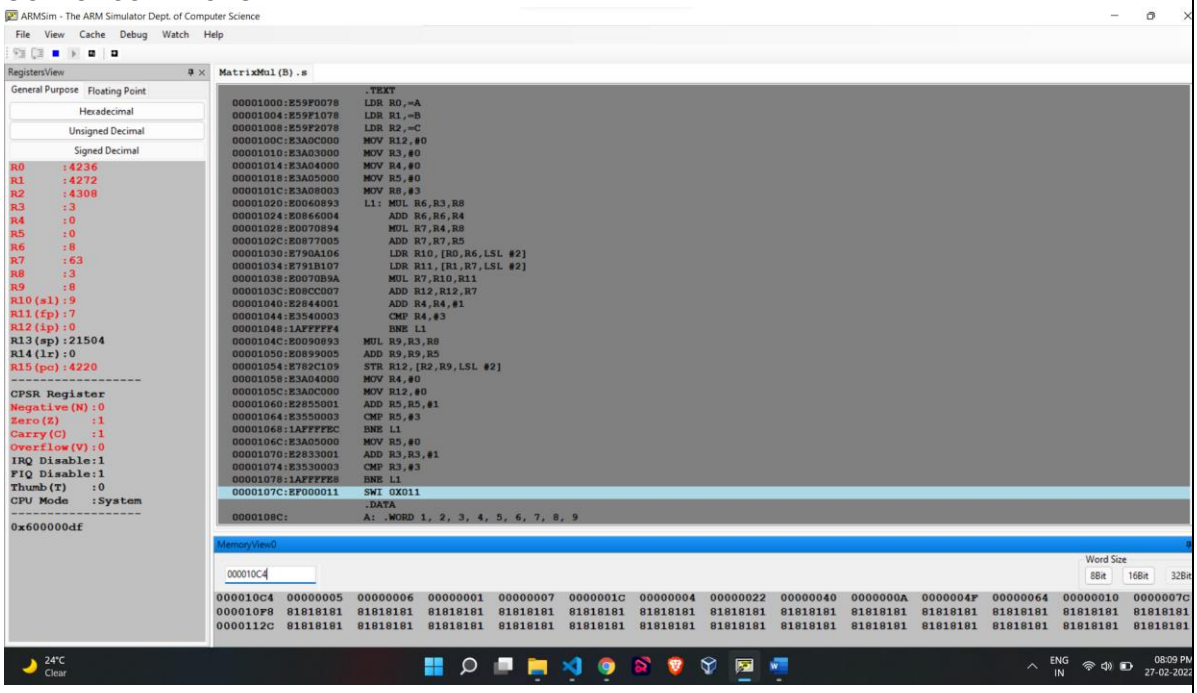


b. Use MUL instruction

```
.TEXT
LDR R0,=A
LDR R1,=B
LDR R2,=C
MOV R12,#0
MOV R3,#0
MOV R4,#0
MOV R5,#0
MOV R8,#3
L1: MUL R6,R3,R8
   ADD R6,R6,R4
   MUL R7,R4,R8
   ADD R7,R7,R5
   LDR R10,[R0,R6,LSL #2]
   LDR R11,[R1,R7,LSL #2]
   MUL R7,R10,R11
   ADD R12,R12,R7
   ADD R4,R4,#1
   CMP R4,#3
   BNE L1
MUL R9,R3,R8
ADD R9,R9,R5
STR R12,[R2,R9,LSL #2]
MOV R4,#0
MOV R12,#0
ADD R5,R5,#1
CMP R5,#3
BNE L1
MOV R5,#0
```

ADD R3,R3,#1
CMP R3,#3
BNE L1
SWI 0X011
.DATA
A: .WORD 1, 2, 3, 4, 5, 6, 7, 8, 9
B: .WORD 2, 1, 3, 4, 0, 5, 6, 1, 7
C: .WORD 0, 0, 0, 0, 0, 0, 0, 0, 0

OUTPUT SCREENSHOT:



2. Write a program in ARM7TDMI-ISA to find the NORM of a square matrix of order n

Code:

.TEXT

LDR R0,=A
LDR R9,=SUM
MOV R1,#0
MOV R2,#0
MOV R3,#3
MOV R4,#0
MOV R8,#0

LOOP:MLA R5,R3,R1,R2
MOV R5,R5,LSL #2
LDR R6,[R0,R5]

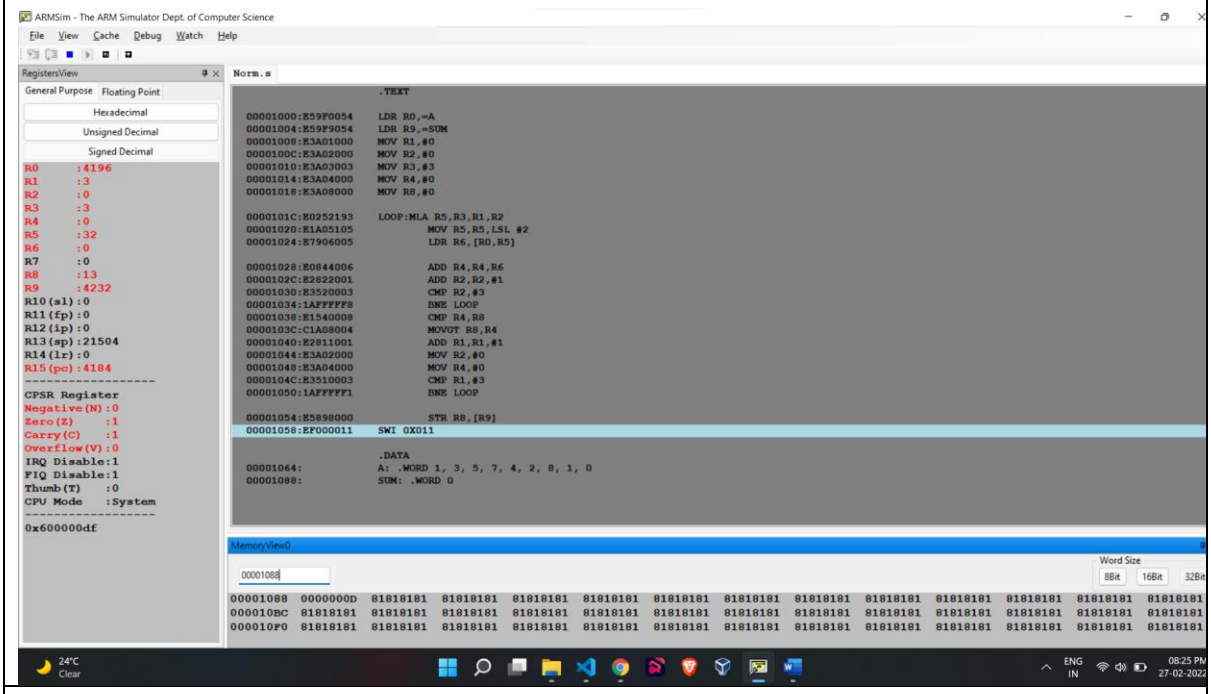
ADD R4,R4,R6

```
        ADD R2,R2,#1
        CMP R2,#3
        BNE LOOP
        CMP R4,R8
        MOVGT R8,R4
        ADD R1,R1,#1
        MOV R2,#0
        MOV R4,#0
        CMP R1,#3
        BNE LOOP

        STR R8,[R9]
SWI 0X011

.DATA
A: .WORD 1, 3, 5, 7, 4, 2, 8, 1, 0
SUM: .WORD 0
```

OUTPUT SCREENSHOT



3. Write a program in ARM7TDMI-ISA to find the ROWSUM of a matrix.

CODE:

```
.TEXT

LDR R0,=A
LDR R9,=SUM

MOV R1,#0
```

```
MOV R2,#0

MOV R3,#3

MOV R4,#0

LOOP:MLA R5,R3,R1,R2
        MOV R5,R5,LSL #2
        LDR R6,[R0,R5]

        ADD R4,R4,R6
        ADD R2,R2,#1
        CMP R2,#3
        BNE LOOP
        STR R4,[R9],#4
        ADD R1,R1,#1
        MOV R2,#0
        MOV R4,#0
        CMP R1,#3
        BNE LOOP


SWI 0X011

.DATA
A: .WORD 1, 2, 3, 4, 5, 6, 7, 8, 9
SUM: .WORD 0, 0, 0
```