Microprocessor and Computer Architecture Laboratory

UE19CS256

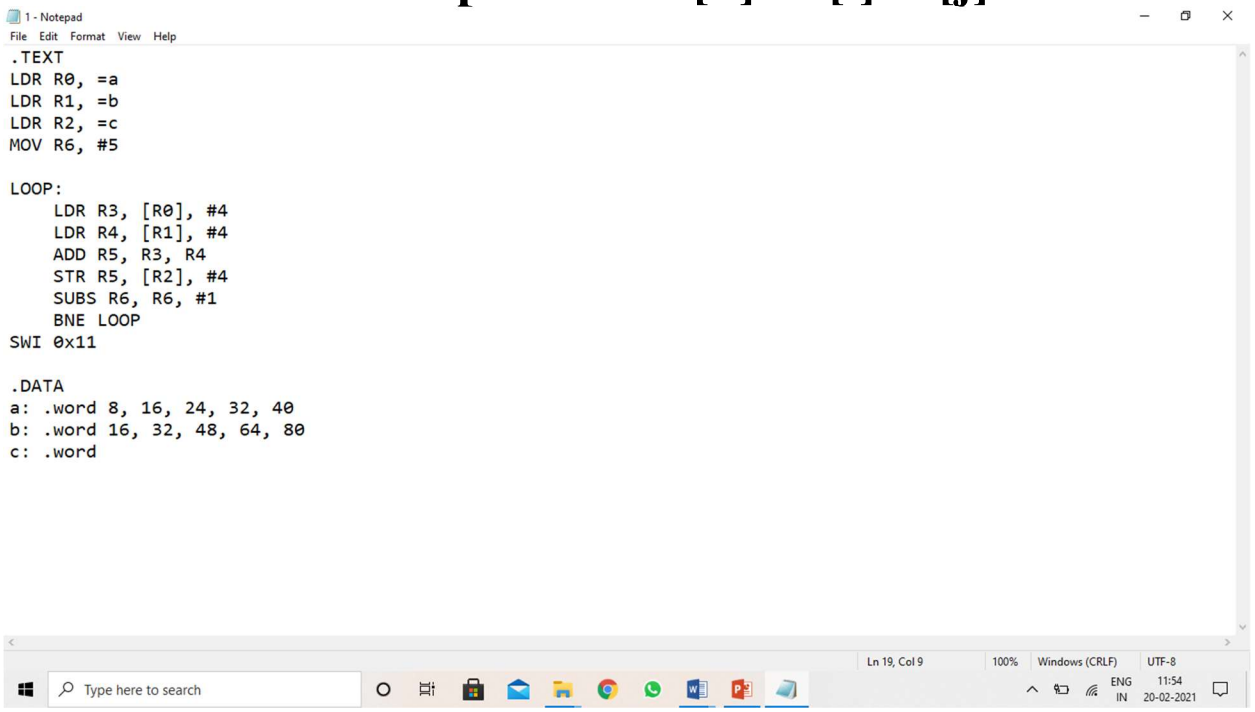
4th Semester, Academic Year 2020-21

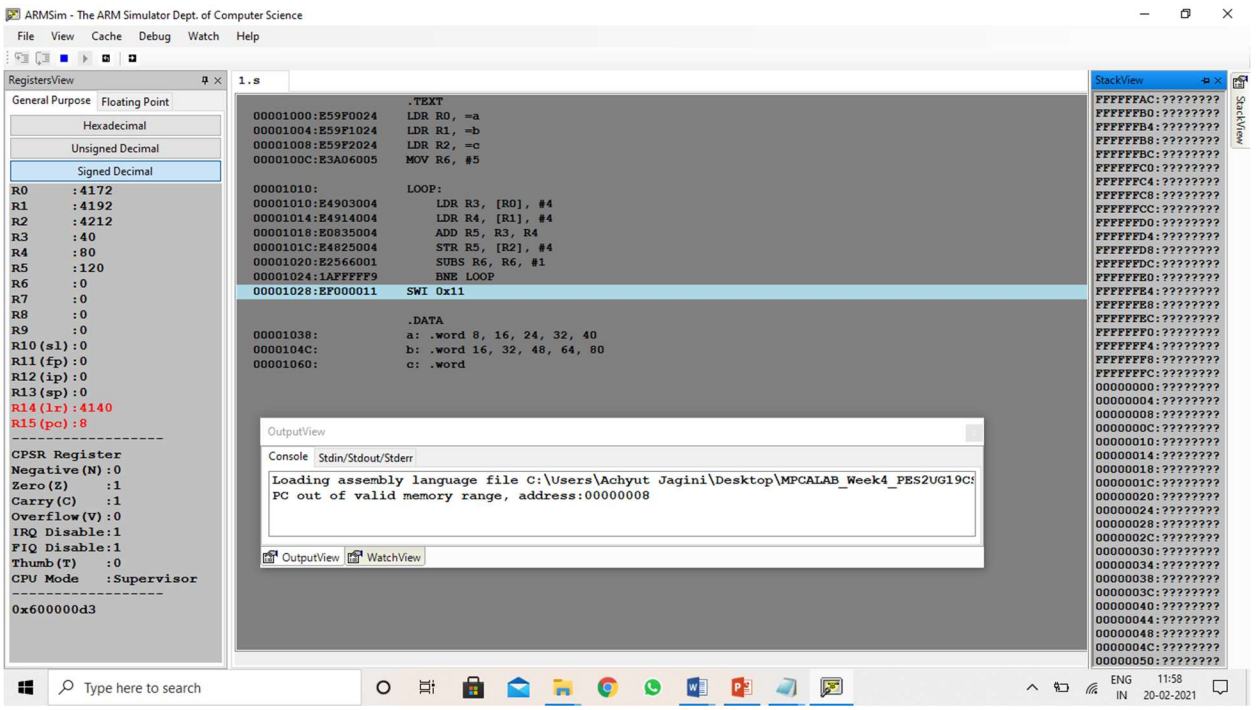
Date:

Name: Achyut Jagini	SRN:PES2UG19CS013	Section A

Week#____4_____ Program Number: ____1__

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





Microprocessor and Computer Architecture Laboratory

UE19CS256

4th Semester, Academic Year 2020-21

Date:

Name:	SRN:	Section

Week#____4_____ Program Number: ____2__

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

2 - Notepad

File Edit Format View Help

```
.TEXT
LDR R0, =a
LDR R1, =b
LDR R2, =c
MOV R6, #5

LOOP:
    LDR R3, [R0], #4
    LDR R4, [R1], #4
    MUL R5, R3, R4
    STR R5, [R2], #4
    SUB R6, R6, #1
    CMP R6, #0
    BNE LOOP
SWI 0x11

.DATA
a: .word 8, 16, 24, 32, 40
b: .word 16, 32, 48, 64, 80
c: .word
```

Ln 20, Col 9 100% Windows (CRLF) UTF-8

Type here to search ENG IN 12:01 20-02-2021

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      :4176
R1      :4196
R2      :4216
R3      :40
R4      :80
R5      :3200
R6      :0
R7      :0
R8      :0
R9      :0
R10(sl):0
R11(fp):0
R12(ip):0
R13(sp):0
R14(lr):4144
R15(pc):8
-----------------
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   :Supervisor
-----------------
0x600000d3
```

2.s

```
                    .TEXT
00001000:E59F0028   LDR R0, =a
00001004:E59F1028   LDR R1, =b
00001008:E59F2028   LDR R2, =c
0000100C:E3A06005   MOV R6, #5

00001010:           LOOP:
00001010:E4903004       LDR R3, [R0], #4
00001014:E4914004       LDR R4, [R1], #4
00001018:E0050493       MUL R5, R3, R4
0000101C:E4825004       STR R5, [R2], #4
00001020:E2466001       SUB R6, R6, #1
00001024:E3560000       CMP R6, #0
00001028:1AFFFFF8       BNE LOOP
0000102C:EF000011   SWI 0x11

                    .DATA
0000103C:           a: .word 8, 16, 24, 32, 40
00001050:           b: .word 16, 32, 48, 64, 80
00001064:           c: .word
```

StackView

OutputView

Console | Stdin/Stdout/Stderr

```
Loading assembly language file C:\Users\Achyut Jagini\Desktop\MPCALAB_Week4_PES2UG19CS
Execution starting ...
PC out of valid memory range, address:00000008

Execution ending, Instruction Count:0 Elasped Time:00:00:00.0294204
Instructions per second:0
```

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Microprocessor and Computer Architecture Laboratory

UE19CS256

4th Semester, Academic Year 2020-21

Date:

Name:	SRN:	Section

Week#____4_____ Program Number: ____3__

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

A

3a - Notepad

File Edit Format View Help

```
.TEXT
LDR R0, =a
LDR R1, =b
MOV R2, #5
MOV R5, #0

LOOP:
    LDR R3, [R0], #4
    LDR R4, [R1], #4
    MUL R6, R3, R4
    ADD R5, R5, R6
    SUBS R2, R2, #1
    BNE LOOP
SWI 0x11

.DATA
a: .word 5, 10, 15, 20, 25
b: .word 2, 4, 6, 8, 10
c: .word
```

Ln 19, Col 9 100% Windows (CRLF) UTF-8

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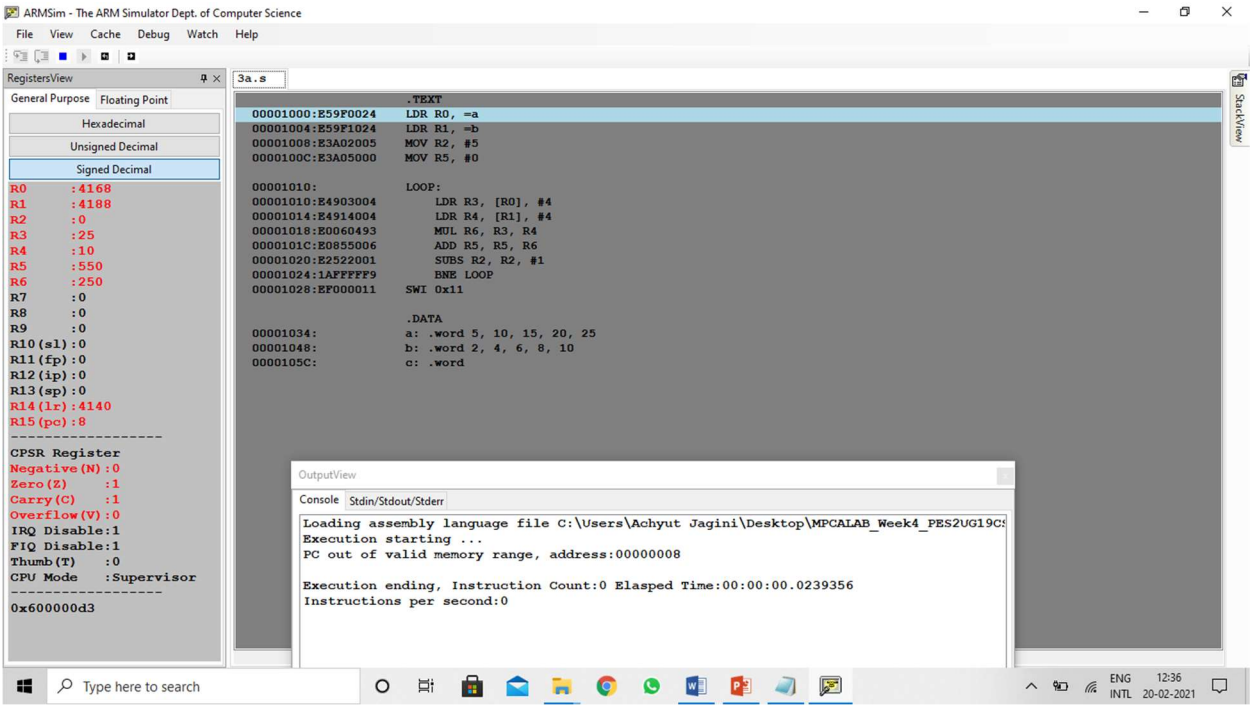

B

3b - Notepad

File Edit Format View Help

```
.TEXT
LDR R0, =a
LDR R1, =b
MOV R2, #5
MOV R5, #0

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 5, 10, 15, 20, 25
b: .word 2, 4, 6, 8, 10
c: .word
```

Ln 18, Col 9 100% Windows (CRLF) UTF-8

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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      :4164
R1      :4184
R2      :0
R3      :25
R4      :10
R5      :550
R6      :0
R7      :0
R8      :0
R9      :0
R10(sl):0
R11(fp):0
R12(ip):0
R13(sp):0
R14(lr):4136
R15(pc):8
------------------
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   :Supervisor
------------------
0x600000d3
```

3b.s

```
                    .TEXT
00001000:E59F0020   LDR R0, =a
00001004:E59F1020   LDR R1, =b
00001008:E3A02005   MOV R2, #5
0000100C:E3A05000   MOV R5, #0

00001010:           LOOP:
00001010:E4903004       LDR R3, [R0], #4
00001014:E4914004       LDR R4, [R1], #4
00001018:E0255493       MLA R5, R3, R4, R5
0000101C:E2522001       SUBS R2, R2, #1
00001020:1AFFFFFA       BNE LOOP
00001024:EF000011   SWI 0x11

                    .DATA
00001030:           a: .word 5, 10, 15, 20, 25
00001044:           b: .word 2, 4, 6, 8, 10
00001058:           c: .word
```

OutputView

Console | Stdin/Stdout/Stderr

```
Loading assembly language file C:\Users\Achyut Jagini\Desktop\MPCALAB_Week4_PES2UG19CS
Execution starting ...
PC out of valid memory range, address:00000008

Execution ending, Instruction Count:0 Elasped Time:00:00:00.0249343
Instructions per second:0
```

StackView

Type here to search ENG INTL 12:38 20-02-2021

Microprocessor and Computer Architecture Laboratory

UE19CS256

4th Semester, Academic Year 2020-21

Date:

Name:	SRN:	Section

Week#____4_____ Program Number: ____4_

Write an ALP to read from a 2D array such that

B=a[i] [j]

4 - Notepad

File Edit Format View Help

```
.TEXT
LDR R0, =a
LDR R1, =b
MOV R2, #3 @ #Rows and #Columns (Square Matrix)
MOV R3, #4 @ Size of Word

MOV R4, #0 @ i = 0
FOR_I:
    MOV R5, #0 @ j = 0
    FOR_J:
        MLA R6, R4, R2, R5
        MLA R6, R3, R6, R0 @ Required Address of Matrix A
        LDR R7, [R6]
        MLA R6, R4, R2, R5
        MLA R6, R3, R6, R1 @ Required Address of Matrix B
        STR R7, [R6]
        ADD R5, R5, #1
        CMP R5, R2
        BNE FOR_J
    ADD R4, R4, #1
    CMP R4, R2
    BNE FOR_I
SWI 0x11

.DATA
a: .word 3, 6, 9, 12, 15, 18, 21, 24, 27
b: .word
```

Ln 1, Col 1 | 100% | Windows (CRLF) | UTF-8

Type here to search

ENG INTL 12:42 20-02-2021

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      :4180
R1      :4216
R2      :3
R3      :4
R4      :3
R5      :3
R6      :4248
R7      :27
R8      :0
R9      :0
R10(sl):0
R11(fp):0
R12(ip):0
R13(sp):0
R14(lr):4172
R15(pc):8
------------------
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   :Supervisor
------------------
0x600000d3
```

4.s

```
                    .TEXT
00001000:E59F0044   LDR R0, =a
00001004:E59F1044   LDR R1, =b
00001008:E3A02003   MOV R2, #3 @ #Rows and #Columns (Square Matrix)
0000100C:E3A03004   MOV R3, #4 @ Size of Word

00001010:E3A04000   MOV R4, #0 @ i = 0
00001014:           FOR_I:
00001014:E3A05000       MOV R5, #0 @ j = 0
00001018:               FOR_J:
00001018:E0265294           MLA R6, R4, R2, R5
0000101C:E0260693           MLA R6, R3, R6, R0 @ Required Address of Matrix A
00001020:E5967000           LDR R7, [R6]
00001024:E0265294           MLA R6, R4, R2, R5
00001028:E0261693           MLA R6, R3, R6, R1 @ Required Address of Matrix B
0000102C:E5867000           STR R7, [R6]
00001030:E2855001           ADD R5, R5, #1
00001034:E1550002           CMP R5, R2
00001038:1AFFFFF6           BNE FOR_J
0000103C:E2844001       ADD R4, R4, #1
00001040:E1540002       CMP R4, R2
00001044:1AFFFFF2       BNE FOR_I
00001048:EF000011   SWI 0x11

                    .DATA
00001054:           a: .word 3, 6, 9, 12, 15, 18, 21, 24, 27
00001078:           b: .word
```

OutputView

Console | Stdin/Stdout/Stderr

```
Loading assembly language file C:\Users\Achyut Jagini\Desktop\MPCALAB_Week4_PES2UG19CS
Execution starting ...
PC out of valid memory range, address:00000008

Execution ending, Instruction Count:0 Elasped Time:00:00:00.0199479
Instructions per second:0
```

StackView

Type here to search

ENG INTL 12:43 20-02-2021

Microprocessor and Computer Architecture Laboratory

UE19CS256

4th Semester, Academic Year 2020-21

Date:

Name:	SRN:	Section

Week#____4_____ Program Number: ____5_

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

5 - Notepad

File Edit Format View Help

```
.TEXT
LDR R0, =a
LDR R1, =b
LDR R2, =c
MOV R3, #3 @ #Rows and #Columns (Square Matrix)
MOV R4, #4 @ Size of Word

MOV R5, #0 @ i
FOR_I:
    MOV R6, #0 @ j
    FOR_J:
        MLA R7, R5, R3, R6
        MLA R7, R4, R7, R0 @ Required Address of Matrix A
        LDR R8, [R7]
        MLA R7, R5, R3, R6
        MLA R7, R4, R7, R1 @ Required Address of Matrix B
        LDR R9, [R7]
        ADD R7, R8, R9 @ Sum
        MLA R8, R5, R3, R6
        MLA R8, R4, R8, R2 @ Required Address of Matrix C
        STR R7, [R8]
        ADD R6, R6, #1
        CMP R6, R3
        BNE FOR_J
    ADD R5, R5, #1
    CMP R5, R3
    BNE FOR_I
SWI 0x11

.DATA
a: .word 3, 6, 9, 12, 15, 18, 21, 24, 27
b: .word 1, 2, 3, 4, 5, 6, 7, 8, 9
c: .word
```

Ln 33, Col 9 | 100% | Windows (CRLF) | UTF-8

Type here to search

ENG INTL 12:44 20-02-2021

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      :4204
R1      :4240
R2      :4276
R3      :3
R4      :4
R5      :3
R6      :3
R7      :36
R8      :4308
R9      :9
R10(sl):0
R11(fp):0
R12(ip):0
R13(sp):0
R14(lr):4192
R15(pc):8
------------------
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   :Supervisor
------------------
0x600000d3
```

5.s

```
                    .TEXT
 00001000:E59F0058  LDR R0, =a
 00001004:E59F1058  LDR R1, =b
 00001008:E59F2058  LDR R2, =c
 0000100C:E3A03003  MOV R3, #3 @ #Rows and #Columns (Square Matrix)
 00001010:E3A04004  MOV R4, #4 @ Size of Word

 00001014:E3A05000  MOV R5, #0 @ i
 00001018:          FOR_I:
 00001018:E3A06000      MOV R6, #0 @ j
 0000101C:              FOR_J:
 0000101C:E0276395          MLA R7, R5, R3, R6
 00001020:E0270794          MLA R7, R4, R7, R0 @ Required Address of Matrix A
 00001024:E5978000          LDR R8, [R7]
 00001028:E0276395          MLA R7, R5, R3, R6
 0000102C:E0271794          MLA R7, R4, R7, R1 @ Required Address of Matrix B
 00001030:E5979000          LDR R9, [R7]
 00001034:E0887009          ADD R7, R8, R9 @ Sum
 00001038:E0286395          MLA R8, R5, R3, R6
 0000103C:E0282894          MLA R8, R4, R8, R2 @ Required Address of Matrix C
 00001040:E5887000          STR R7, [R8]
 00001044:E2866001          ADD R6, R6, #1
 00001048:E1560003          CMP R6, R3
 0000104C:1AFFFFF2          BNE FOR_J
 00001050:E2855001      ADD R5, R5, #1
 00001054:E1550003      CMP R5, R3
 00001058:1AFFFFEE      BNE FOR_I
 0000105C:EF000011  SWI 0x11
```

OutputView

Console | Stdin/Stdout/Stderr

```
Loading assembly language file C:\Users\Achyut Jagini\Desktop\MPCALAB_Week4_PES2UG19CS
Execution starting ...
PC out of valid memory range, address:00000008

Execution ending, Instruction Count:0 Elasped Time:00:00:00.0199453
Instructions per second:0
```

StackView

Type here to search

ENG INTL 12:45 20-02-2021

. **Microprocessor and Computer Architecture Laboratory**

UE19CS256

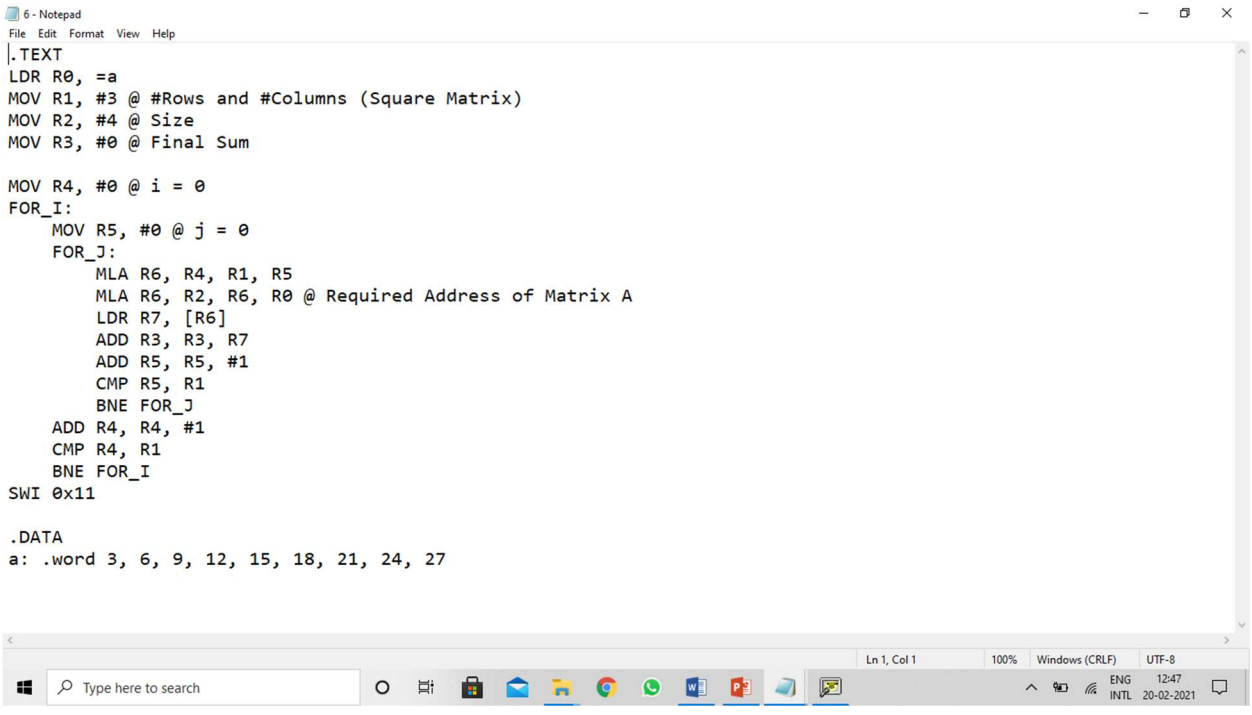
4th Semester, Academic Year 2020-21

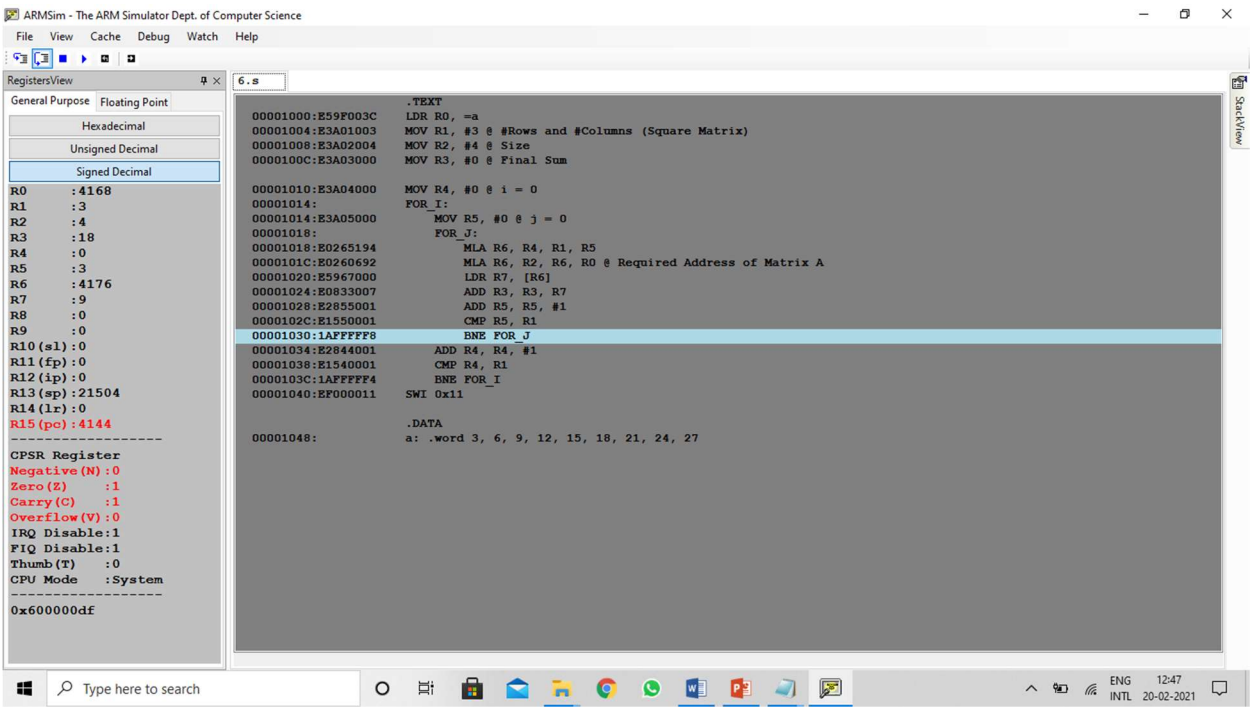
Date:

Name:	SRN:	Section

Week#____4_____ Program Number: ____6_

Write an ALP to implement Sum[i] +=a[i][j]




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 :4168
R1 :3
R2 :4
R3 :18
R4 :0
R5 :3
R6 :4176
R7 :9
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
6.s
.TEXT
00001000:E59F003C LDR R0, =a
00001004:E3A01003 MOV R1, #3 @ #Rows and #Columns (Square Matrix)
00001008:E3A02004 MOV R2, #4 @ Size
0000100C:E3A03000 MOV R3, #0 @ Final Sum
00001010:E3A04000 MOV R4, #0 @ i = 0
00001014: FOR_I:
00001014:E3A05000 MOV R5, #0 @ j = 0
00001018: FOR_J:
00001018:E0265194 MLA R6, R4, R1, R5
0000101C:E0260692 MLA R6, R2, R6, R0 @ Required Address of Matrix A
00001020:E5967000 LDR R7, [R6]
00001024:E0833007 ADD R3, R3, R7
00001028:E2855001 ADD R5, R5, #1
0000102C:E1550001 CMP R5, R1
00001030:1AFFFFF8 BNE FOR_J
00001034:E2844001 ADD R4, R4, #1
00001038:E1540001 CMP R4, R1
0000103C:1AFFFFF4 BNE FOR_I
00001040:EF000011 SWI 0x11
.DATA
00001048: a: .word 3, 6, 9, 12, 15, 18, 21, 24, 27
StackView
Type here to search
ENG
INTL
12:47
20-02-2021