Microprocessor and Computer Architecture (MPCA) Laboratory
UE20CS252 4th Semester,
Academic Year 2021-22

Date: 04/02/2022
Date: 28/01/2022

Name : SUNDEEP A	SRN: PES1UG20CS445
SEC: H	ROLL NO : 48

Week # 2 **Program Number: 1**

Title of the Program

1. Write a program in ARM7TDMI-ISA to find GCD of two numbers.
    a. Assume operands to be in the CPU registers
    b. Assume operands in the memory locations.

Program Code

1.a.

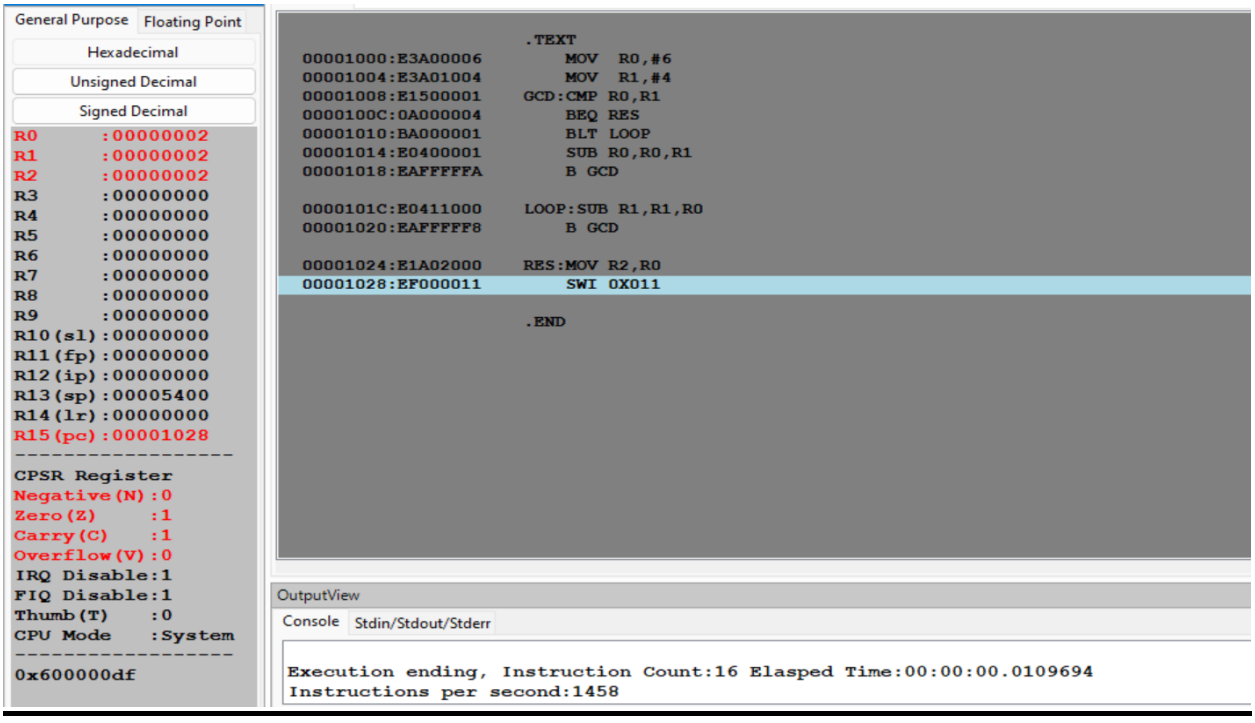
```
.TEXT
    MOV  R0,#6
    MOV  R1,#4
GCD:CMP R0,R1
    BEQ RES
    BLT LOOP
    SUB R0,R0,R1
    B GCD

LOOP:SUB R1,R1,R0
    B GCD

RES:MOV R2,R0
    SWI 0X011

.END
```

1.b

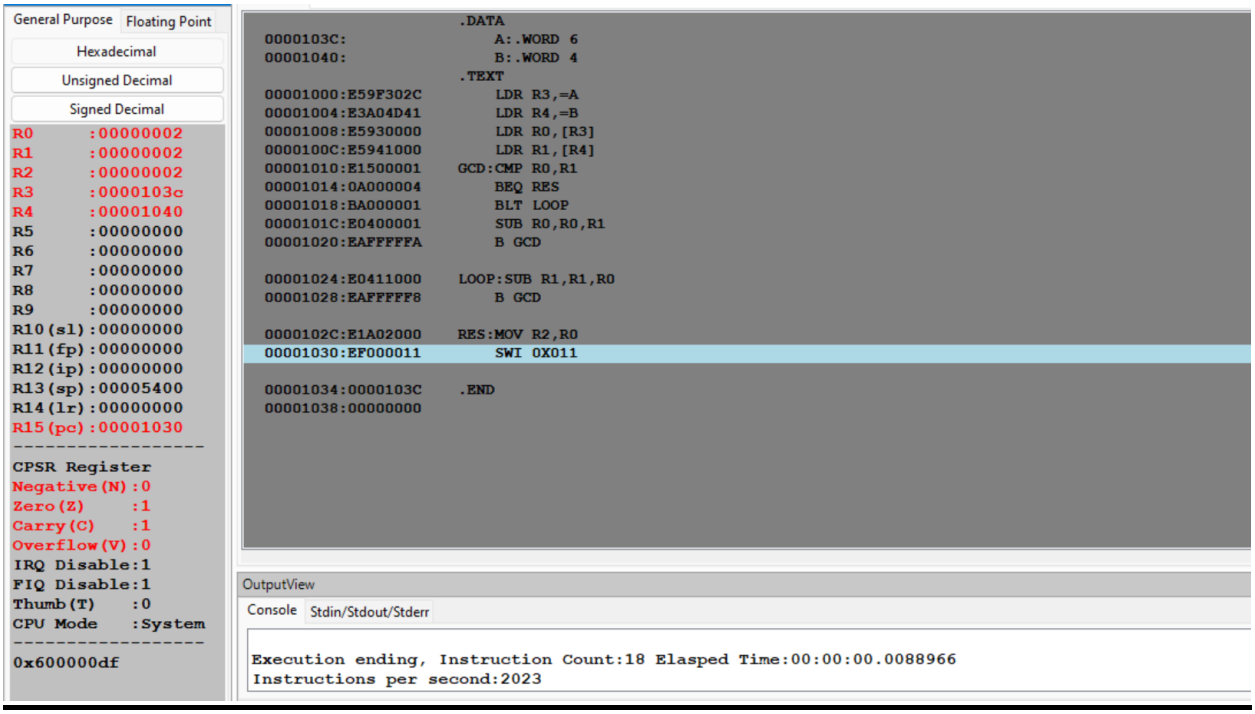
```
.DATA
    A:.WORD 6
    B:.WORD 4
.TEXT
    LDR R3,=A
    LDR R4,=B
    LDR R0,[R3]
    LDR R1,[R4]
GCD:CMP R0,R1
    BEQ RES
    BLT LOOP
    SUB R0,R0,R1
    B GCD

LOOP:SUB R1,R1,R0
    B GCD

RES:MOV R2,R0
    SWI 0X011

.END
```

Screenshot of ArmSimulator of the Program Executed

1.a



1.b



Program Number: 2

Title of the Program

2. Write a program in ARM7TDMI-ISA to find the sum of N data items in the memory. Store the result in the memory location.

Program Code

a. Use Pre-indexing addressing mode

```
.DATA
    A:.WORD 10,20,30,40
    SUM:.WORD 0
.TEXT
    MOV R2,#0
    LDR R1,=A
    LDR R3,=SUM
    MOV R6,#0
    SUB R1,R1,#4
LOOP:
    LDR R4,[R1,#4]
    ADD R1,R1,#4
```

```
    ADD R2,R2,R4
    ADD R6,R6,#1
    CMP R6,#4
    BNE LOOP
STR R2,[R3]

.END
```

b. Use Post- Indexing addressing mode

```
.DATA
    A:.WORD 10,20,30,40
    SUM:.WORD 0
.TEXT
    MOV R2,#0
    LDR R1,=A
    LDR R3,=SUM
    MOV R6,#0

LOOP:
    LDR R4,[R1],#4
    ADD R2,R2,R4
    ADD R6,R6,#1
    CMP R6,#4
    BNE LOOP
STR R2,[R3]

.END
```

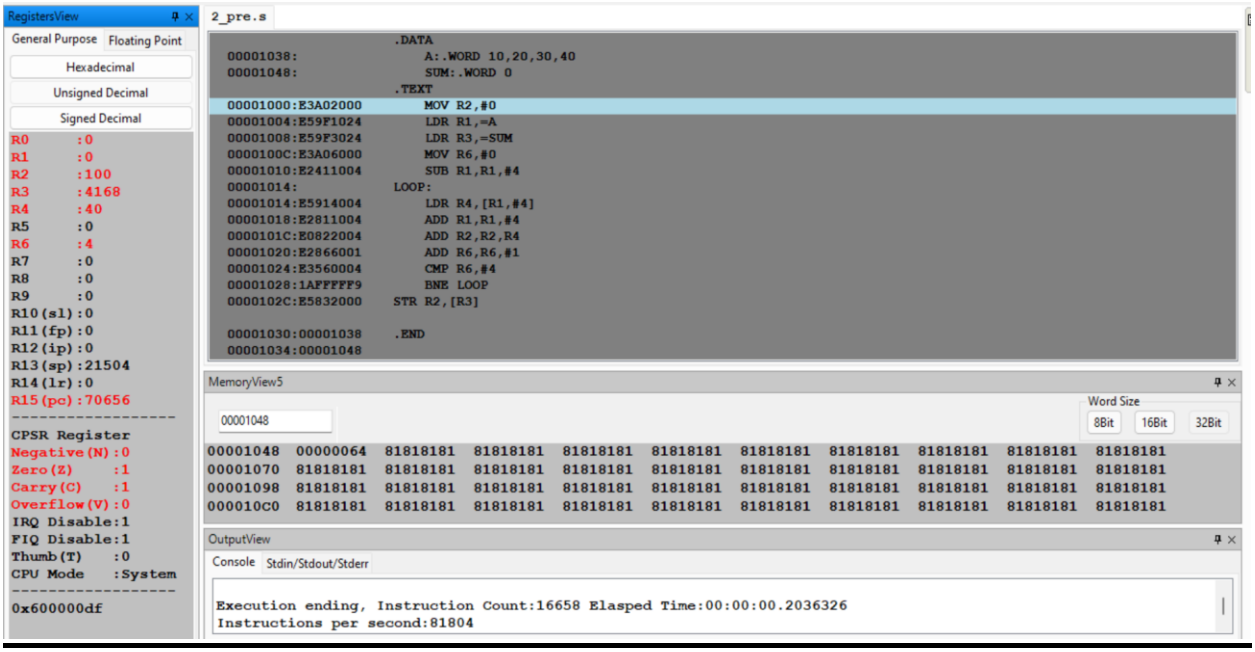
c. Use Auto-indexing addressing mode

```
d.  .DATA
e.      A:.WORD 10,20,30,40
f.      SUM:.WORD 0
g.  .TEXT
h.      MOV R2,#0
i.      LDR R1,=A
j.      LDR R3,=SUM
k.      MOV R6,#0
l.      SUB R1,R1,#4
m.  LOOP:
n.      LDR R4,[R1,#4]!
o.      ADD R2,R2,R4
```

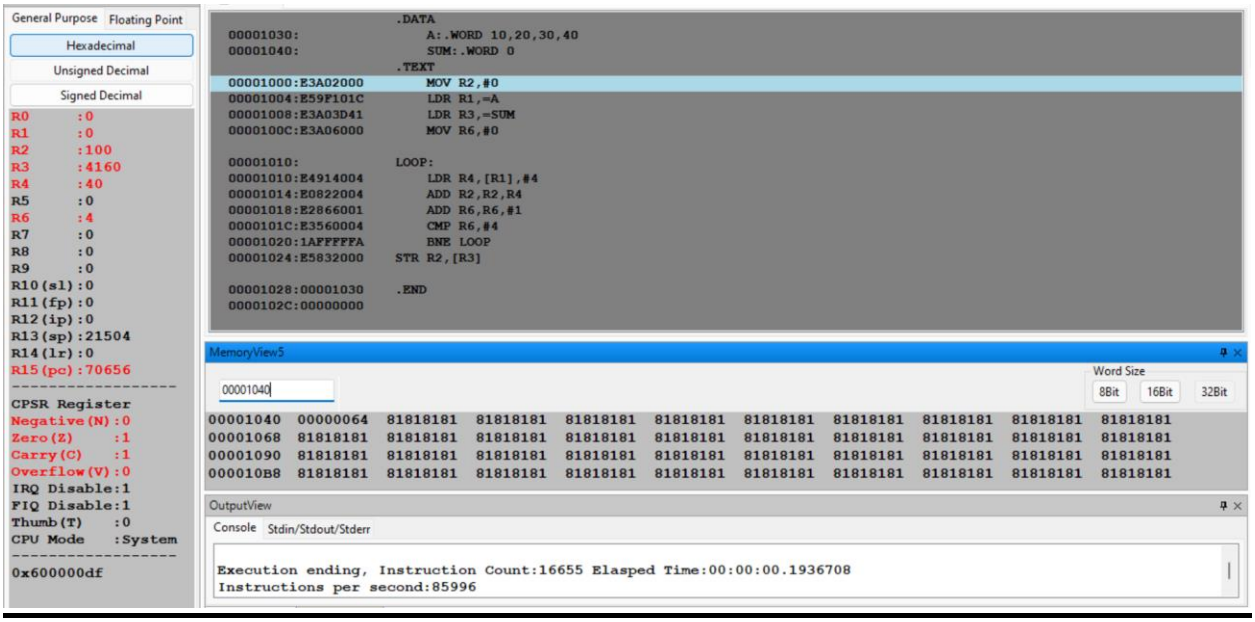
```
p.      ADD R6,R6,#1
q.      CMP R6,#4
r.      BNE LOOP
s.  STR R2,[R3]
t.
u.  .END
v.
```

Screenshot of ArmSimulator of the Program Executed

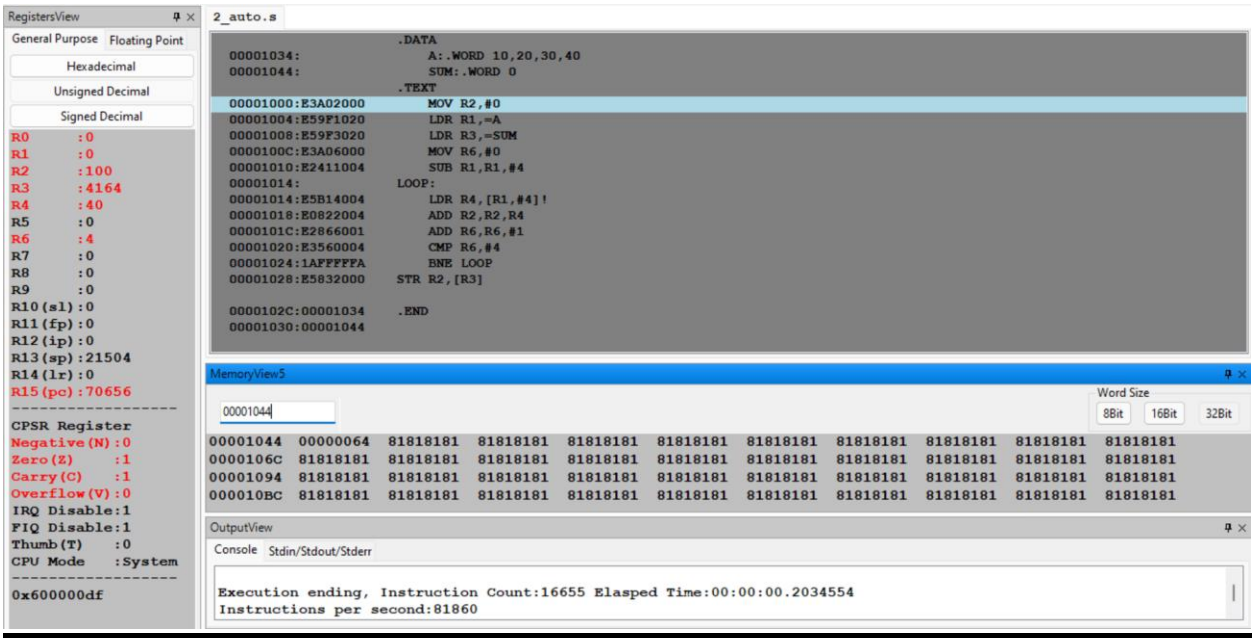
2.a



2.b



2.c



Program Number: 3

Title of the Program

Write a program in ARM7TDMI-ISA to find the sum of N data items at alternate [odd or **even** positions] locations in the memory. Store the result in the memory location.

Program Code

a. Use Pre-indexing addressing mode

```
;here we are finding the sum of n numbers at odd locations
.DATA
    A:.WORD 10,20,30,40,50,60
    SUM:.WORD 0
.TEXT
    MOV R2,#0
    LDR R1,=A
    LDR R3,=SUM
    MOV R6,#0
    SUB R1,R1,#8 ;change #8 to #4 to find the sum of numbers at even positions

LOOP:
```

```
    LDR R4,[R1,#8]
    ADD R1,R1,#8
    ADD R2,R2,R4
    ADD R6,R6,#2
    CMP R6,#6
    BNE LOOP
STR R2,[R3]

.END
```

b. Use Post- Indexing addressing mode

```
;here we are finding the sum of n numbers at odd locations
.DATA
    A:.WORD 10,20,30,40,50,60
    SUM:.WORD 0
.TEXT
    MOV R2,#0
    LDR R1,=A
    LDR R3,=SUM
    MOV R6,#0

LOOP:
    LDR R4,[R1],#8
    ADD R2,R2,R4
    ADD R6,R6,#2
    CMP R6,#6
    BNE LOOP
STR R2,[R3]

.END
```

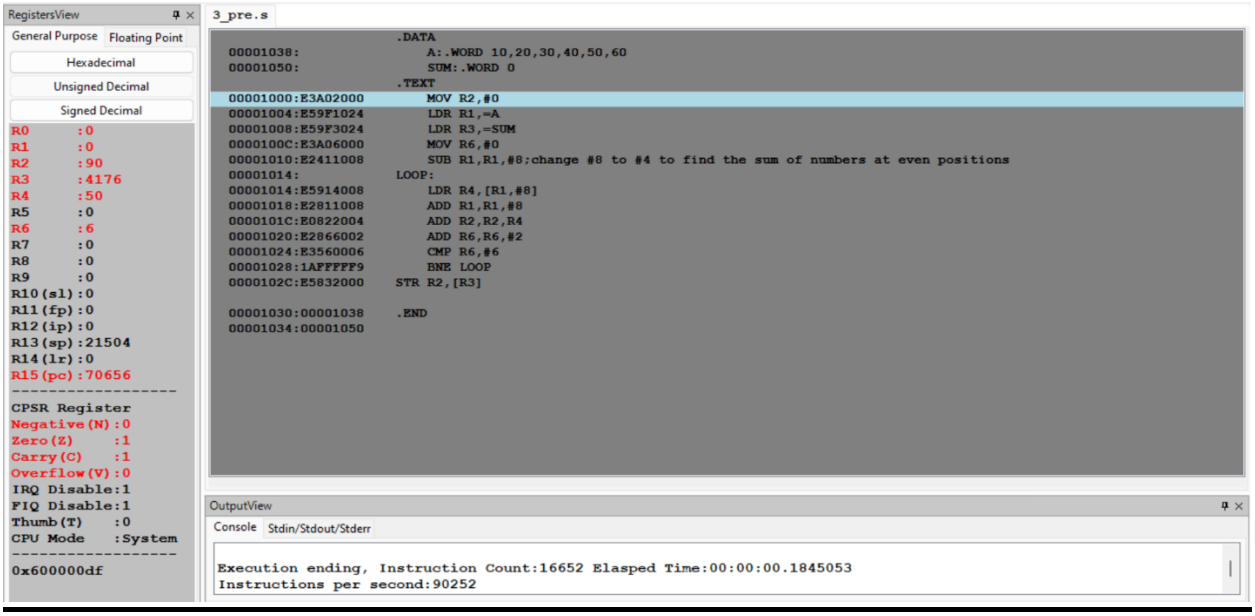
c. Use Auto-indexing addressing mode

```
;here we are finding the sum of n numbers at odd locations
.DATA
    A:.WORD 10,20,30,40,50,60
    SUM:.WORD 0
.TEXT
    MOV R2,#0
    LDR R1,=A
    LDR R3,=SUM
    MOV R6,#0
    SUB R1,R1,#8;change the #8 to #4 to get the sum of n numbers at even
positions
LOOP:
```

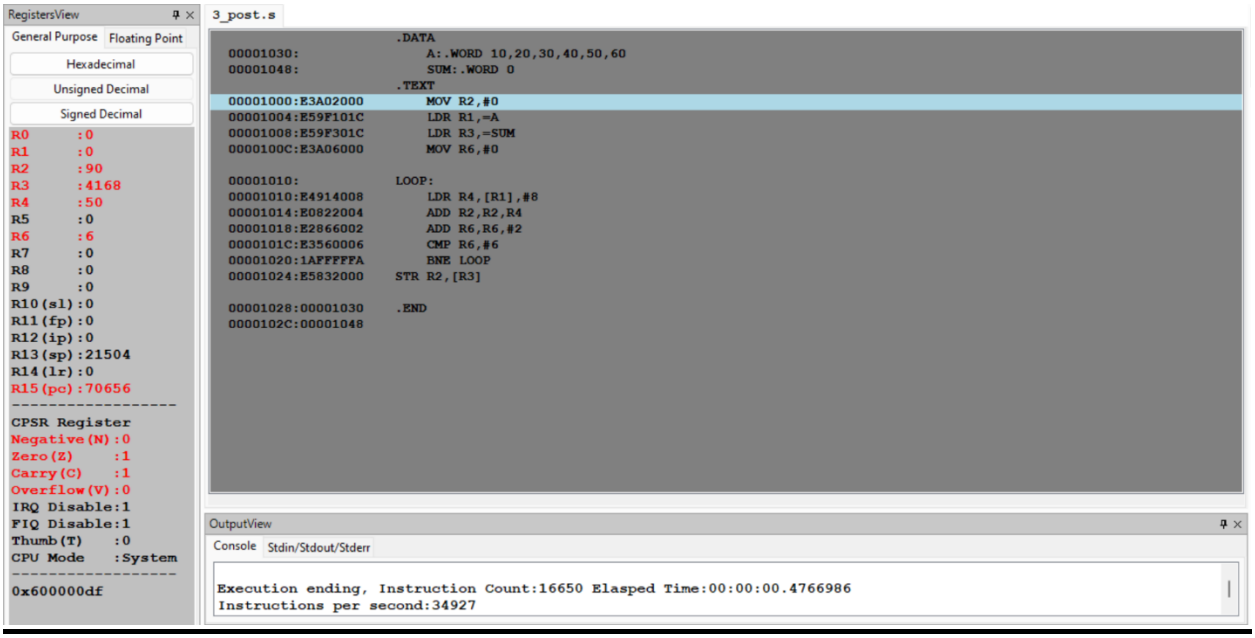
```
    LDR R4,[R1,#8]!
    ADD R2,R2,R4
    ADD R6,R6,#2
    CMP R6,#6
    BNE LOOP
STR R2,[R3]

.END
```

Screenshot of ArmSimulator of the Program Executed

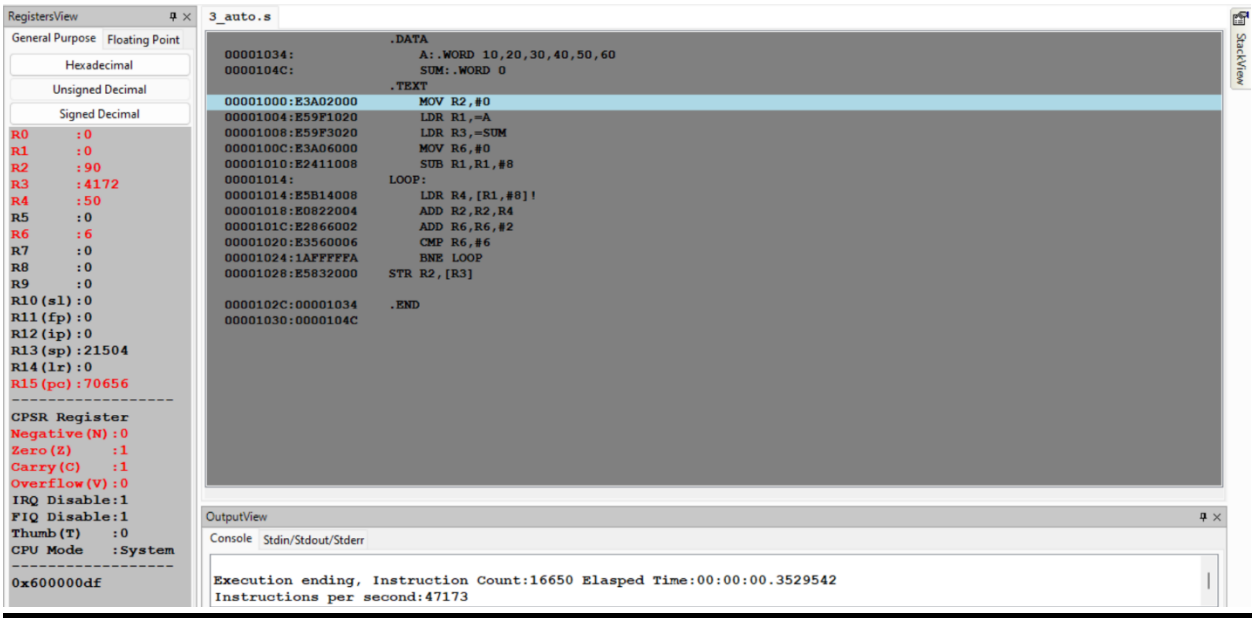
3.a.



3.b.



3.c.



Program Number: 4

Title of the Program

Write a program in ARM7TDMI-ISA to search for an element in an array. Store 00 if the search is unsuccessful and 01 if the search is successful in the register.

a. Use Linear Search Technique

Program Code

```
.DATA
    A:.WORD 10,20,30,40,50
    KEY:.WORD 40
.TEXT
    LDR R0,=A
    LDR R1,=KEY
    LDR R5,[R1]
    MOV R4,#1
LOOP: LDR R2,[R0],#4;POST INDEXING
      CMP R5,R2
      BEQ FOUND
      ADD R4,R4,#1
      CMP R4,#5
      BNE LOOP
      MOV R3,#0;If key is not found then r3 contains 0
```

```
      B EXIT

FOUND:MOV R3,#1;If key is found then r3 contains 1
EXIT:SWI 0X011
```

Screenshot of ArmSimulator of the Program Executed