Ramaiah Institute of Technology
(Autonomous Institute, Affiliated to VTU)
Department of CSE
Tutorial-I

Programme: B.E
Course: Computer Organization

Term: Jan to May 2018
Course Code: CS45

Name: Keerthana Nagaraju	**Marks:** 10/10	**Date:** 21/01/2020
USN: 1MS18CS059	**Signature of the Faculty:** 4/2/2020	

Activity I: Assembling and disassembling of a computer

Objective: To demonstrate the functional units of a system.

Assembling of a system: A PC computer is a modular type of computer, it can be assembled using hardware components made by different manufacturers, so as to have a custom built computer according to one's specific needs.

Disassembling of a system: When referring to hardware, **disassemble** is the process of breaking down a device into separate parts. A device may be disassembled to help determine a problem, to replace a part, or to take the parts and use them in another device or to sell them individually.

Activity to be performed by students: Identify the different parts of the system including its interconnection. Observe the assembly and disassembly procedure.

Answer the following questions.

1. Write down the detailed procedure to assemble a system.
2. Explain how troubleshooting a system helps to trace and correct the faults in a system
3. List out the procedure to install extra memory card to a system
4. With a diagram explain different cables used to connect function units in a system.
5. Discuss the safety precautions one should take while removing components of a system

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Data Sheet

MARKS :

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Subject :	Computer Organization Lab	Sem/Sec:	IV 'B'
		Subject Code:	

→ Write down the detailed procedure to assemble a system.

Step 1: Remove side panels on case. After removing the case from the box. The panels removing from the case with thumb screws.

Step 2: Insert motherboard - Before setting the board in, the I/O panel faceplate needs to be snapped into the location in the back of the case, into the location. Once the board is resting in the case, line up the first hole

Step 3: Check clearances - Being that the computer includes high performance components, some of them are large enough that clearance can become an issue

Step 4: Front Panel Connections - Attach the connections for the buttons, lights, USB ports and audio communication

Step 5: Install Power supply - cables that are needed are plugged into the unit

Step 6: Power motherboard - The largest motherboard power cable is to be connected

Step 7: Installing Optical Drive - The optical drive for the computer is a DVD/CD read/write combo

Step 8: Installing the hard drives - Computer uses 4 drives, two in raid and the next for a main drive and miscellaneous storage

Step 9: Connect Cables - Connect the cables the hard drives and opticals drives. The cables are keyed so they will only be in one direction into the board

Step 10: Installing RAM - The slots are keyed as are the RAM clicks, so make sure the notch is lined up

Step11: Install graphics cards and expand cards- the network card and audio card for the computer and connect into the slots below the graphics card.

step12: Cable management- Organization and hiding cables for high airflow and security / safety

2. Explain how troubleshooting a system helps to trace and correct the false in the system

A. Troubleshooting is a form of problem solving often applied to repair failed products or processes on a machine or a system. It is a logical, systematic search for the source of a problem in order to solve it and make the product or process operational again. Troubleshooting is needed to identify the symptoms. Determining the most likely cause is a process of elimination eliminating potential causes of a problem. Finally, troubleshooting requires confirmation that the solution restores the product or process to its working

Step1: Identify the problem

step 2: Establish a theory of proable cause

Step3: Test the theory to determine cause.

step 4: Establish a plan of action to resolve the problem and implement the solution

step 5: Verify the full system functionality and if applicable implement preventive measure

step 6: Document findings, actions and outcomes

3. List out the procedure to install extra memory card to a System

A Step1 Disconnect the power cable from the system and if needed, unplug other back-panel cables so that you can apply turn your system on to its side

Step 2: Remove the side panel to give you full access to the interior and locate the RAM access to the interior and locate the RAM slots. They're most commonly found next to the processor and its cooler. If there's already RAM in your system, eject it by pressingly firmly on the tabs on the motherboard at either end of the slots

Step 3: To install the new RAM, line up the notches in the bottom of the sticks with the gaps in the slot on the motherboard. Make sure the wings at either end of the slots are pushed back, so that they are tucked away from the RAM. As it does the wings will clamp in and hold the memory securely

Step 4: Once the sticks have clicked into it confirm that the wing clips are locked in to hold the sticks firmly in their slots and then close the PC back up. Plug all the cables back in and try to boot the system

---

4. With a neat diagram explain different ~~card~~ cables used to connect functional units in a system

A. 1. VGA Cable

Also known as D-sub cable, analog video cable, Connect one end to computer monitor television
Connect other end to VGA port on computer

2. DVI Cable

Connect one end to computer monitor. connect other end to DVI port on computer

3. HDMI Cable

Connect one end to computer monitor, television. Connect other end to computer monitor, television. Connect other end to HDMI port on computer.

4. PS/2 Cable:- Connect one end to PS/2 keyboard, PS/2 mouse. Connect other end to PS/2 ports on computer. Purple PS/2 port: keyboard. Green PS/2 port: mouse

5. Ethernet cable:- Connect one end to router network switch. Connect other end to ethernet port on computer

6. USB cable:- connect one end to USB drive device. Connect other end to USB ports on computer

7. Computer Power Cord (Kettle plug): Connect one end to AC power socket. Connect other end to power supply unit, computer ~~or~~ monitor

Diagram:

1) VGA Cable

2) DVI cable

3) HDMI Cable

6). PS/2 cable

4) Ethernet Cable

5) USB Cable

7) Computer Power Cord (Kettle Plug)

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USN/Roll No :	1MS18CS059	Sem/Sec:	IV 'A'
Subject :	CO Lab	Subject Code:	

5 Discuss the safety precautions one should take while removing components of a system.

A A few warnings and reminder before you start disassembling your computer tower to keep both your unit and yourself safe.

1. Fully shutdown and unplug the computer before you make any attempts to disassemble the tower
2. take off any metal objects, on your arms or rings such as bracelets rings or watches.
3. make sure your hands are completely dry to avoid damaging any mechanical parts as well as to avoid electrocution
4. work in cool areas to avoid perspiration for the same person as seen in the prev previous number
5. Before touching any part within the tower, put your hands against another metal surface to remove static charge, which may damage sensitive devices
6. Prepare a place to keep any screws you may remove. A container or piece of paper with labels for each part is ideal to avoid confusion between the similar-looking screws
7. Handle all parts with care. Place each piece you remove carefully down onto a stable surface
8. If a component does not come out easily, do not forcefully remove it
9. Be careful when handling the motherboard.

10 Never attempt to remove the power source, a box attached to the side or bottom of the unit to which all cables are connected.

11. when removing any cables, wires or ribbons make sure to grasp the wire at the base or head to keep it from breaking

12. Be careful not to drop any small parts into unreachable areas such as into the computer fan or disk drive

13 take note that the three most damaging things is a computer are moisture, shock and dust.

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Tutorial -II

Programme: B.E. Term: Jan to May 2020
Course: Computer Organization Course Code: CS45

Name: Keerthana Ningaraju		**Marks:** 10/10	**Date:** 28/01/2020
USN: 1MS18CS069		**Signature of the Faculty:**	

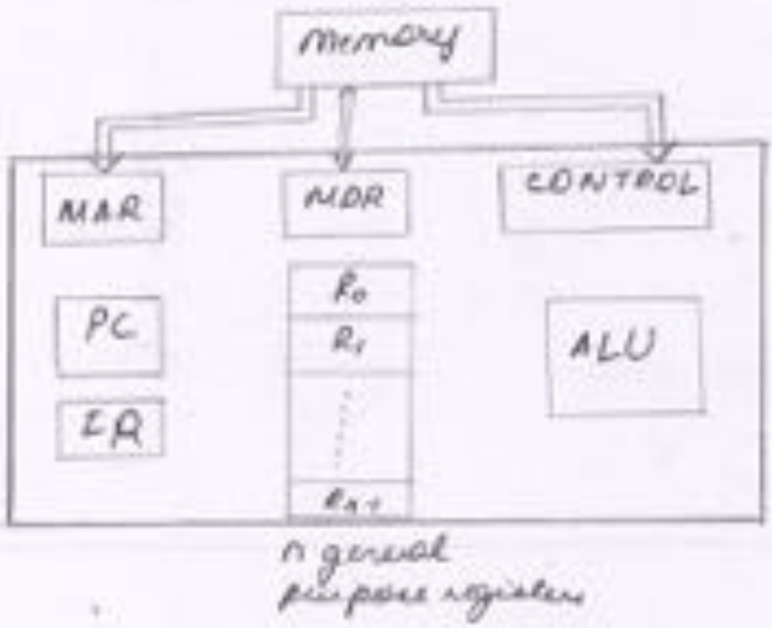
Activity II: Demonstrating Datapath and instruction execution stages using MarieSim Simulator

Objective: To simulate inter communication between CPU and memory.

Simulator Description: MarieSim is a computer architecture simulator based on the MARIE architecture. It provides users with interactive tools and simulations to help them deepen their understanding of the operation of a simple computer. One can observe how assembly language statements affect the registers and memory of a computer system.

Activity to be performed by students:

1. Draw the interconnection between memory and a processor.



2. List out the steps required to execute an instruction.

3. Write and execute assembly language program to compute

   i) $f=(g+h)*(i+y)$

   ii) $d=b^2-4ac$

4. Describe the factors affecting the performance of a processor

3. Results and Snapshots:

2. List out the steps required to execute an instruction

Soln 6steps: (i) Fetch instruction
(ii) Decode instruction
(iii) Perform ALU operation
(iv) Access memory
(v) Update register file
(vi) update program counter

3 (i)
```
LOAD G
ADD H
STORE A
LOAD I
ADD Y
STORE B
loop, LOAD A
      ADD F
      STORE F
      LOAD B
      SUBT one
      STORE B
      SKIPCOND 400
      JUMP loop
LOAD F
OUTPUT
HALT
G, DEC 7
H, DEC 7
Y, DEC 1
I, DEC 4
A, DEC 0
B, DEC 0
F, DEC 0
One, DEC 1
```

```
(ii) ~~LOAD~~
Loop, LOAD B X
ADD B
STORE B
LOAD D
SUBT one
STORE D
SKIPCOND 400
JUMP Loop
Loop, LOAD Y
ADD C
STORE C
LOAD F
SUBT one
STORE F
SKIPCOND 400
JUMP Loop
Loop, LOAD Z
ADD C
STORE C
LOAD A
SUBT one
STORE A
SKIPCOND 400
JUMP Loop
LOAD B
SUBT C
STORE ans
LOAD ans
OUTPUT
HALT
A, DEC 10
B, DEC 8
C, DEC 2
F, DEC 4
one, DEC 1
D, DEC 8
X, DEC 0
Y, DEC 0
```

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MARKS :

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Subject :	CO Lab	Subject Code:	

4(i) Processor clock : Processor circuits are controlled by a clock signal. It is a clock defines regular intervals - clock cycles to execute a machine instruction, the processor divides the action to be performed into a series of steps, each completed in 1 clock cycle. Length P of 1 clock cycle is important for processor performance, whose inverse is called the clock rate $R = 1/P$ cycles/sec is called Hertz, mega-millions, Giga-billions

(ii) Basic Performance Eqn : $T = \frac{N \times S}{R}$ where N is no of machine language instruction

R = clock rate (in cycles/sec)

S = No of basic steps to execute 1 instruction

T = processor time

For high performance, reduce T (by reducing N and S, increasing R)

(iii) Pipelining and superscalar operation: Pipelining is the overlapping execution of several instructions, this reduces no of clock cycles, we can achieve a higher degree of concurrency. Parallel paths are created. Execution of several instructions in every clock cycles called superscalar execution

(iv) Clock rate: 2 possibilities to increase clock rate (Improving IC tech, makes logic circuits faster, which reduce time to execute each step. P reduces, R is increased. Secondly reducing amount of processing also works

(V) CISC and RISC

RISC Allows simple instructions which requires small number of basic steps to execute. A program will have more no of instructions i.e N = max, S = min.

CISC Instructions are complex, number of basic steps to execute are more. A program will have less no of instructions i.e N = min, S = max

(vi) Compiler

translates high-level language into a sequence of machine instruction. Optimizes compiler reduces N×S, may rearrange program instructions to achieve better performance high-quality compiler must be closely linked to processor architecture, they are often designed at the same time, with much interaction to achieve best results

(vii) Performance measurement:

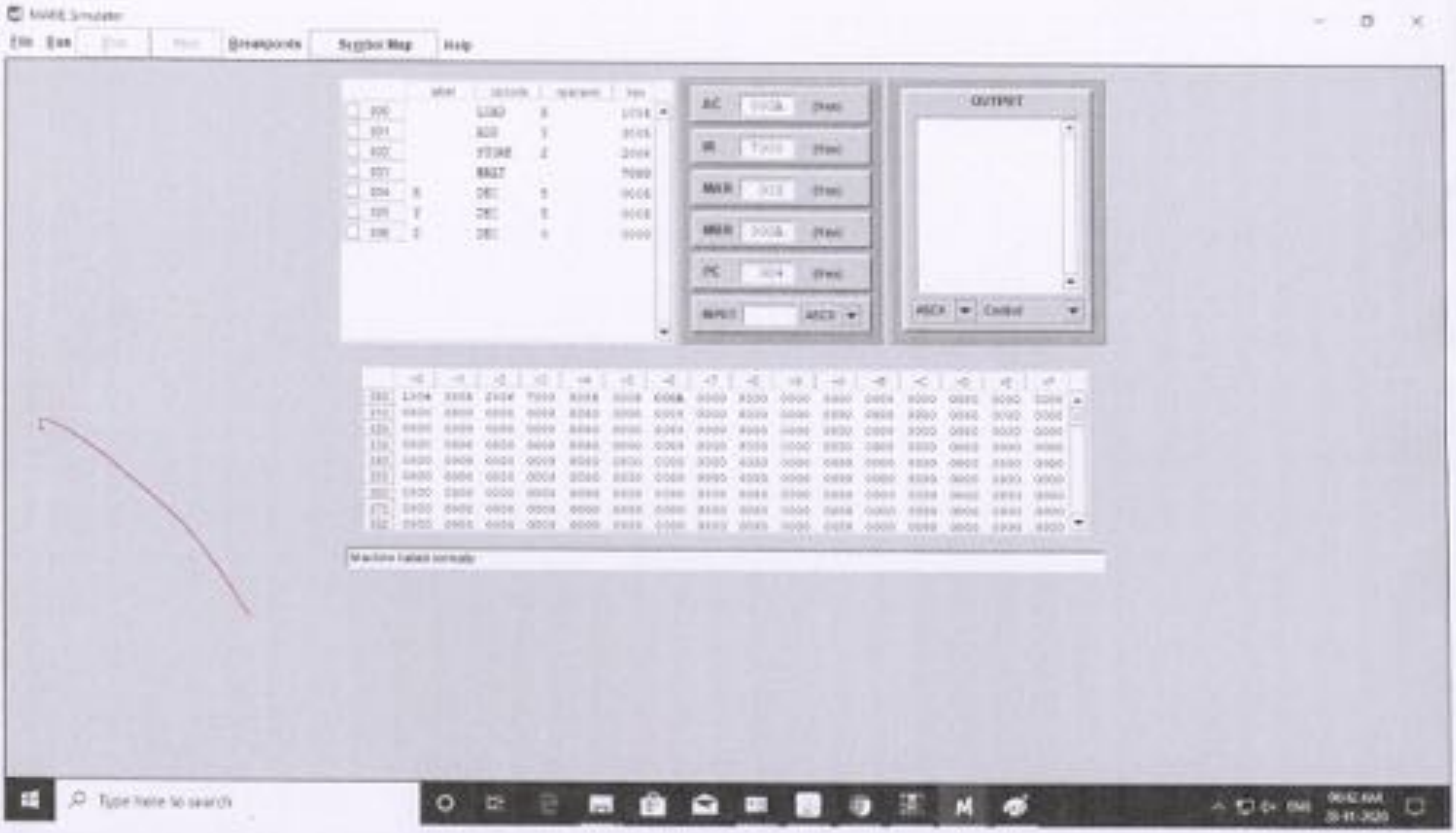
Used to evaluate effectiveness of new features used in marketing process, to choose computer models. It is done using time factor taken to execute benchmarked programs

SPEC - ~~specific Per~~

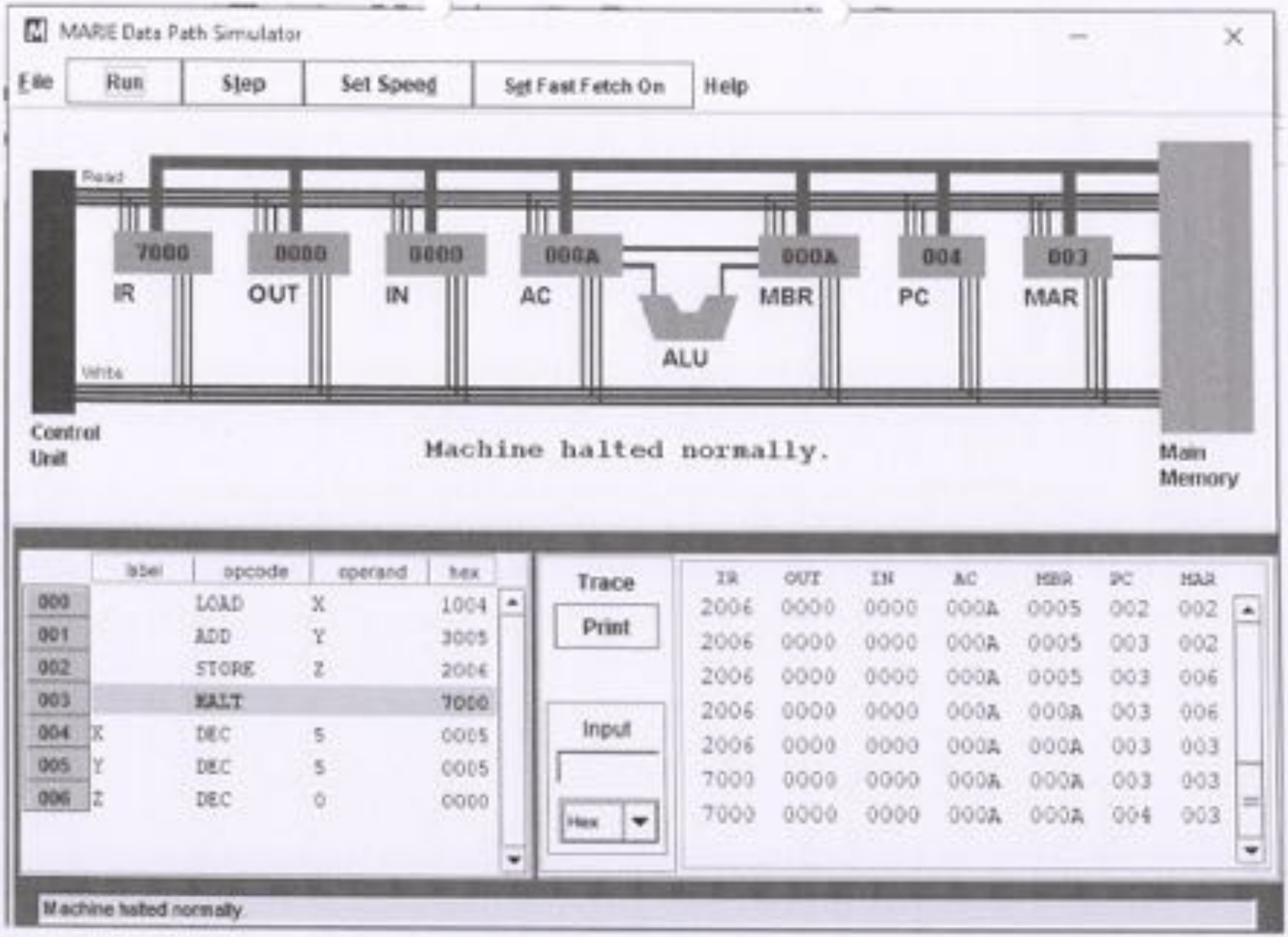
specific Performance evaluation corporation

$$= \frac{\text{Running time on reference computer}}{\text{Running time on test computer}}$$

$$= \left(\prod_{i=1}^{n} SPEC_i\right)^{1/n}$$



Breakpoints
Symbol Map
Help
LOAD
ADD
STORE
HALT
DEC
AC
OUTPUT
Type here to search


MARIE Data Path Simulator
File
Run
Step
Set Speed
Set Fast Fetch On
Help
Read
Write
7000
IR
0000
OUT
0000
IN
000A
AC
ALU
000A
MBR
004
PC
003
MAR
Control Unit
Main Memory
Machine halted normally.
label
opcode
operand
hex
000 LOAD X 1004
001 ADD Y 3005
002 STORE Z 2006
003 HALT 7000
004 X DEC 5 0005
005 Y DEC 5 0005
006 Z DEC 0 0000
Trace
Print
Input
Hex
IR OUT IN AC MBR PC MAR
2006 0000 0000 000A 0005 002 002
2006 0000 0000 000A 0005 003 002
2006 0000 0000 000A 0005 003 006
2006 0000 0000 000A 000A 003 006
2006 0000 0000 000A 000A 003 003
7000 0000 0000 000A 000A 003 003
7000 0000 0000 000A 000A 004 003
Machine halted normally.

Assembly listing for Ex2.mas

```
    Assembly listing for: Ex2.mas
              Assembled: Tue Jan 28 07:13:08 IST 2020

000 1011 |         LOAD G
001 3012 |         ADD H
002 2015 |         STORE A
003 1014 |         LOAD I
004 3013 |         ADD Y
005 2016 |         STORE B
006 1015 |  loop   LOAD A
007 3017 |         ADD F
008 2017 |         STORE F
009 1016 |         LOAD B
00A 4018 |         SUBT one
00B 2016 |         STORE B
00C 8400 |         SKIPCOND 400
00D 9006 |         JUMP loop
00E 1017 |         LOAD F
00F 6000 |         OUTPUT
010 7000 |         HALT
011 0007 |  G      DEC 7
012 0003 |  H      DEC 3
013 0001 |  Y      DEC 1
014 0004 |  I      DEC 4
015 0000 |  A      DEC 0
016 0000 |  B      DEC 0
017 0000 |  F      DEC 0
018 0001 |  one    DEC 1

Assembly successful.

        SYMBOL TABLE
        ----------------------------------------------
```

Print

Close

Type here to search

07:15 AM 28-01-2020

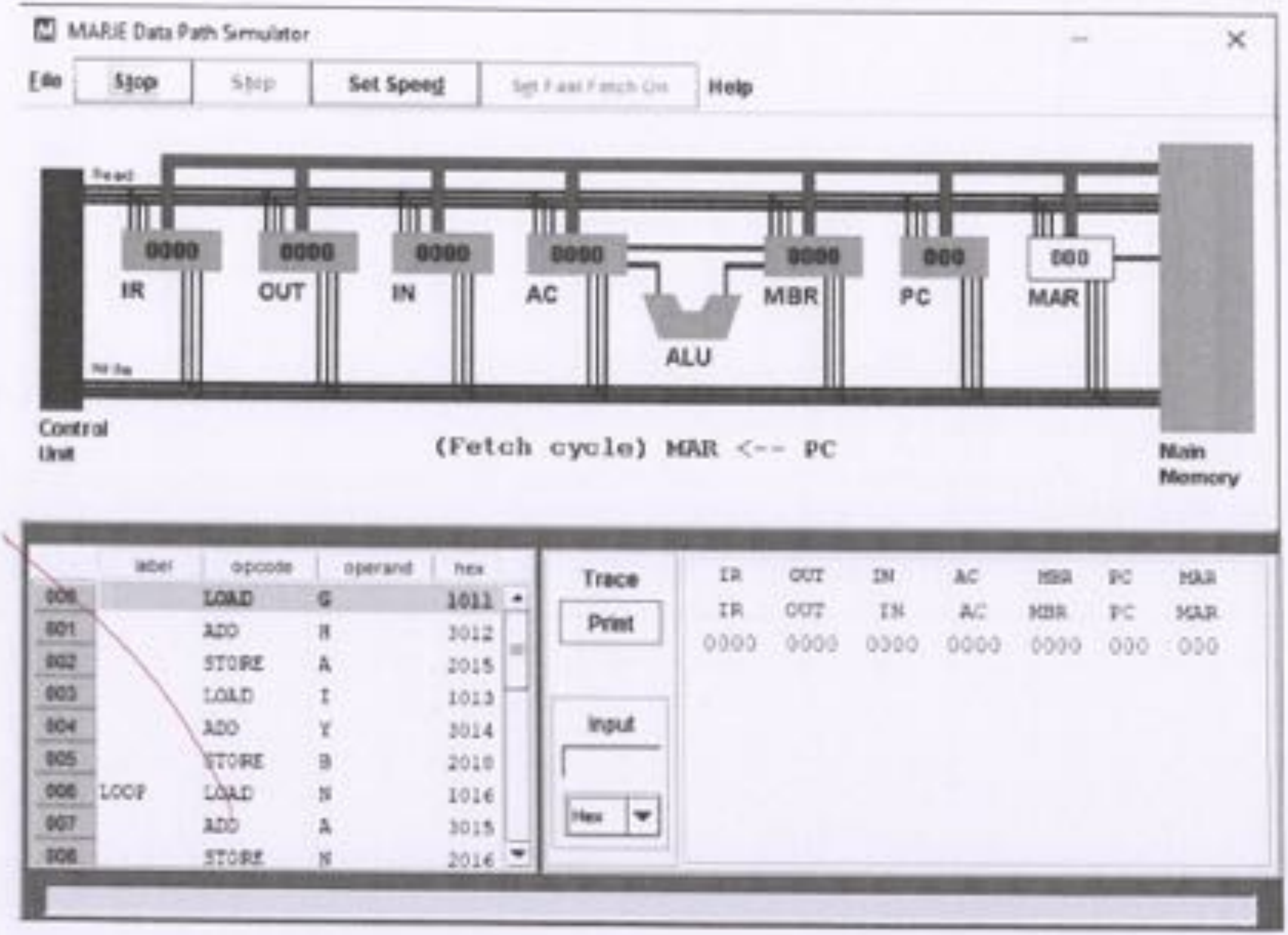
Assembly Listing for Ex1.mas

```
    Assembly listing for: Ex1.mas
              Assembled: Tue Jan 28 06:37:31 IST 2020

000 1004 |          LOAD X
001 3005 |          ADD Y
002 2006 |          STORE Z
003 7000 |          HALT
004 0005 |  X       DEC 5
005 0005 |  Y       DEC 5
006 0000 |  Z       DEC 0

Assembly successful.

        SYMBOL TABLE
        --------------------------------------------------
         Symbol | Defined | References
        --------+---------+-------------------------------
         X      |   004   | 000
         Y      |   005   | 001
         Z      |   006   | 002
        --------------------------------------------------
```

Print

Close

Type here to search


MARIE Data Path Simulator
Edit
Stop
Step
Set Speed
Set Fast Fetch On
Help
Read
Write
0000
IR
0000
OUT
0000
IN
0000
AC
ALU
0000
MBR
000
PC
000
MAR
Control Unit
Main Memory
(Fetch cycle) MAR <-- PC
label
opcode
operand
hex
000 LOAD G 1011
001 ADD H 3012
002 STORE A 2015
003 LOAD I 1013
004 ADD Y 3014
005 STORE B 2010
006 LOOP LOAD N 1016
007 ADD A 3015
008 STORE N 2016
Trace
Print
Input
Hex
IR OUT IN AC MBR PC MAR
IR OUT IN AC MBR PC MAR
0000 0000 0000 0000 0000 000 000

Ramaiah Institute of Technology
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Department of CSE

Tutorial -III

Programme: B.E
Course: Computer Organization Course Code: CS45

Term: Jan to May 2020

Name: Rashana Nagaraju	**Marks:** 10/10	**Date:** 04/02/2020
USN: 1MS18CS069	**Signature of the Faculty:**	11/2/2020

Objective: To simulate ARM Instruction set using ARMsim simulator.

Simulator Used: ARMSim 1.91 is a desktop application running in a Windows environment. It allows users to simulate the execution of ARM assembly language programs on a system based on the ARM7TDMI processor.

ARM enables the users both to debug ARM assembly programs and to monitor the state of the system while a program executes.

Activity to be performed by students:

1) Write an ARM program to perform basic arithmetic operations.
2) Write an ARM program to demonstrate the working of load and store instructions.
3) Write an ARM program to evaluate expression f=(g+h)-(i+j)
4) Write an ARM program to find the sum of all elements of an array.
5) Write an ARM program to find the factorial of a number.

Programs and the snapshots:

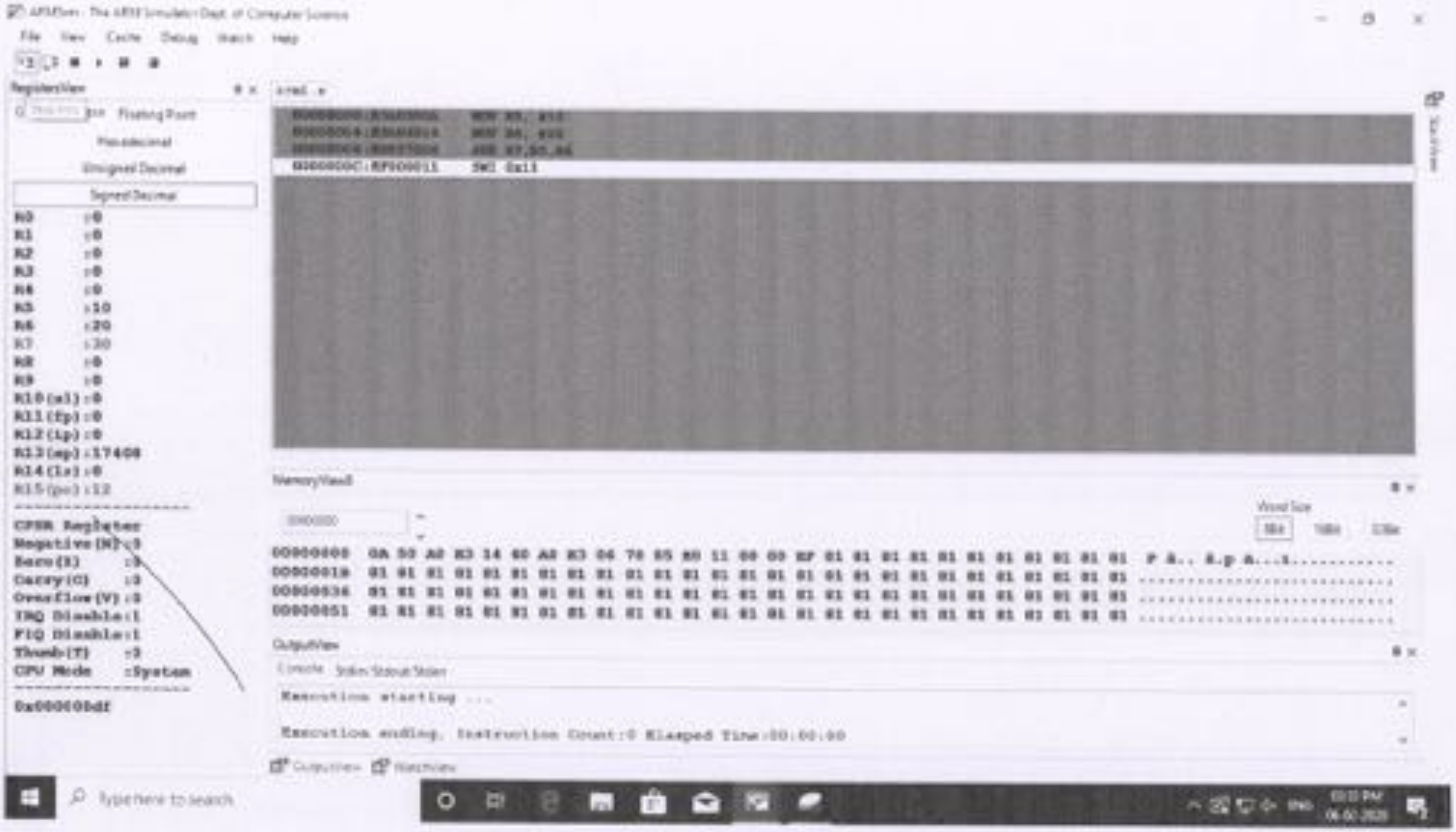
Basic Arithmetic operation

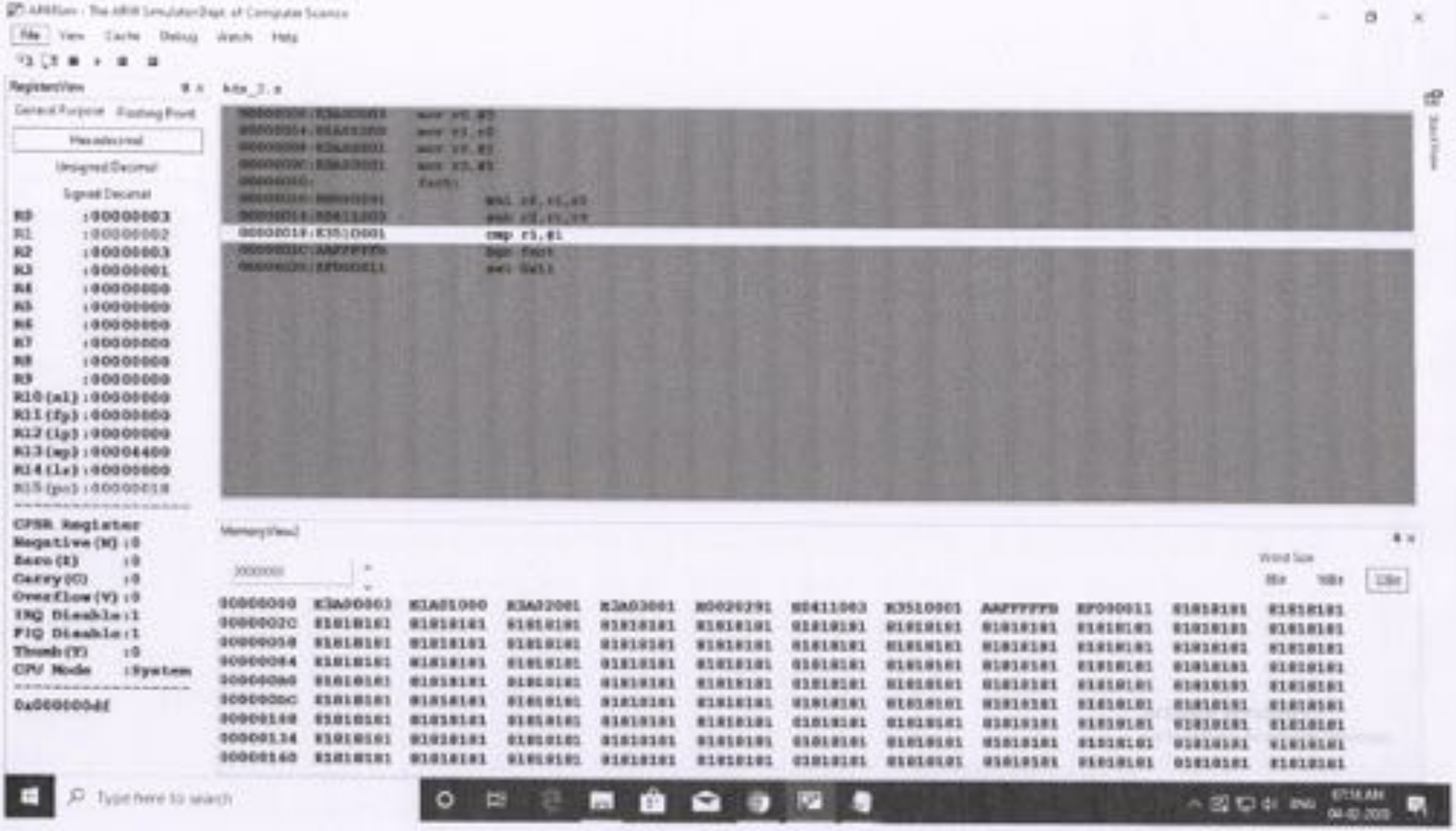
(i) mov R5, #10
mov R6, #20
ADD R7, R6, R5
MUL R8, R6, R5
SUB R9, R6, R5
SWI 0X11

Load and store
(ii) mov R0, #10
mov R2, #0x00000040
STR R0, [R2, #0]
LDR R3, [R2, #0]
ADD R4, R0, R3
SWI 0X11

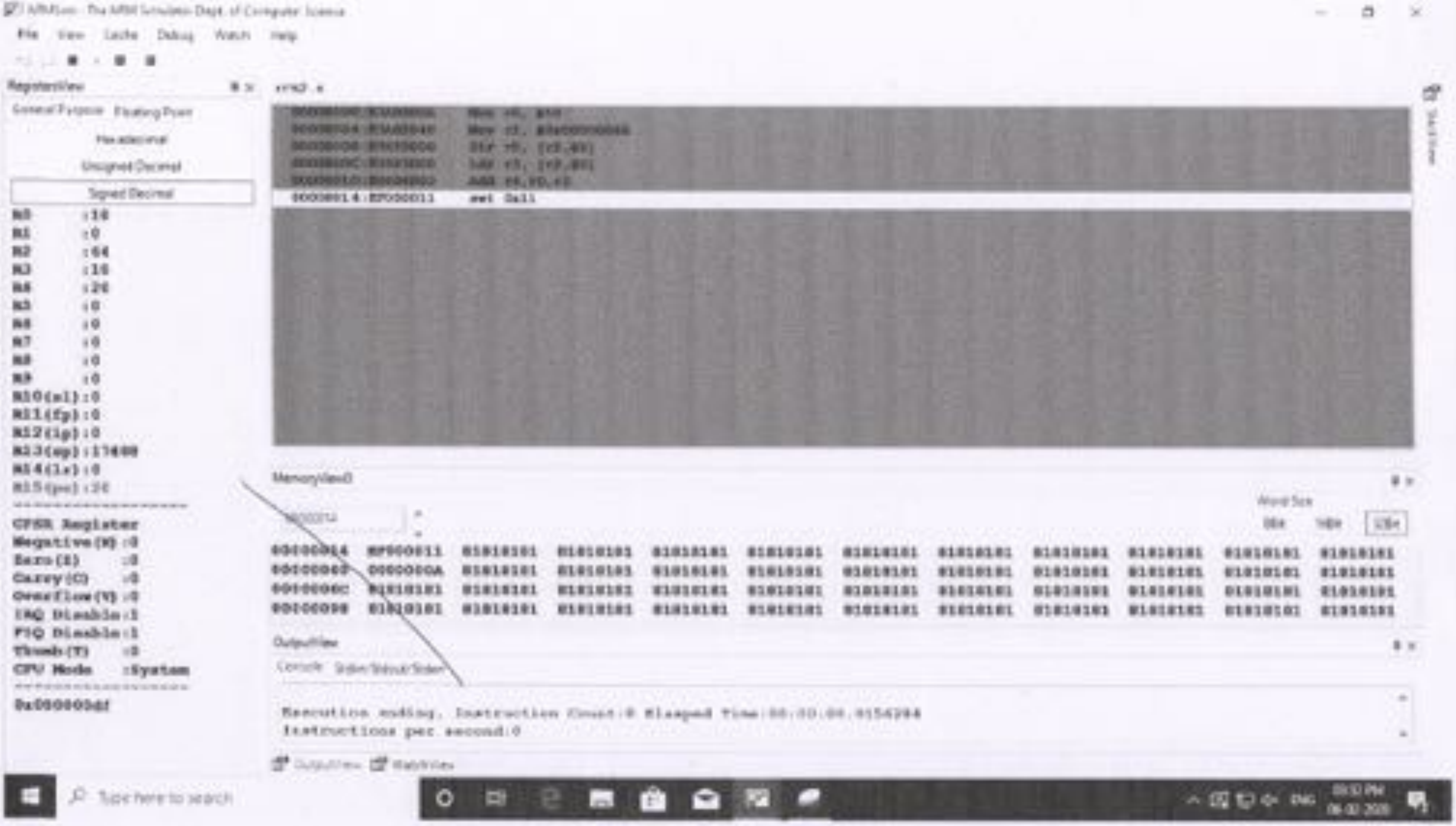
(iii) $f = (g+h) - (i+j)$
mov R1, #20
mov R2, #30
ADD R3, R1, R2
mov R4, #40
mov R5, #50
ADD R6, R4, R5
SUB R7, R3, R6
SWI 0X11

(iv) factorial
mov R0, #3
mov R1, R0
mov R2, #1
mov R3, #1
fact:
mul R2, R1, R2
sub R1, R1, R3
cmp R1, #1
bge fact
swi 0X11

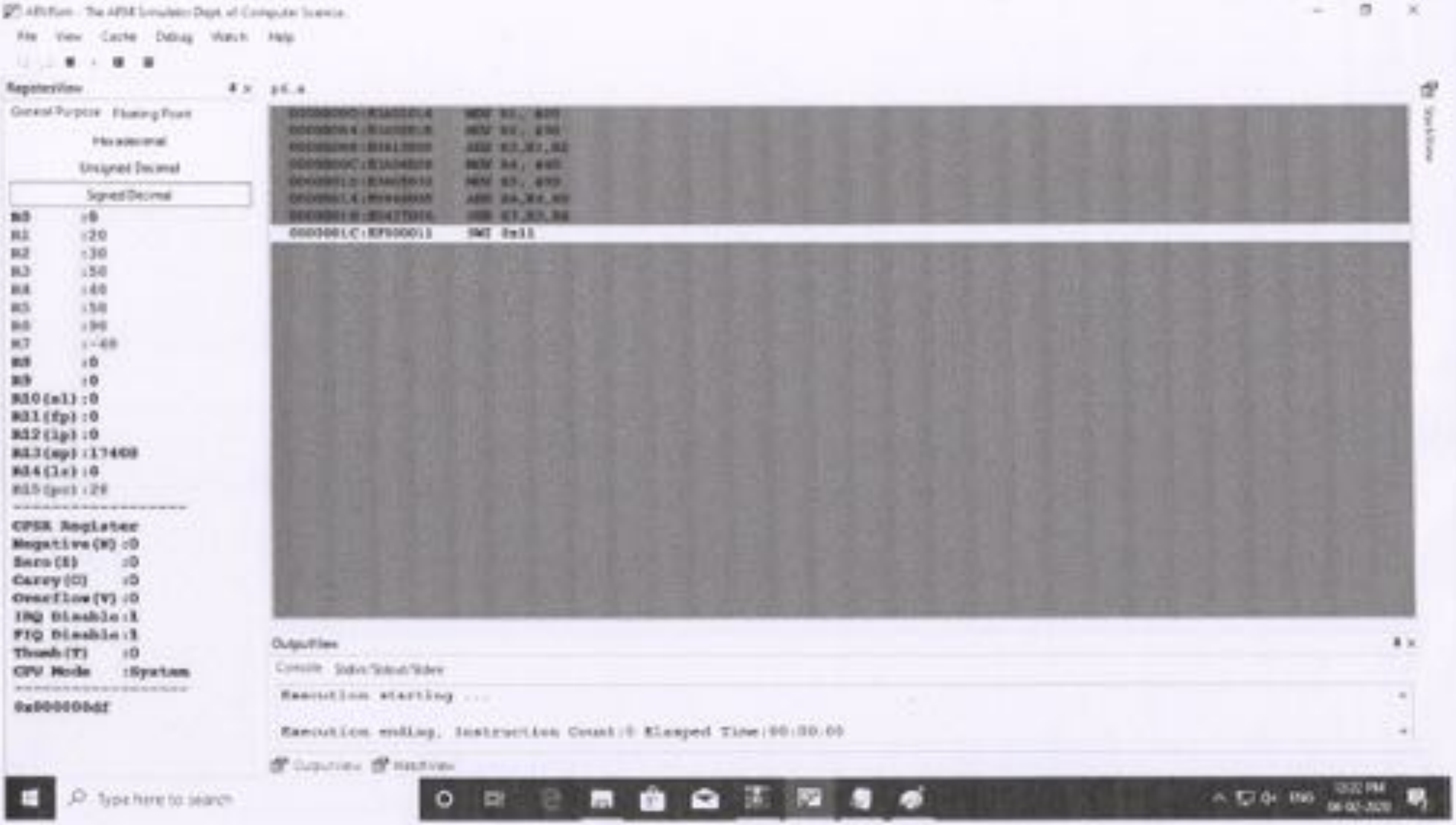

ARMSim - The ARM Simulator Dept. of Computer Science
File View Cache Debug Watch Help
RegistersView
Floating Point
Hexadecimal
Unsigned Decimal
Signed Decimal
R0 :0
R1 :0
R2 :0
R3 :0
R4 :0
R5 :10
R6 :20
R7 :30
R8 :0
R9 :0
R10(sl) :0
R11(fp) :0
R12(ip) :0
R13(sp) :17408
R14(lr) :0
R15(pc) :12
CPSR Register
Negative(N) :0
Zero(Z) :0
Carry(C) :0
Overflow(V) :0
IRQ Disable :1
FIQ Disable :1
Thumb(T) :0
CPU Mode :System
0x000000df
SWI 0x11
MemoryView0
Word Size
8bit 16bit 32bit
OutputView
Console Stdin/Stdout/Stderr
Execution starting ...
Execution ending. Instruction Count:0 Elapsed Time:00:00:00
OutputView WatchView
Type here to search



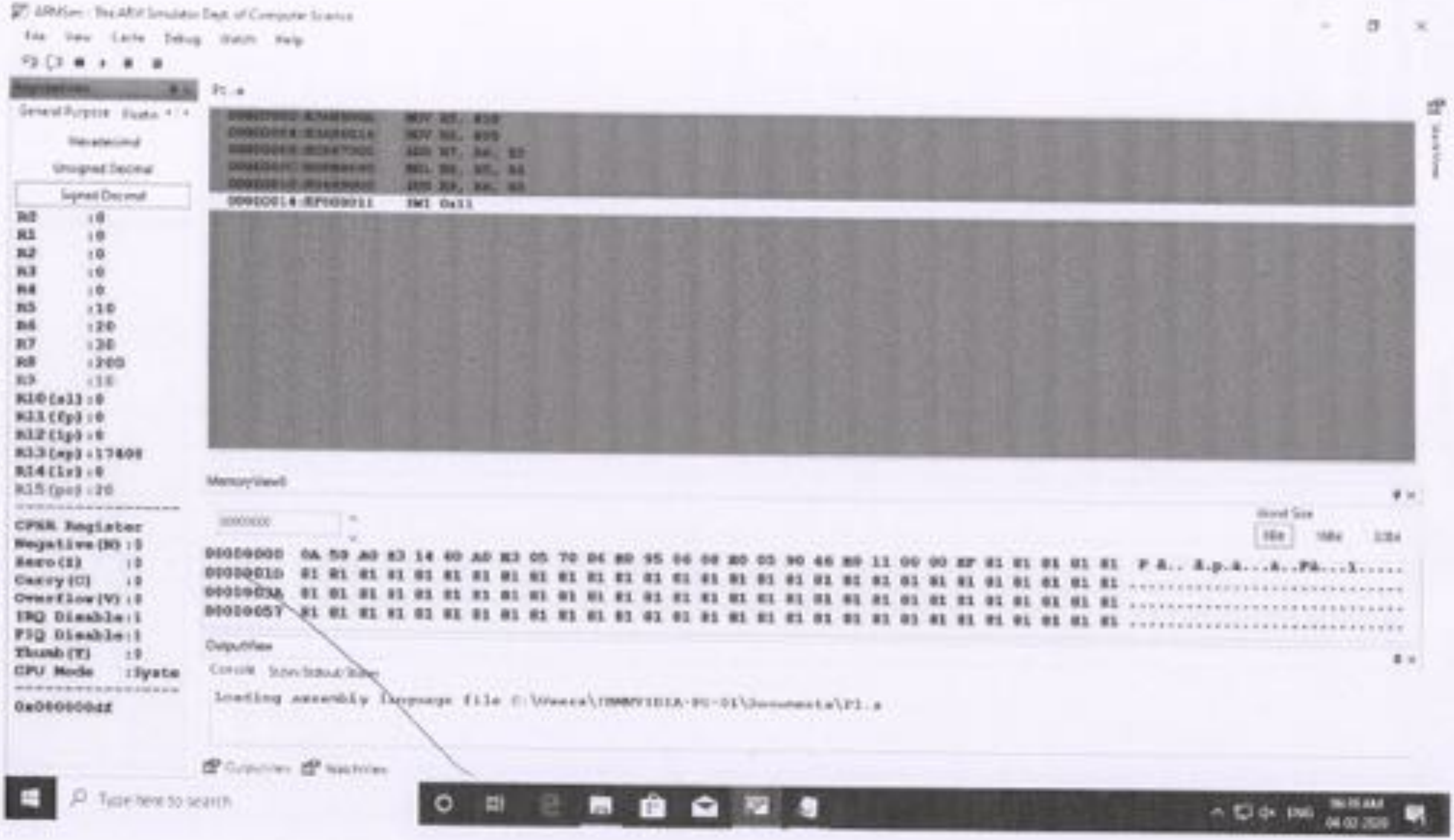
File View Cache Debug Watch Help
General Purpose Floating Point
Hexadecimal
Unsigned Decimal
Signed Decimal
R0 :00000003
R1 :00000002
R2 :00000003
R3 :00000001
R4 :00000000
R5 :00000000
R6 :00000000
R7 :00000000
R8 :00000000
R9 :00000000
R10(sl):00000000
R11(fp):00000000
R12(ip):00000000
R13(sp):00004400
R14(lr):00000000
00000018:E3510001 cmp r1,#1
CPSR Register
Negative(N):0
Zero(Z) :0
Carry(C) :0
Overflow(V):0
IRQ Disable:1
FIQ Disable:1
Thumb(T) :0
CPU Mode :System
0x000000df
MemoryView
Word Size
Type here to search



File View Cache Debug Watch Help
RegistersView
General Purpose Floating Point
Hexadecimal
Unsigned Decimal
Signed Decimal
R0 :10
R1 :0
R2 :64
R3 :10
R4 :20
R5 :0
R6 :0
R7 :0
R8 :0
R9 :0
R10(sl):0
R11(fp):0
R12(ip):0
R13(sp):17408
R14(lr):0
CPSR Register
Negative(N) :0
Zero(Z) :0
Carry(C) :0
Overflow(V) :0
IRQ Disable:1
FIQ Disable:1
Thumb(T) :0
CPU Mode :System
00000014:EF000011 swi 0x11
MemoryView0
Word Size
OutputView
Console
Execution ending, Instruction Count:0 Elapsed Time:00:00:00.0156284
Instructions per second:0
OutputView WatchView
Type here to search



File View Cache Debug Watch Help
General Purpose Floating Point
Hexadecimal
Unsigned Decimal
Signed Decimal
R13(sp) :17408
CPSR Register
Negative(N) :0
Zero(Z) :0
Carry(C) :0
Overflow(V) :0
IRQ Disable:1
FIQ Disable:1
Thumb(T) :0
CPU Mode :System
0x000000df
SWI 0x11
OutputView
Console Stdin/Stdout/Stderr
Execution starting ...
Type here to search


P1.s
00000014:EF000011 SWI 0x11
R0 :0
R1 :0
R2 :0
R3 :0
R4 :0
R5 :10
R6 :20
R7 :30
R8 :200
R10(sl):0
R11(fp):0
R12(ip):0
R13(sp):17408
R14(lr):0
R15(pc):20
CPSR Register
Zero(Z) :0
Carry(C) :0
Overflow(V):0
IRQ Disable:1
FIQ Disable:1
Thumb(T) :0
CPU Mode :Syste
0x000000df
Loading assembly language file

Ramaiah Institute of Technology
(Autonomous Institute, Affiliated to VTU)

Department of CSE

Programme: B.E **Term: Jan to May**
2019
Course: Computer Organization **Course Code:**
CS45

Activity IV: Executing ARM programs using ARMsim simulator.

Name: Keerthana Nagarajan	**Marks: /10**	**Date:** 11/03/2020
USN: 1MS18CS059	**Signature of the Faculty:**	

Objective: To simulate ARM Instruction set using ARMsim simulator.

Simulator Used: ARMSim 1.91 is a desktop application running in a Windows environment. It allows users to simulate the execution of ARM assembly language programs on a system based on the ARM7TDMI processor.

ARM enables the users both to debug ARM assembly programs and to monitor the state of the system while a program executes.

Activity to be performed by students:

1) Write an ARM program to generate Fibonacci Series.
2) Write an ARM to search an element in an array and print Y if found and print N if not found.
3) Write an ARM program to find the length of a string and copying one string to another.

Results/Conclusions and Snapshots: Take the snap shot of registers file and memory view

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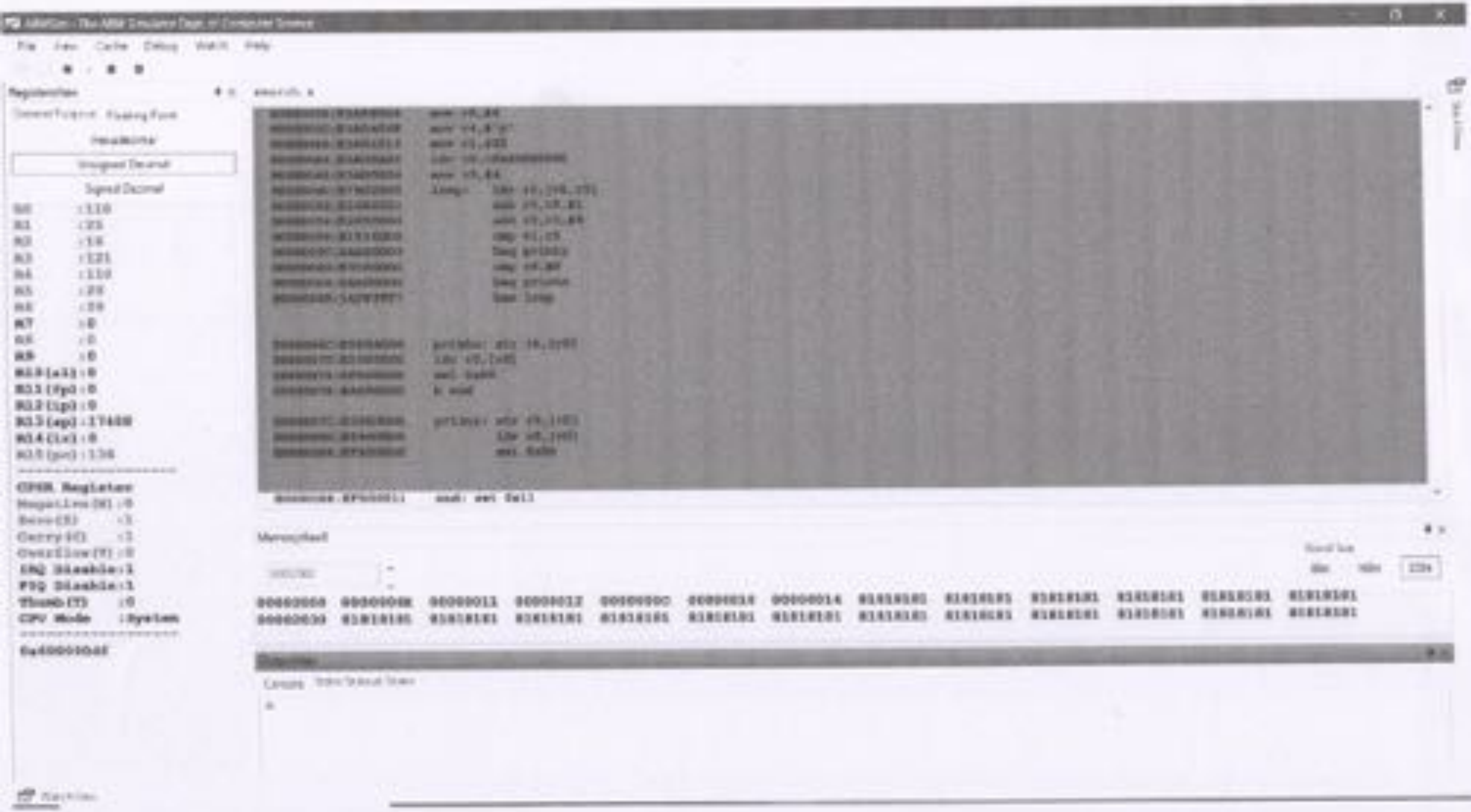
Data Sheet

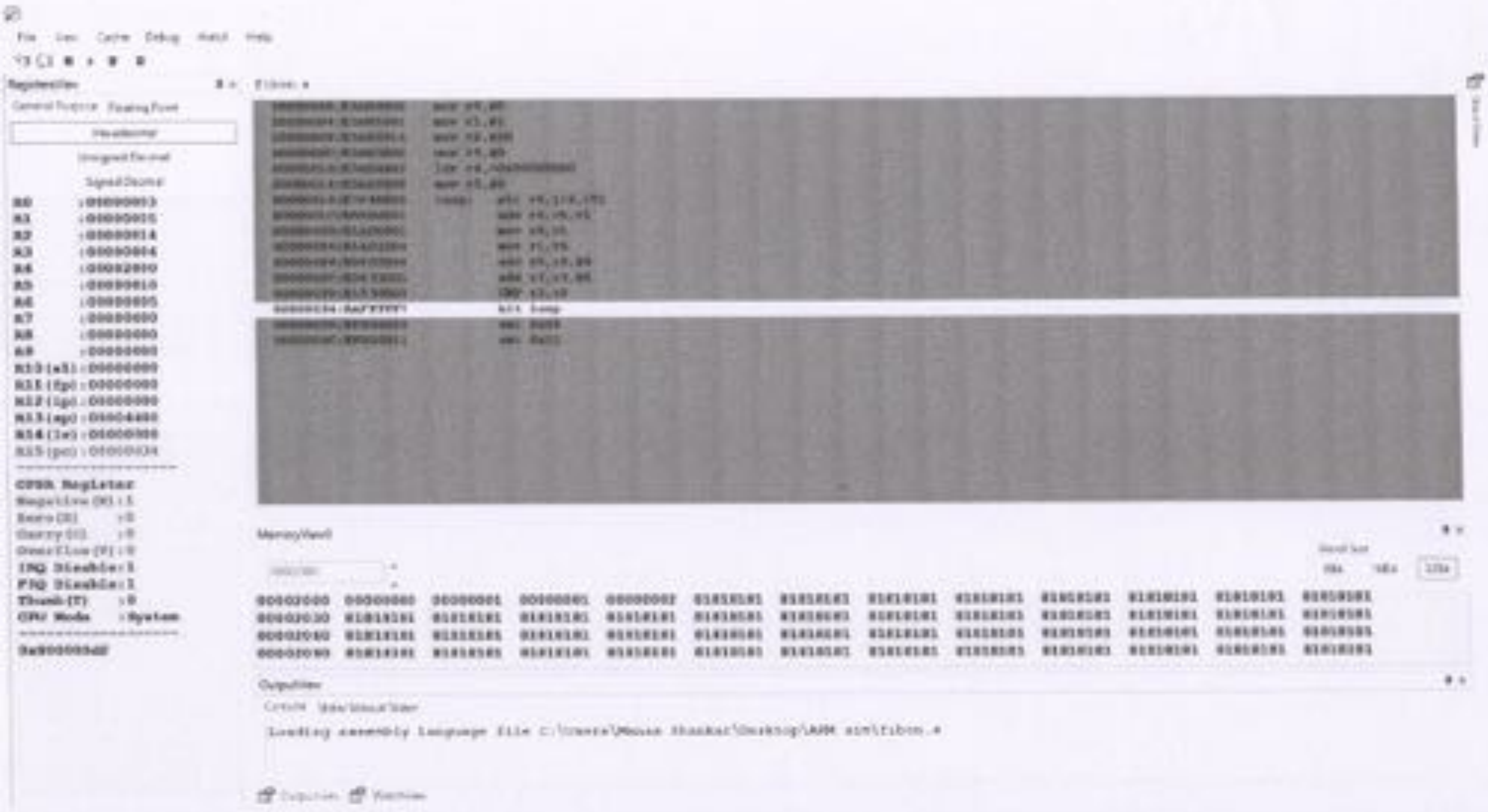
MARKS :

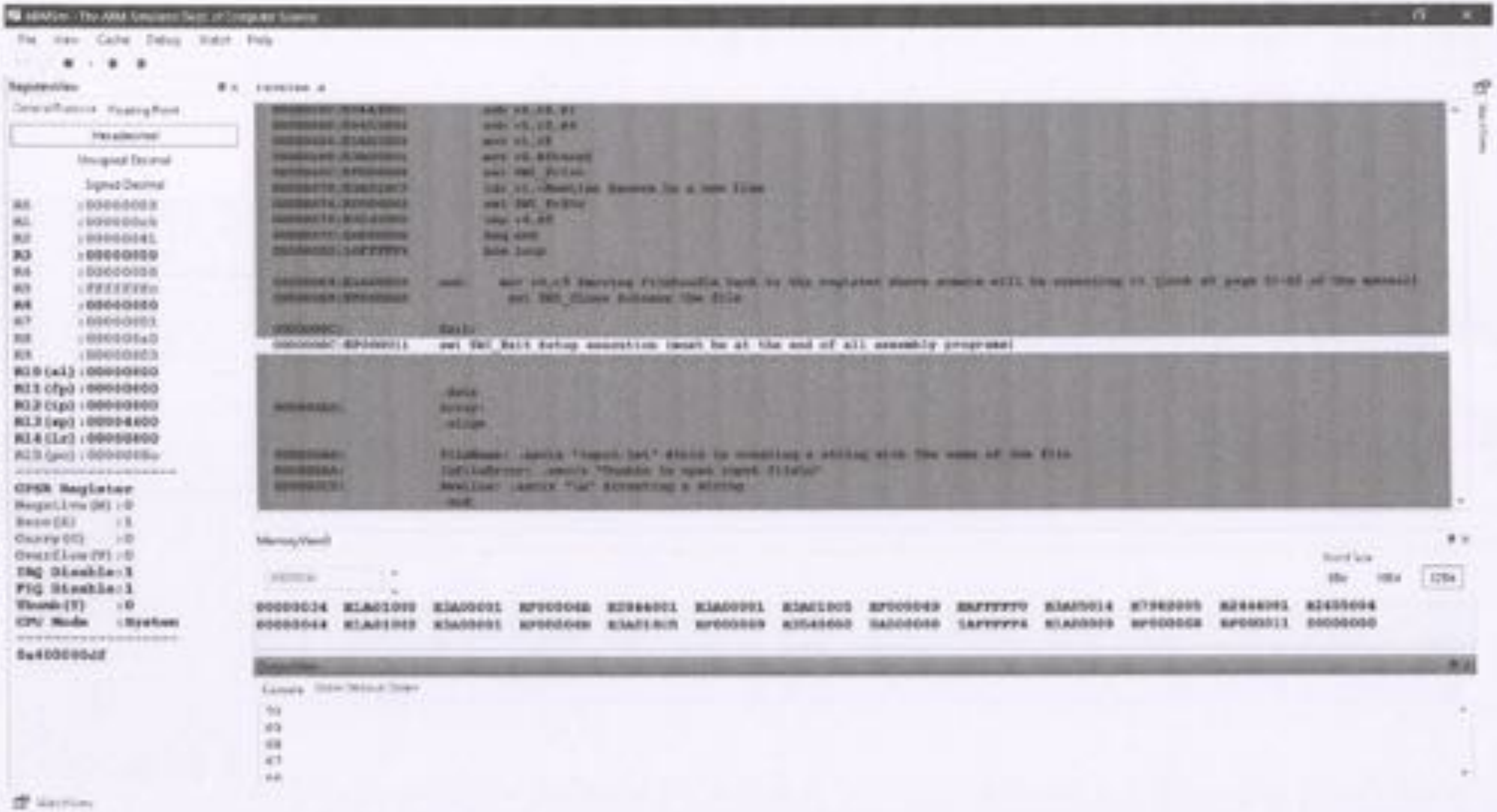
Name :	Keerthana Nagaraju	Branch:	CSE
USN/Roll No. :	1MS18CS059	Sem/Sec:	IV 'B'
Subject :	CO Lab	Subject Code:	

```
1). mov   R0, #0
    mov   R1, #1
    mov   R2, #5
    mov   R3, #0
    LDR   R4, = 0x0000 2000
    mov   R5, #0
    LOOP:  STR  R0, [R4, R5]
           ADD  R6, R0, R1
           mov  R0, R1
           mov  R1, R6
           ADD  R5, R5, #4
           ADD  R3, R3, #1
           CMP  R3, R2
           BLT  LOOP
     SWI 0x11

2). mov R0, #4
    mov R4, #'n'
    mov R1, #25
    LDR R0, = 0x0000 2000
    mov R5, #4
    LOOP: LDR R3, [R0, R5]
          SUB R0, R0, #1
          ADD R5, R5, #4
          CMP R1, R2
          BEQ priny
```

```
ldr r0, = Array
bcs afterloop
str r0,[r8, r5]
add r5, r5, #4
mov r1, r0
mov r0, #stdout
swi SWI_Print
add r7, r7, #1
ldr r1, = NewLine
swi SWI_Prstr
bal loopstart

afterloop:
 mov r5, #20
 loop: ldr r2, [r8, r5]
       sub r7, r7, #1
       sub r5, r5, #4
       mov r1, r2
       mov r0, #stdout
       swi SWI_Print
       ldr r1, = NewLine
       swi SWI_Prstr
       cmp r7, #0
       beq end
       bne loop
end: mov r0, r9
     swi SWI_close

Exit
swi SWI_Exit
```


File View Cache Debug Watch Help
Signed Decimal
CPSR Register
IRQ Disable :1
FIQ Disable :1
Thumb(T) :0
CPU Mode :System
end: swi 0x11
Console


CPSR Register
IRQ Disable
FIQ Disable
Thumb (T)
CPU Mode
System


CPSR Register
IRQ Disable:1
FIQ Disable:1
CPU Mode :System

Computer Organization Lab

Activity VI: Designing memory system using Logisim simulator.

Name:Keerthana Ningaraju	**Date: 20/04/2020**
USN:1MS18CS059	**Signature of the Faculty:**

Objective: To simulate the writing operation on memory.

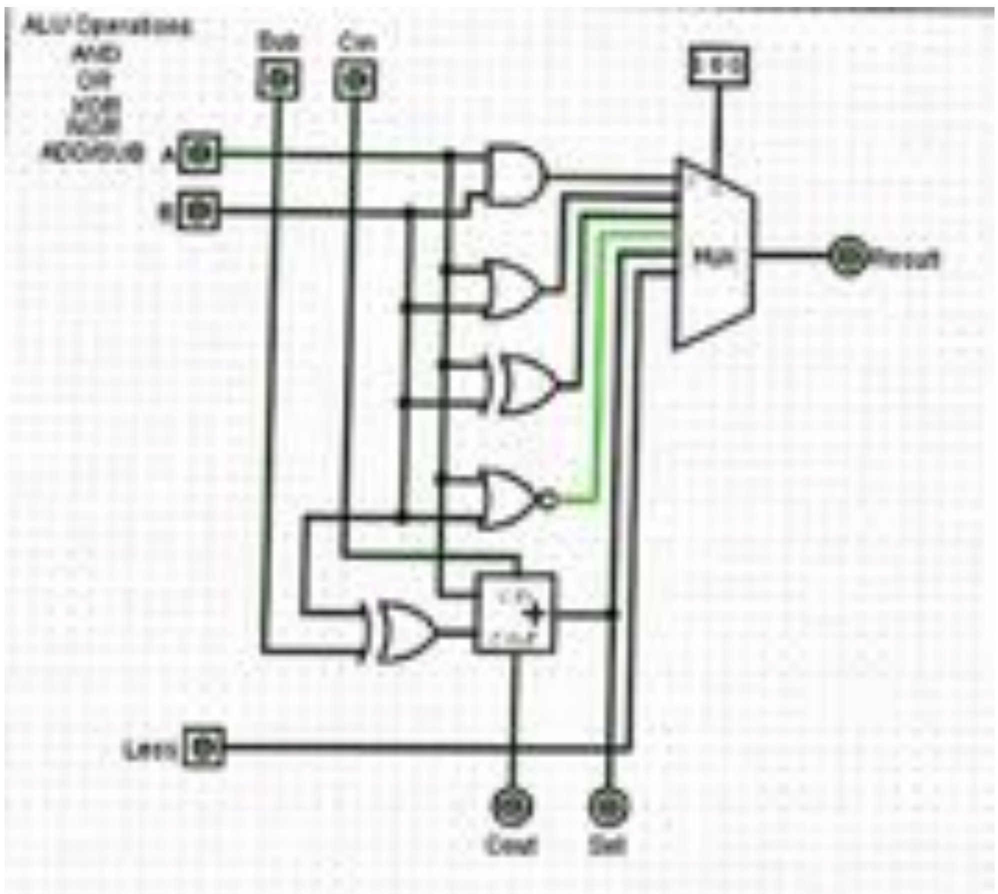
Simulator Description: Logisim is an educational tool for designing and simulating digital logic circuits. With its simple toolbar interface and simulation of circuits as you build them, it is simple enough to facilitate learning the most basic concepts related to logic circuits. With the capacity to build larger circuits from smaller sub circuits, and to draw bundles of wires with a single mouse drag, Logisim can be used (and is used) to design and simulate entire CPUs for educational purposes.

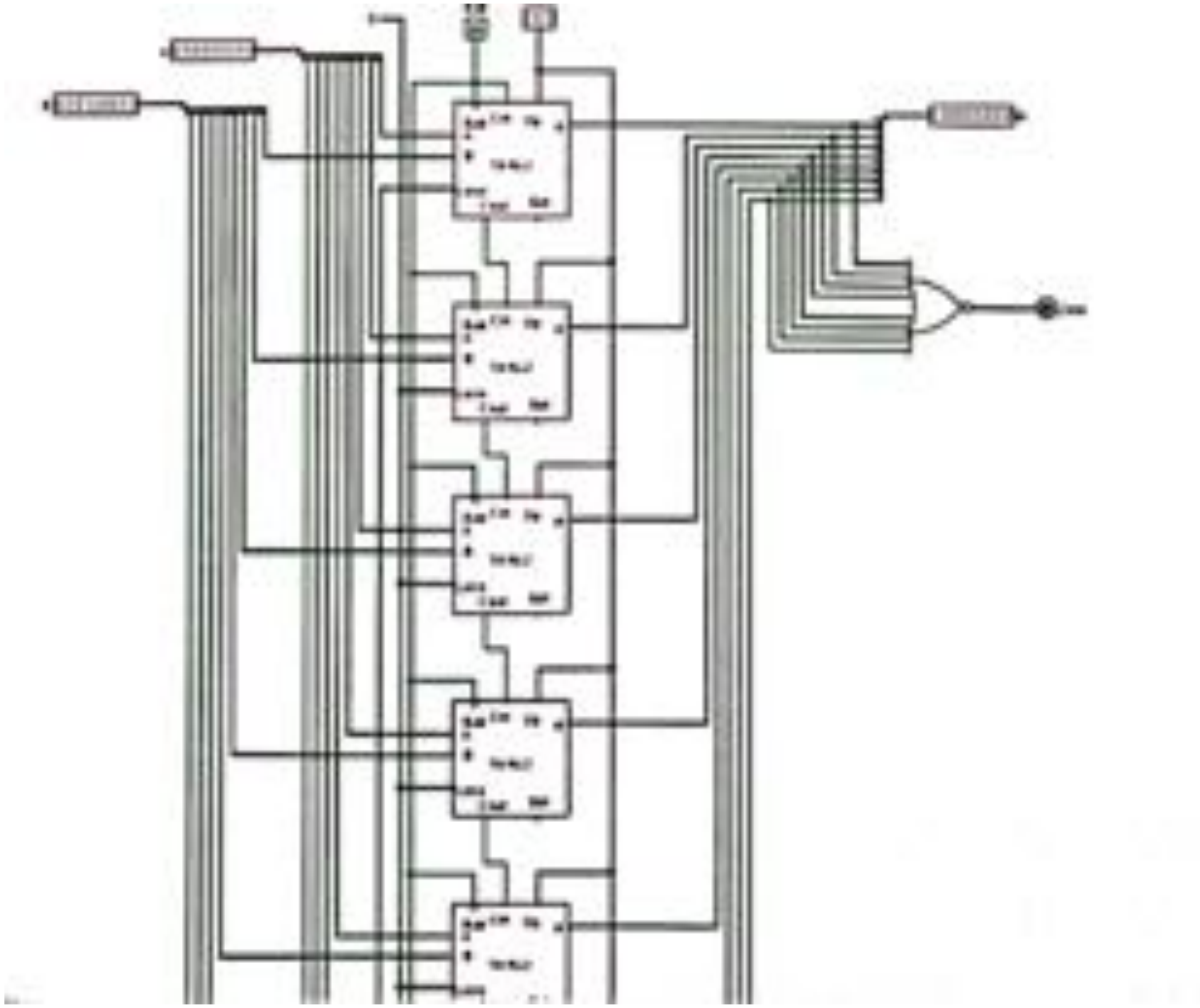
Activity to be performed by students

List out the steps in designing memory system

1. Add the two i/ps pins, name them A and B
2. Add or, and ex-or, nor gates and a 1-bit adder
3. Connect the A's and B's of all the gates to their respective pins
4. Add an output pin and name is Result
5. Add a 6-bit multiplier with 3 select bits
6. Connect outputs of all the gates to the mux.
7. Connect 3 bit input to mux
8. Add i/p pin to Cin, and output pin to cout.
9. Add an ex-or gate, connect its o/p to cout, the first i/p must to be connected B and then second to another i/p pin sub
10. Add another i/p and name it less, connect it to the mux.
11. Add an o/p pin and name it set, connect it to the o/p of the adder and

Observations and Snapshots:





MARKS FOR DIFFERENT CRITERIA	MARKS OBTAINED
Exploring of Tool : 2M	
Execution: 6M	
Documenting the Work and Results:2M	
Total: 10M	

Ramaiah Institute of Technology
(Autonomous Institute, Affiliated to VTU)

Department of CSE

Programme: B.E **Term: Jan to May 2019**
Course: Computer Organization **Course Code: CS45**

Activity VI: Designing memory system using Logisim simulator.

Name: Keerthana Ningaraju	**Marks: /10**	**Date: 20/04/2020**
USN: 1MS18CS059	**Signature of the Faculty:**	

Objective: To simulate the writing operation on memory.

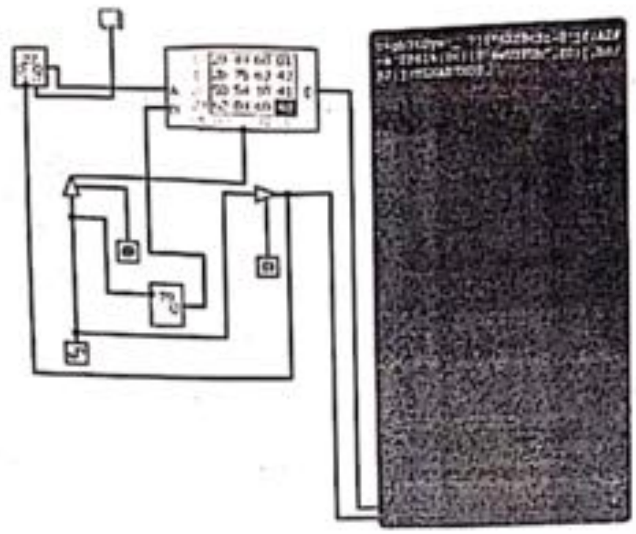
Simulator Description: Logisim is an educational tool for designing and simulating digital logic circuits. With its simple toolbar interface and simulation of circuits as you build them, it is simple enough to facilitate learning the most basic concepts related to logic circuits. With the capacity to build larger circuits from smaller sub circuits, and to draw bundles of wires with a single mouse drag, Logisim can be used (and is used) to design and simulate entire CPUs for educational purposes.

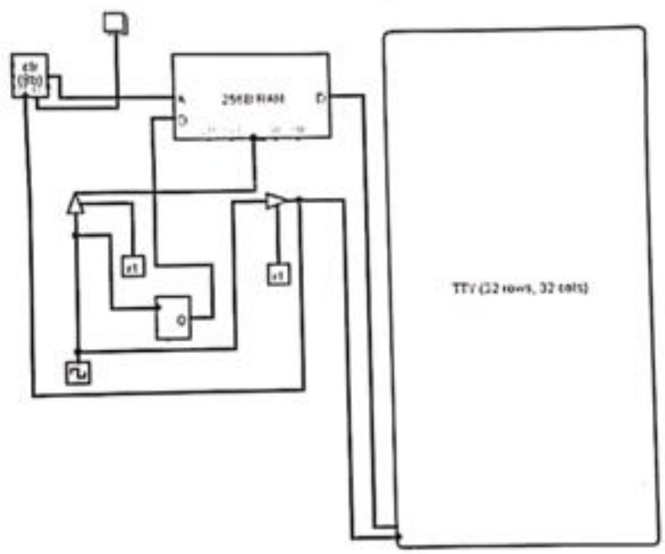
Activity to be performed by students:

List out the steps in designing memory system

1) Add a RAM with separate load & store selected
2) Add a counter and count 0 to A of the RAM
3) Add a controller buffer and connect its output to the paper
4) Add a controller buffer and connect its output to the RAM
5) Add a TTY unit & with 32 rows and colums, make the connections with RAM
6) Add a 7-bit random number generator, connect a end to D
7) Add another controlled buffer, connect the TTY, also add an input pin to the buffer
8) Connect the output of the second buffer to the counter
9) connect a button to the counter

Observations and Snapshots:





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Department of CSE

Programme: B.E **Term: Jan to May 2019**
Course: Computer Organization **Course Code: CS45**

Activity VII: To simulate advantages of using pipeline technique in executing a program.

Name: Keerthana Ningaraju	**Marks: /10**	**Date: 20/05/2020**
USN: 1MS18CS059	**Signature of the Faculty:**	

Objective: To learn and analyze the performance of the CPU by overlapping of instructions using CPUOS-SIM simulator.

Simulator Used: CPUOS-SIM is a software development environment for the simulation of simple computers. It was developed by Dale Skrien to help users to understand computer architectures.

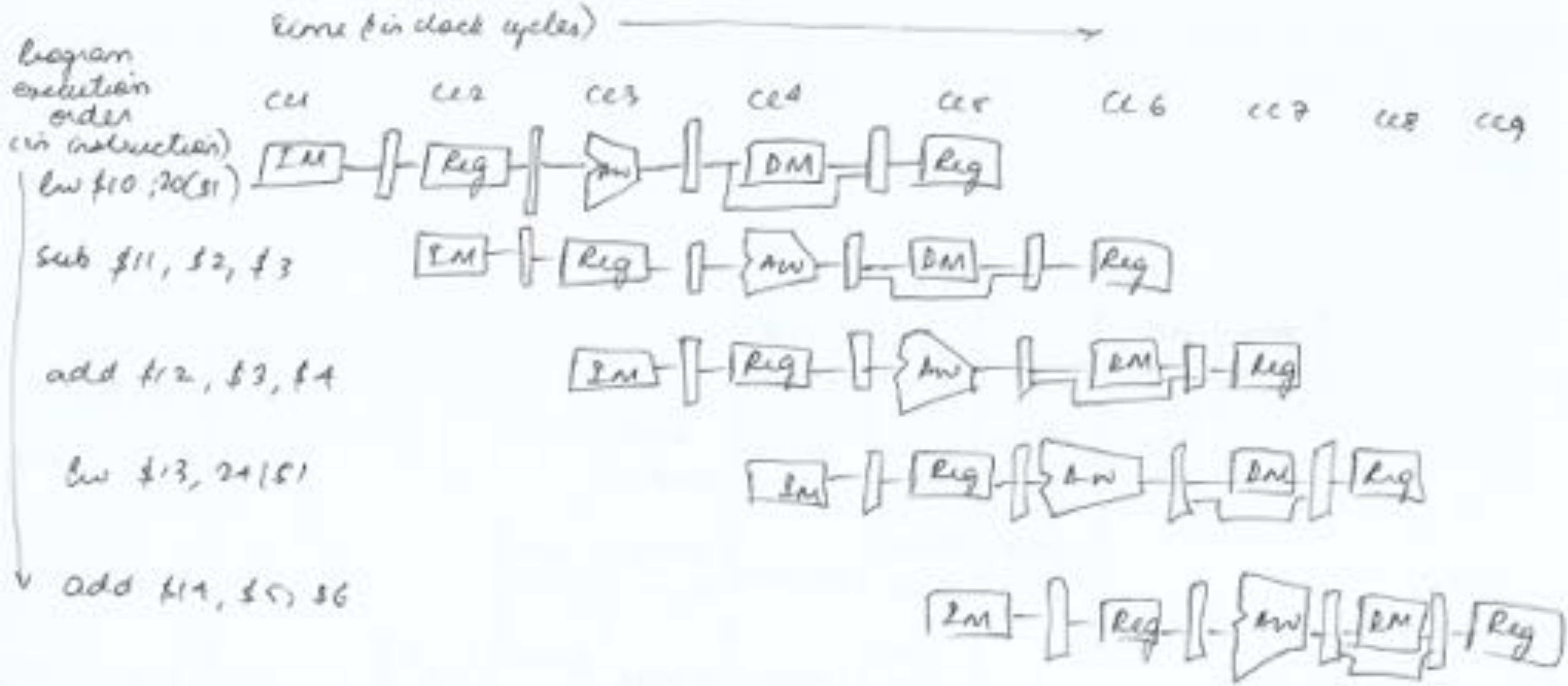
Modern CPU's contain several semi-independent circuits involved in decoding and executing each machine instruction. Separate circuit elements perform each of these typical steps:

- Fetch the next instruction from memory into an internal CPU register.
- Decode the instruction to determine which function sub-circuits it requires.
- Read any input operands required from high-speed registers or directly from memory.
- Execute the operation using the selected sub-circuits.
- Write any output results to high-speed registers or directly to memory.

Separate sections of the CPU circuitry are used for each of these steps. This allows these circuit sections to be arranged into a sequential pipeline, with the output of one step feeding into the next step.

Activity to be performed by students:
With diagram demonstrate the execution of the following instructions using pipelining technique.

lw $10,20($1)
sub $11, 42, $3
add $12, $3, $4
lw $13, 24($1)
add $14, $5, $6


Time (in clock cycles)
Program execution order (in instructions)
CC1
CC2
CC3
CC4
CC5
CC6
CC7
CC8
CC9
lw $10, 20($1)
sub $11, $2, $3
add $12, $3, $4
lw $13, 24($1)
add $14, $5, $6
IM
Reg
DM


CPU INSTRUCTIONS IN MEMORY (RAM)
SPECIAL CPU REGISTERS
GENERAL PURPOSE CPU REGISTERS
Pipeline Stages
Colour Code

Observations and Snapshots: Take the snap shot of CPU statistics and pipeline design.