Ramaiah Institute of Technology
(Autonomous Institute, Affiliated to VTU)
Department of CSE
Tutorial-1

Programme: B.E
Course: Computer Organization

Term: Jan to May 2018
Course Code: CS45

Name: MANISH.M	**Marks:** /10	**Date:** 21/01/2020
USN: 1MS18CS066	**Signature of the Faculty:**	

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 :

LAB - 1

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① Write a detailed procedure to assemble the system

Ans:

① The first step for assembling the computer system starts with mounting the processor on the processor socket of the motherboard.

② Once the processor is mounted, the heat sink will be attached on top of the processor. The CPU fan is also attached on top of the heat sink.

③ Motherboard is now fixed vertically in the tower case and the screws are fixed from behind of the motherboard.

④ Now, line up the power supply at the top back end of the cabinet and screw it.

⑤ If the cabinet cooling fan is required then it is to be screwed at the back end grill of the cabinet and its power connector is to be connected from SMPS

⑥ Install the CD/DVD drives at the top front end of the cabinet and screw it.

⑦ For SATA hard disk drive or CD/DVD drive use SATA cable and its power cable, else use IDE data cable.

⑧ Mount the memory modules on the motherboard by aligning the RAM to its socket on the motherboard.

⑨ Connect the external devices with CPU at its appropriate socket. Includes mouse and keyboard at PS2 or USB connectors.

(2) (2) Explain how trouble shooting a system helps to trace and correct the failure in the system.

Ans: * Troubleshooting is a form of problem solving, often applied to repair failed products or processes on a machine or a system.

* Verify that the problem actually exists:
A problem is usually indicated by a change in equipment performance or product quality. Do not simply accept a report that something is wrong without personally verifying the failure.

* Identify and locate the cause of the trouble:
Trouble is often caused by a change in the system. A thorough understanding of the system,

its modes of operation, and how the modes of operation are supposed to work.

* Correct the problem:

It is often caused by a change in the system. ~~A the~~ not just the effect or symptom. this often involves replacing or repairing a part or making adjustments.

* Verify that the problem has been corrected:

Repeating the same check that originally indicated the problem can often do this. If the fault has been corrected, the system should operate properly.

* Follow up to prevent further trouble:

Determine the underlying cause of the trouble. Suggest a plan to supervisor that will prevent a future recurrence of this problem.

List out the procedure to install extra memory card to a system.

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

* Remove the side panel to give you full access to the processor and its chunky cooler. If there's

already RAM, eject it.

* 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 slot are pushed back, so they're tilted away from the RAM.

* Once the sticks have slicked into place, confirm that the wing clips are clocked in to hold the sticks firmly in their slots and then close the PC back up. Plug all the cables back and try and boot the system.

(4.) With a neat diagram, explain different cables used to connect functional units in a system.

Ans: (1) HDMI cable - Connect one end to computer, monitor, television. Connect other end to HDMI port on the computer.

(2) DVI cable - In this cable, one end is connected to the monitor and the other end is connected to the DVI port on the computer's CPU.

(3) VGA cable - It is also known as D-sub cable, analog video cable. Connect one end to the monitor or television and other end to the VGA port on the back panel of the CPU.

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MARKS: 10

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

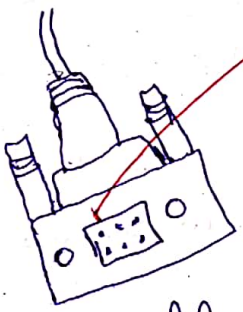
⑤ Ethernet cable - Connect one end to router & network switch. The other end is connected to the ethernet port on the computer.

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

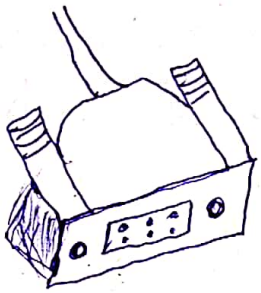
⑦ Computer power cord (kettle plug) - Connect one of the ends to AC power socket. Connect other end to power supply unit, computer monitor.

Diagrams:

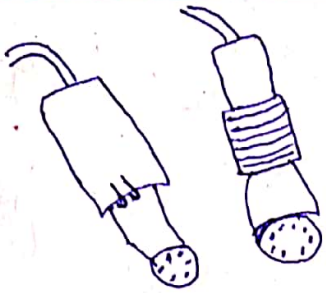
① HDMI cable



② DVI cable

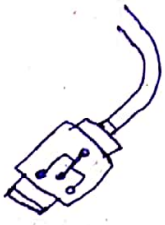


③ VGA cable

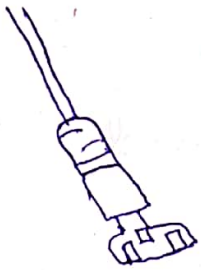


④ PS/2 cable

⑤ Ethernet cable



⑥ USB cable



⑦ Computer Power cord (kettle Plug)

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

Ans: A few precautions have to be taken before you ~~start~~ disassembling your computer for both the computer unit as well as ourselves.

1) Fully shutdown and unplug the computer before you make any attempts to disassemble the tower.

2) Keep away from any conductors (direct contact) on your arms 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 Works in a cool area to avoid perspiration from excess of heat.

⑤ Before touching any part within the tower, put your hands against another metal surface to remove the static charges.

⑥ Keep some empty space to place any screws you may remove. A container/piece of paper with labels for each part is ideal to avoid confusion b/w the similar looking screws.

⑦ Handle all parts with care. Place the parts on a flat surface.

⑧ Do not forcefully remove any component.

⑨ Be very careful while handling the motherboard of the CPU.

⑩ Never attempt to remove the power source which is at the bottom of the unit.

⑪ While removing any cables/wires, make sure you 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 a note that the three most damaging things to a computer are moisture, shock and dust.

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Tutorial -II

Programme: B.E
Course: Computer Organization

Term: Jan to May 2020
Course Code: CS45

Name: MANISH.M	**Marks:** /10	**Date:** 28/01/2020
USN: 1MS18CS066	**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:

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Data Sheet

MARKS :

LAB - 2

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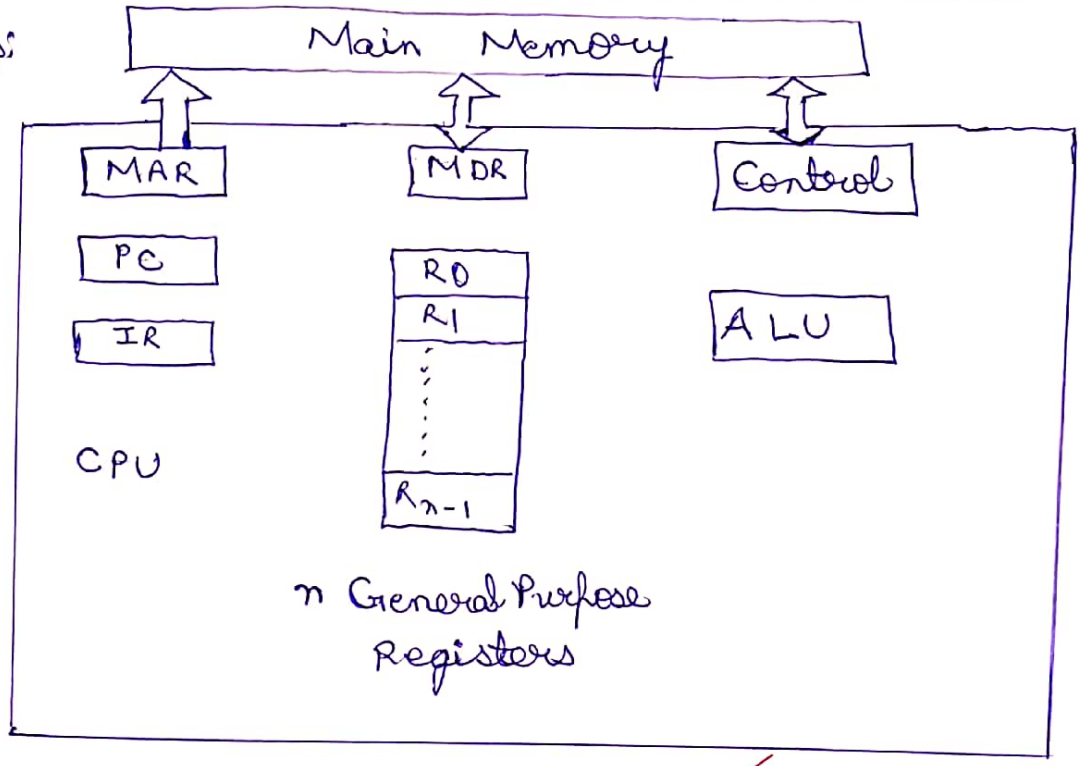
USN/Roll No. :	1MS18CS066	Sem/Sec:	IV, 'B'
Subject :	COA	Subject Code:	

4/2/2020

① Draw the interconnection between memory and processor.

Ans:



② List out the steps required to execute an instruction.

Ans: There are 6 steps involved in the execution of an instruction:

1) Fetch instruction
2) Decode information

3) Perform ALU operation

4) Access memory

5) Update register file

6) Update the Program Counter(PC)

3) Write and execute the assembly language program to compute:

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

Ans:

```
        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 9
H       DEC 5
Y       DEC 8
```

```
I     DEC   2
A     DEC   0
B     DEC   0
F     DEC   0
one   DEC   1
```

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

Ans:

```
      LOAD B
      STORE D
first LOAD B
      ADD X
      STORE X
      LOAD D
      SUBT one
      STORE D
      SKIPCOND400
      JUMP first
second LOAD A
      ADD Y
      STORE Y
      LOAD C
      SUBT one
      STORE C
      SKIPCOND400
      JUMP second
third LOAD four
      ADD Z
      STORE Z
      LOAD Y
      SUBT one
      STORE Y
      SKIPCOND000
      JUMP third
LOAD D
ADD X
SUBT Z
OUTPUT
HALT
A   DEC 6
B   DEC 3
C   DEC 2
D   DEC 0
X   DEC 0
Y   DEC 0
Z   DEC 0
D   DEC 0
one DEC 1
four DEC 4
```

(24) Describe the factors affecting the performance of a processor.

Ans: There are few factor affecting the performance of a processor:

- Multiple cores: Nowadays we have dual, quad and even octa core processors with its own fetch and execute cycles. However, the software should make use of the multiple cores.
- Clock speed: The processor requires a clock pulse in order to operate correctly. One clock cycle = 1 Hz. A PC clock speed is normally in the GHz region.
- Cache memory: It is a small amount of high performance RAM that is built into the processor, this RAM stores the data which has to be repeatedly used by the processor and it does not require a request from memory.
- Word length: The number of bits the CPU can process simultaneously. For example, a 32-bit processor is faster than a 16 bit processor because of the wider word length.
- Address Bus Width: It is the width of the address bus and determines the maximum amount of addressable locations. For example, an address bus of 8 bits means that you can have 256 addresses. (0 to 255)
- Data Bus width: It is the number of bits that can be transferred simultaneously from one device to another. If the data bus is 16 bits and the address bus is 32 bits, so the data is fetched in 2×16 bit groups.

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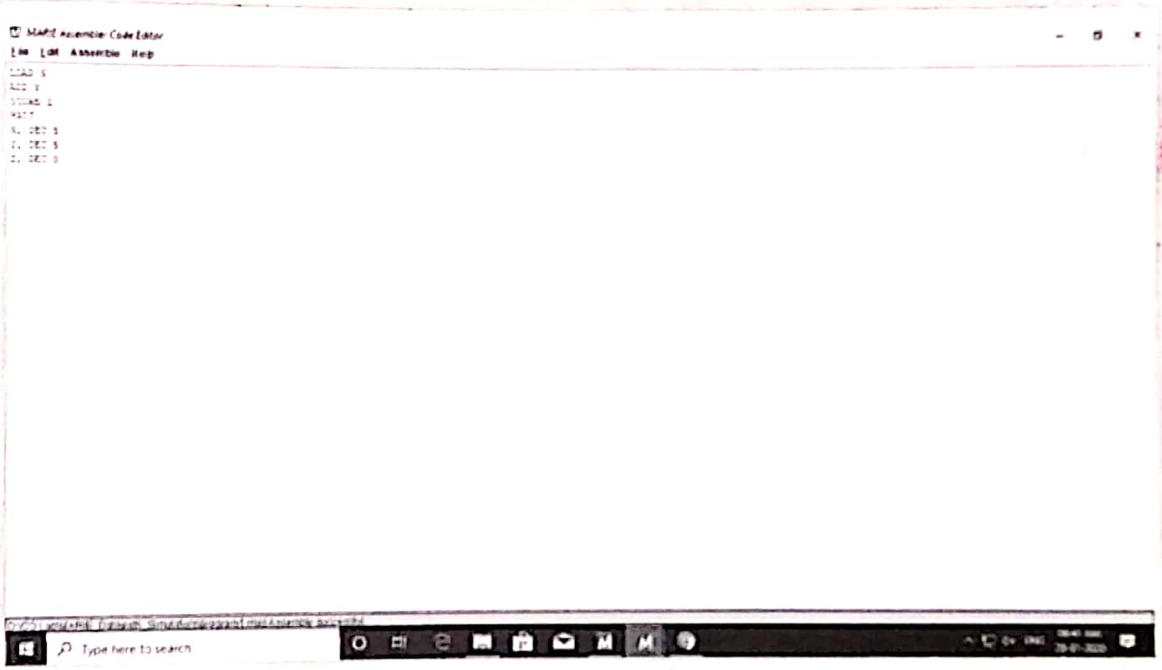
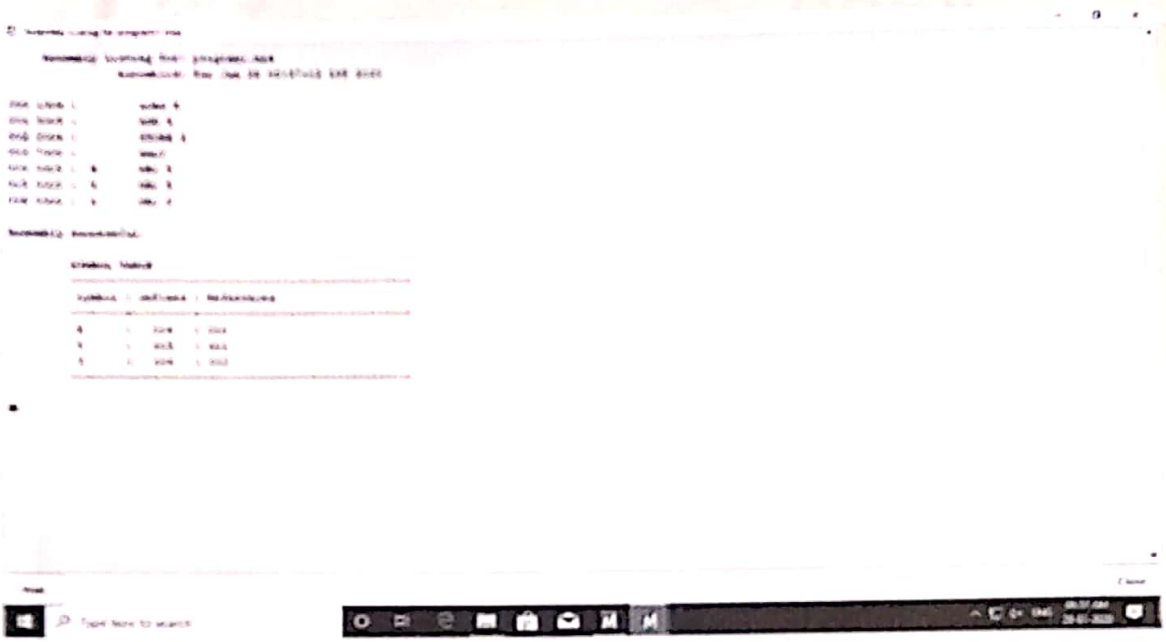
Subject :	COA	Subject Code:	

(5) Results and screen shots.

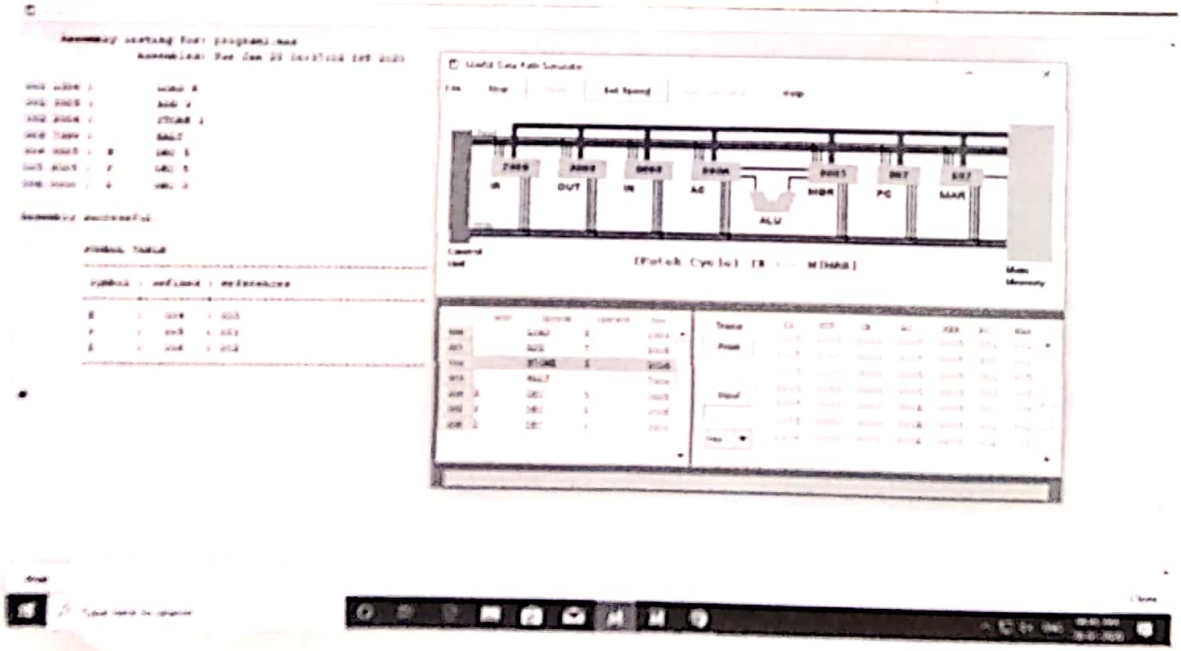
Ans:



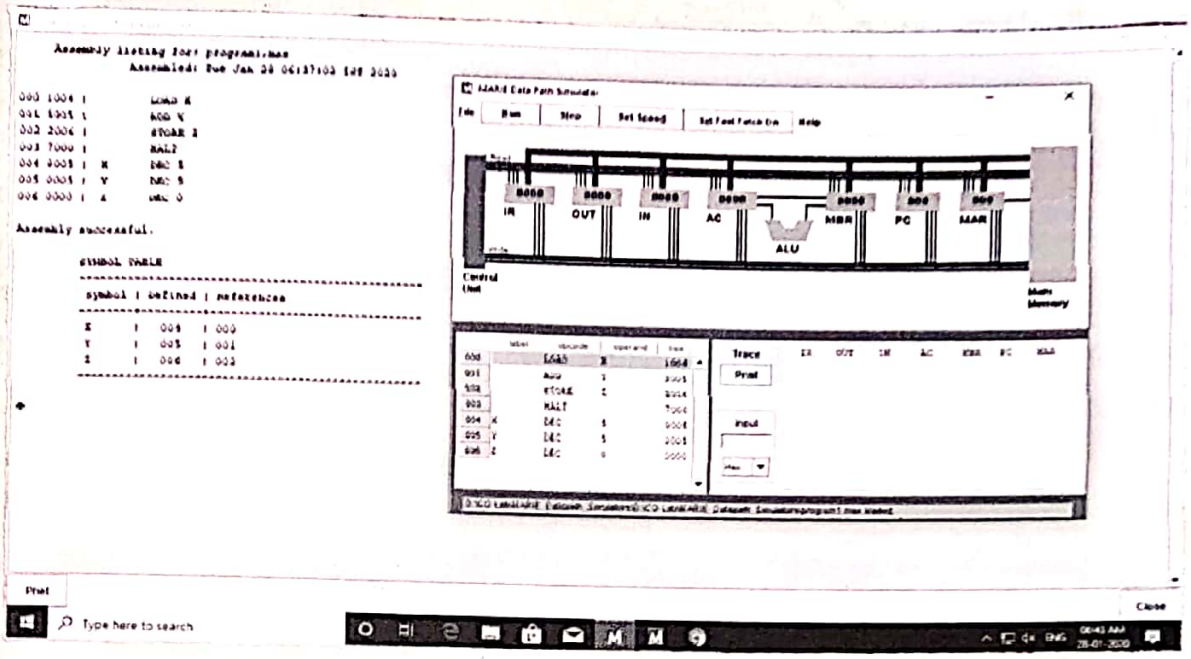
CODE FOR ADDITION OF 2 NUMBERS IN ASSEMBLY LANGUAGE USING MARIE SIM



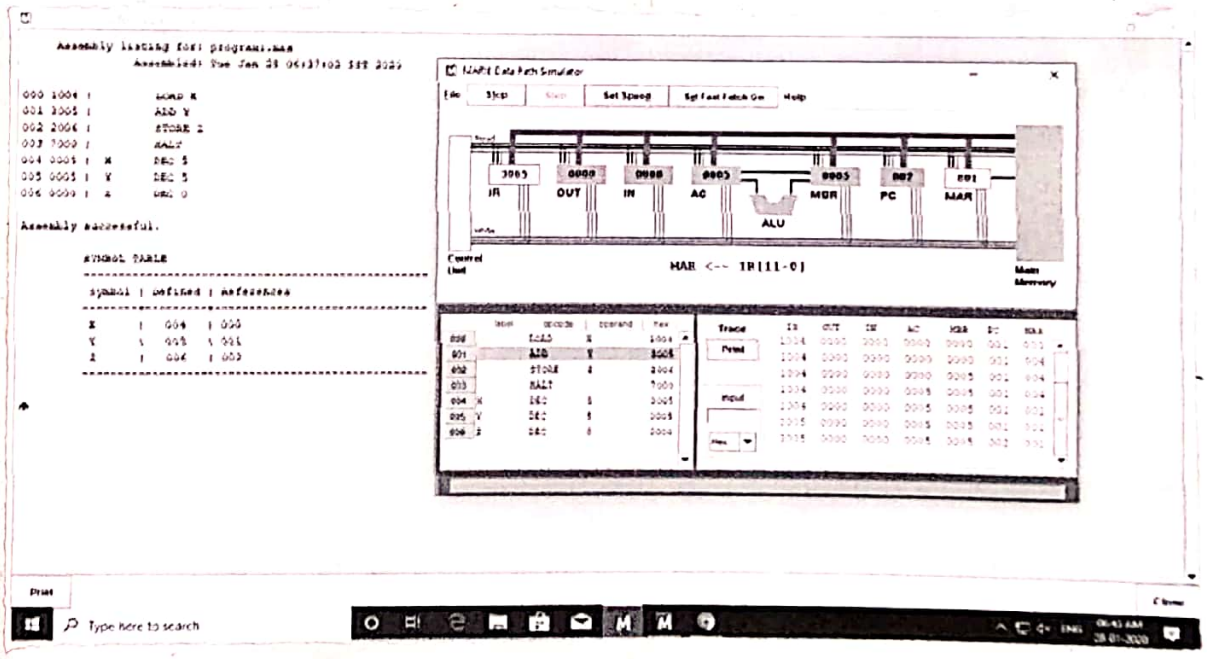
CODE ASSEMBLED SUCCESSFULLY.



SIMULATING THE CODE (DATA PATH SIMULATION)



LOAD OPERATION



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Department of CSE

Tutorial -III

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

Term: Jan to May 2020

Name: MANISH.M	**Marks:** 10 /10	**Date:** 24/02/2020
USN: 1MS18CS066	**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:

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Data Sheet

MARKS :

LAB - 3

Name :	MANISH.M	Branch:	CSE
USN/Roll No. :	1MS18CS066	Sem/Sec:	V 'B'
Subject :	COA Lab	Subject Code:	

1) Write an ARM program for arithmetic operations

Ans:
```
MOV R5,#10
MOV R6,#20
ADD R7,R5,R6
SWI 0x11
```

2) Write an ARM program to demonstrate the working of load and store instructions.

Ans:
```
MOV R1,#0x00000070
MOV R3,#0
MOV R4,#50
STR R4,[R1,R3]
LDR R6,[R1,R3]
SWI 0x11
```

3) Write an ARM program to evaluate $f=(g+h)-(i+j)$

Ans:
```
MOV R6,#30
MOV R7,#40
MOV R8,#10
MOV R9,#20
MOV R3,#0
```

```
MOV R5, #0x00000050
ADD R1, R6, R7
ADD R2, R8, R9
SUB R1, R1, R2
STR R1, [R5, R3]
SWI 0x11
```

5) WRITE an ARM program to find the factorial of a number.

Ans:

```
MOV R1, #5
MOV R0, #1
MOV R3, #1
LOOP: MUL R3, R0, R3
      ADD R0, R0, #1
      SUB R1, R1, #1
      CMP R1, #1
      BGE LOOP
SWI 0x11
```

4)

```
MOV R0, #5
LDR R1, =array
loop LDR R2, [R1], #4
     ADD R3, R3, R2
     SUB R0, R0, #1
     CMP R0, #0
```

BNE loop

- array DCD 0x00000001, 0x00000002, 0x00000003, 0x00000004, 0x00000005

SWI 0x11

SNAPSHOTS:

P.T.O

Snapshots:

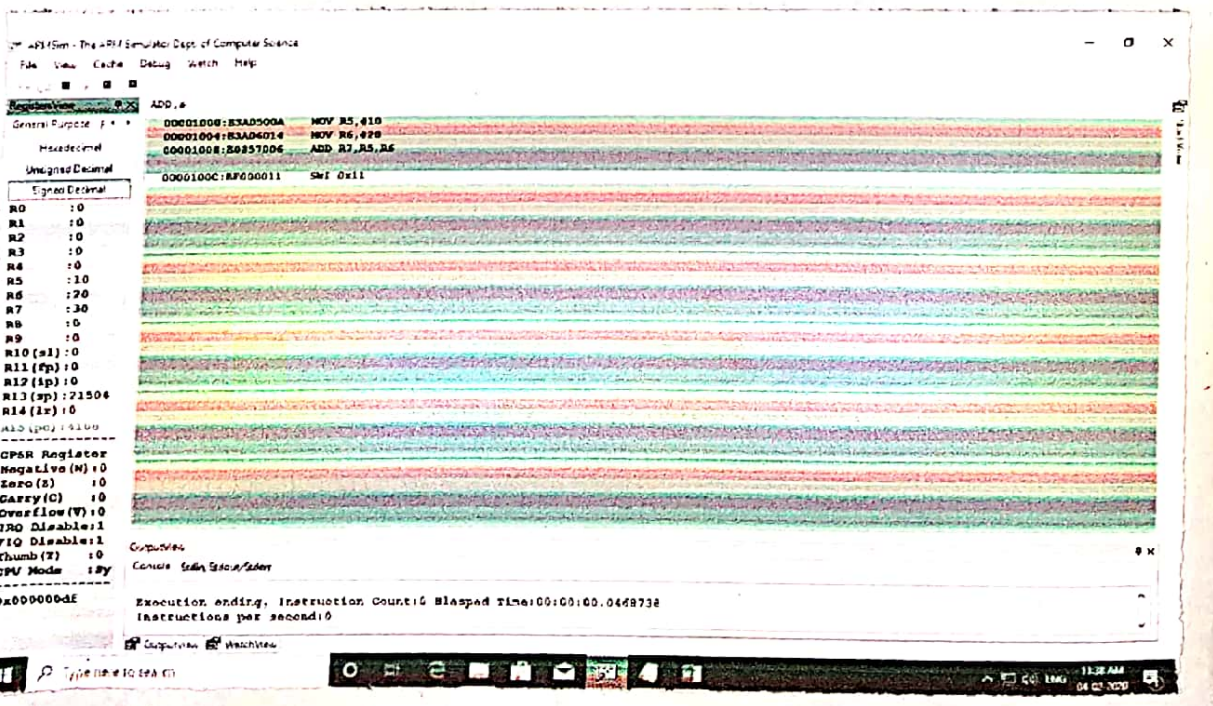
(1)

ADD - Notepad

File Edit Format View Help

```
MOV R5,#10
MOV R6,#20
ADD R7,R5,R6

SWI 0x11
```



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MARKS :

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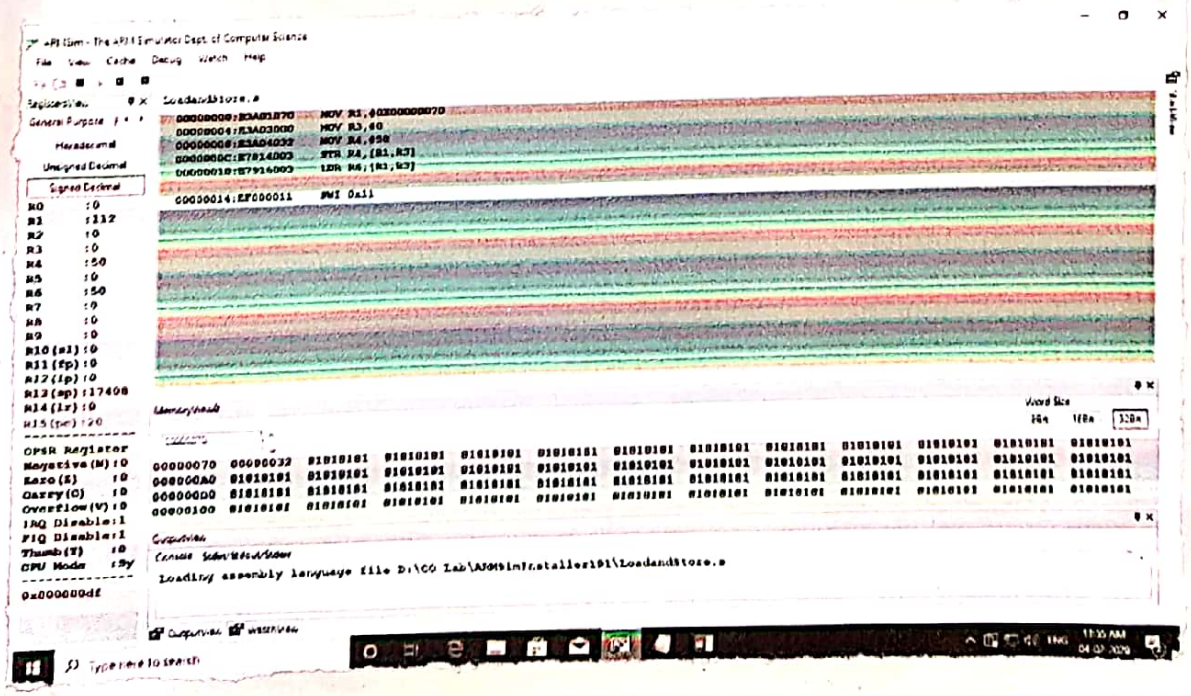
USN/Roll No. :	1MS18CS066	Sem/Sec:	IV 'B'
Subject :	COA Lab	Subject Code:	

(2)

```
LoadandStore - Notepad
File  Edit  Format  View  Help
MOV R1,#0X00000070
MOV R3,#0
MOV R4,#50
STR R4,[R1,R3]
LDR R6,[R1,R3]

SWI 0x11
```

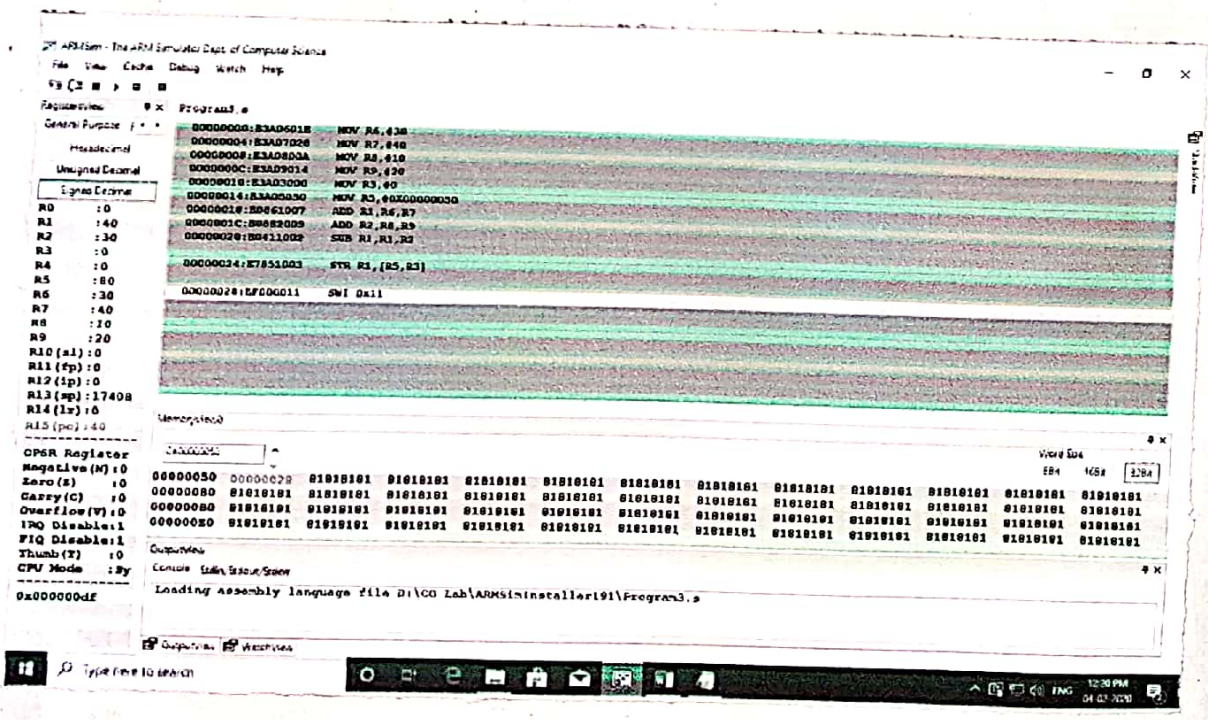


(3)

```
MOV R6,#30
MOV R7,#40
MOV R8,#10
MOV R9,#20
MOV R3,#0
MOV R5,#0X00000050
ADD R1,R6,R7
ADD R2,R8,R9
SUB R1,R1,R2

STR R1,[R5,R3]

SWI 0x11
```



(5)

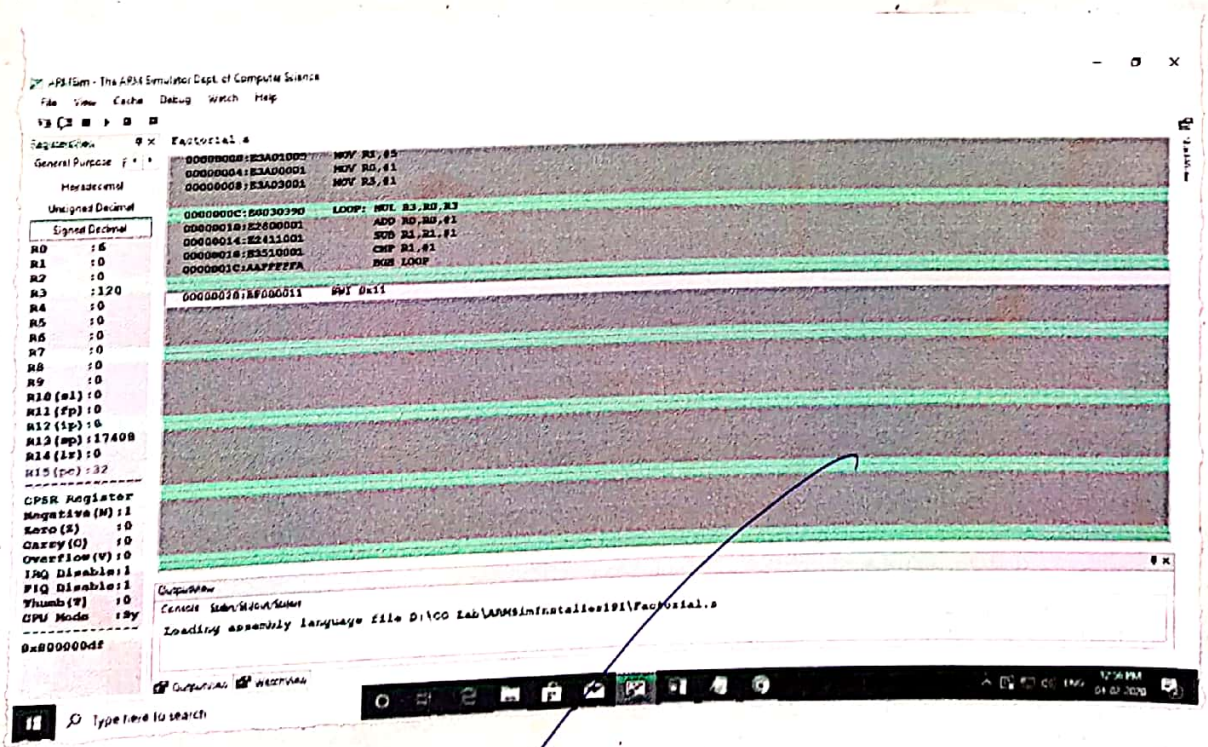
Factorial - Notepad

File Edit Format View Help

```
MOV R1,#5
MOV R0,#1
MOV R3,#1

LOOP: MUL R3,R0,R3
      ADD R0,R0,#1
      SUB R1,R1,#1
      CMP R1,#1
      BGE LOOP

SWI 0x11
```



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USN/Roll No. :	1MS18CS066	Sem/Sec:	IV 'B'
Subject :	COA	Subject Code:	

TUTORIAL – 4

① Fibonacci series

Ans:
```
mov r0,#0
mov r1,#1
mov r2,#20
mov r3,#0
ldr r4,=0x00002000
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 0x22
      SWI 0x11
```

② Search an element in the array

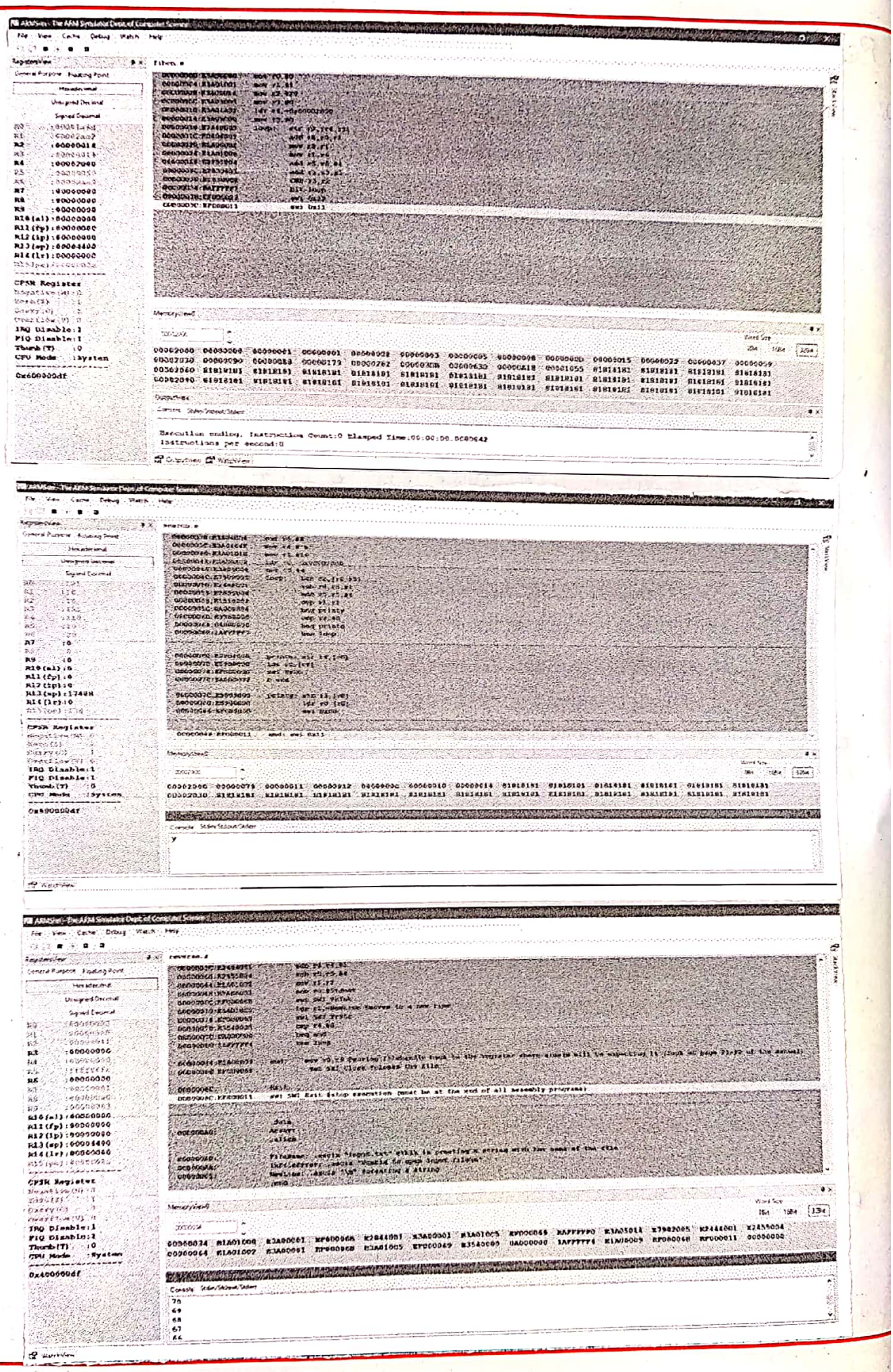
Ans:
```
ldr r0,=0x00002000
mov r1,#14
mov r2,#17
mov r3,#18
```

```
mov r4, #12
mov r5, #16
mov r6, #20
str r1, [r0]
str r2, [r0, #4]
str r3, [r0, #8]
str r4, [r0, #12]
str r5, [r0, #16]
str r6, [r0, #20]
mov r3, #'y'
mov r8, #4
mov r4, #'n'
mov r1, #16
ldr r0, =0x00002000
mov r5, #4
loop: ldr r2, [r0, r5]
      sub r8, r8, #1
      add r5, r5, #4
      cmp r1, r2
      beq printy
      cmp r8, #0
      beq printn
      bne loop
printn: str r4, [r0]
      ldr r0, [r0]
      SWI 0x00
      b end
printy: str r3, [r0]
      ldr r0, [r0]
      SWI 0x00
end: SWI 0x11
```

(3) Reverse an array

Ans

```
_start: ldr r0,=FileName @load filename
  mov r1, #0
  swi SWI_Open @open file
  bcs Exit @exit
  mov r9,r0 @save filehandle
  mov r5, #0
loopstart:
  mov r1,#Stdout
  mov r0,r9 @move filehandle to r0 for use
  ldr r3, =Array
  swi SWI_RdInt
  bcs afterloop
  str r0, [r3,r5]
  bal loopstart
  loopstart
afterloop: mov r5,#20
 loop: ldr r2,[r3, r5]
       sub r4, r4, #1
       sub r5, r5, #4
       mov r1, r2
       mov r0, #Stdout
       swi SWI_Print
       ldr r1, =Newline @
       swi SWI_Prints
       cmp r4, #0
       beq end
       bne loop
end:   mov r0,r9
       swi SWI_Close
Exit: swi SWI_Exit
```



CO Lab Assignment

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CSE - IV 'B'

Lab - 5

→ List out the steps in designing the ALU

1. Place 2 pins A & B (input pins)
2. Connect the input pins to an 'AND' gate
3. Similarly connect A & B to an 'OR' gate, 'XOR' gate and 'NOR' gate and add a 1-bit adder.
4. Place a multiplexer with 3 select bits.
5. Connect the outputs of all the gates to the MUX & a 3-bit input pin to the MUX.
6. Connect the output of the MUX to the output pin and name the output pin as 'Result'.
7. Connect an input pin (C_{in}) to the 1-bit adder and an output pin (C_{out}) to the 1-bit adder.
8. Connect another input pin ('Sub') to an Ex-OR gate and the output of it to Cout.
9. Connect an input pin (Less) to the MUX for comparisons.
10. Connect an input pin (Set) to the output of the 1-bit adder which is in-turn connected to the MUX.

Snapshots:

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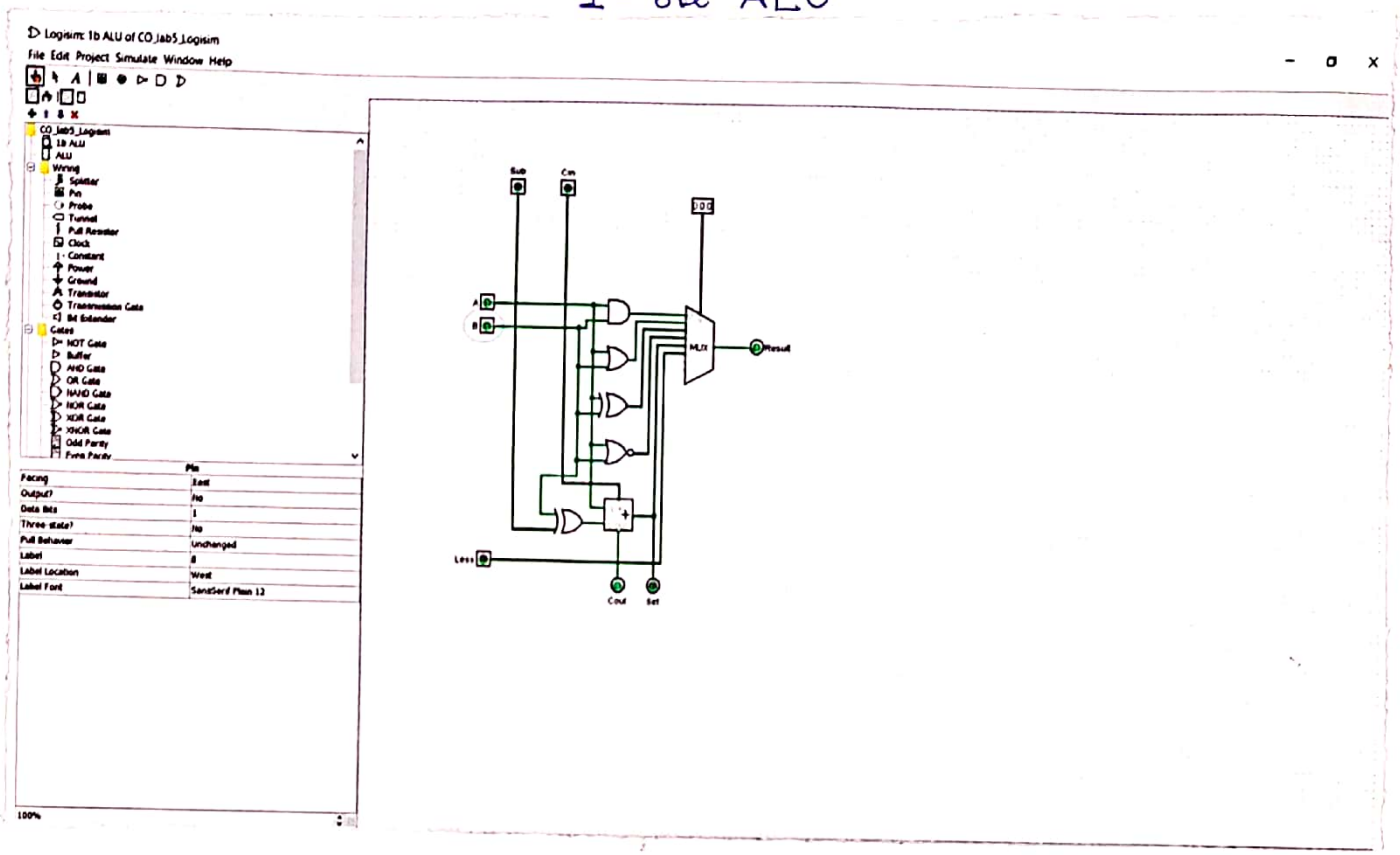
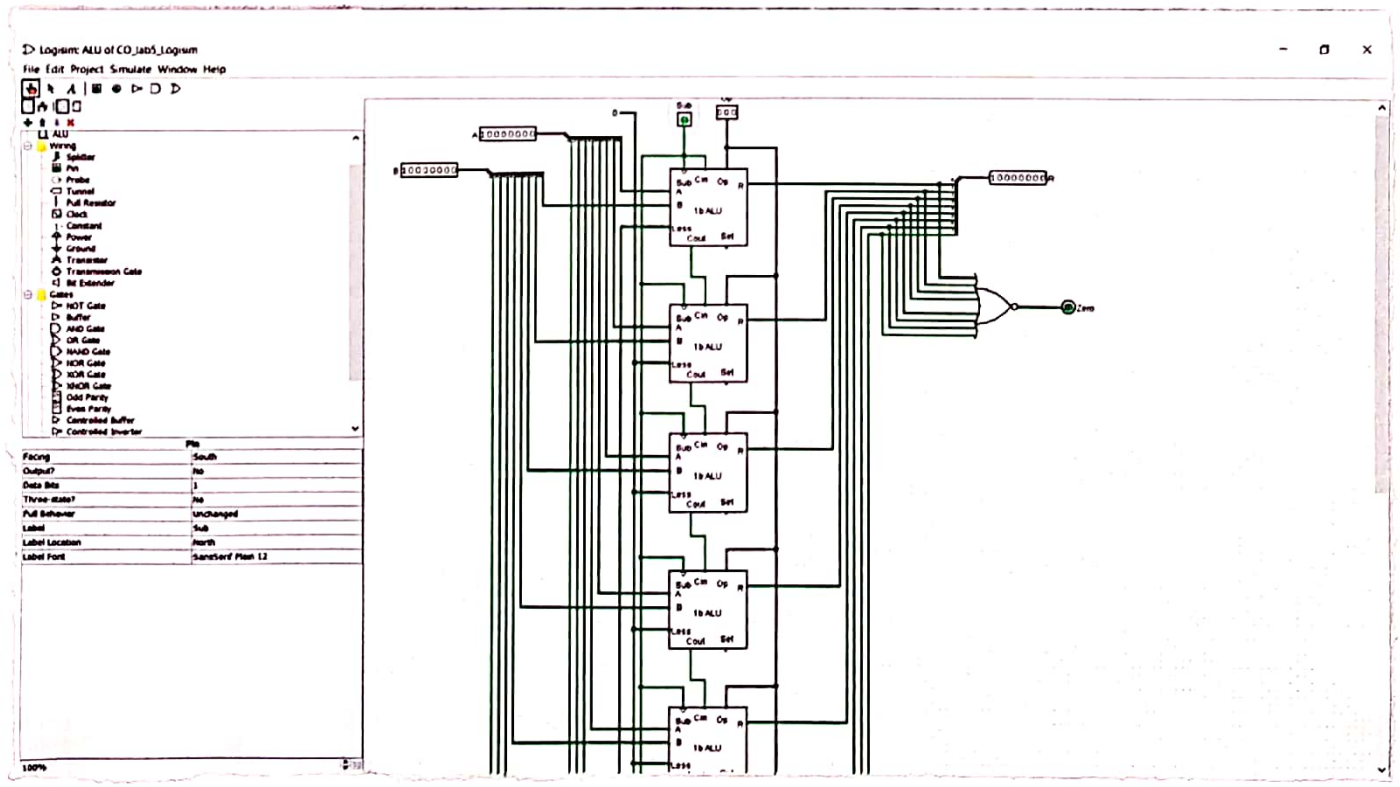
IMS18CS066

1-bit ALU



8-bit ALU



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Lab - 6

→ List out the steps in designing memory system.

1. Add a RAM with separate load and store selected for the component.
2. Place a counter and connect it to the RAM
3. Connect a clock to a controlled buffer and the output of it to the RAM.
4. Connect an input pin to this controlled buffer.
5. Place another controlled buffer and give an input from the input pin and also the clock.
6. Add a 4-bit random generator and connect Q to D of RAM
7. Connect the 'D' from RAM to a TTY unit to display.
8. Connect another input from the second controlled buffer to the TTY.
9. Connect a reset button to the counter.

Snapshots:

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