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: JAYANTH VIKRAM · M	**Marks:** 10/10	**Date:** 22/01/2020
USN: 1MS18CS051	**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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(Q2) Trouble shooting is a systematic approach to problem solving that is often used to find and correct issues with complex machines, electronics, computers and software systems.

steps to troubleshoot a system in case of a failure :-

* Gathers information on the issue, such as an undesired behaviour (or) a lack of expected functionality. Other important information includes related symptoms and special circumstances that may be required to reproduce the issue.

* Once you've got a grasp on the issue, try repeating your understanding of the problem so that you're both on the same page as to what's wrong.

* gather more details, and eliminate the variables such as error messages, events logs, any form of media like screenshots, video clips to help assist the troubleshooting process.

* Run Diagnostic results :- Run the system utilities in your machine to get information like windows check for faulty memory, performance monitor to check for unusually high CPU(or) memory usage.

* Reproduce the problem, and develop a hypothesis of the root cause. This can either be done at the physical site of the problem (or) remote control applications.

* Attempt a fix based on the findings, by trying to tweak the settings related to the problem, swapping out faulty parts & so on.

(Or)

Step I :- Remove Side Panels on Case :-
After removing the case from the box, the

panels are removed from the case with thumb screws, standoffs for mounting motherboard

Step-2 : Insert Motherboard :- Depending on the motherboard, CPU and CPU fan, this might need to be done before installing or one in place. The I/O panel faceplate needs to be snapped into the location in the back of the case. Once the board is resting in the case, line up the first hole, I suggest a corner.

Step-3 : Check clearance :- For computers with some high performance components, some of them large enough that clearance can become an issue.

4 : Front Panel connections :- After the graphics card is removed, attach the buttons, lights, USB ports and audio connections. Refer to manual for placement and orientation of connections

5 : Install Power Supply : The power supply from the previous case was modular, so only the cables that are needed are plugged into the unit.

6: Power the motherboard: The optical drive for this computer is a DVD/CD read/write combo. Some people prefer to only connect an optical drive when installing them.

8: Installing hard drive:- The size and no. of hard drives your computer contains is completely dependent on your style of use and storage needs. There are two ways of installing:- cross-mounted and tool-less.

9: Connect Labels: Connect the labels for hard drives and optical drives. The cables are keyed so they will only fit in on direction into the board.

10: Install RAM: If only one stick is going to be inserted, place it in a slot closest to the CPU. You will know they are firmly set as the locking tabs will snap into place and hold the RAM firmly in the slot.

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11: Install Graphics Card and Expansion Cards. There can be two types of cards which can be installed :- 6 pin and 8 pin

12: Cable Management : Hiding the cables and organizing them will help in the future if you are looking for high airflow through the case.

15: Final Product.

(Q3) Step 1 : Disconnect the power cable from the system and if needed, unplug other back-panel cables so that you can safely 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 slots. They are most commonly found next to the sockets and its cooler. If there is already RAM in the system, eject it by pressing it firmly on the tabs on the motherboard at

down end of the slot.
The memory stick will pop out and we can remove them gently.

Step 3: To install the new RAM, line up notches in the bottom of the sticks with gaps in the slot on the motherboard. Make sure the wings at either end of slots are pushed back, so that they are tilted 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 the slots, confirm that the wing clips are locked in the 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.

(Q4) With a neat diagram, explain different cables used to connect functional units

(A') 1. VGA Cable: Also known as D-sub cable analog video cable. Connect one end to computer monitor, ~~tab~~ 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 HDMI port on computer.

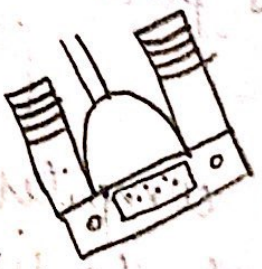
4. PS/2 Cable · Connect on end to PS/2 keyboard, PS/2 mouse. Connect other end to PS/2 ports on computer. Purple PS/2 port : keyboard. Green PS/2 port : mouse.

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

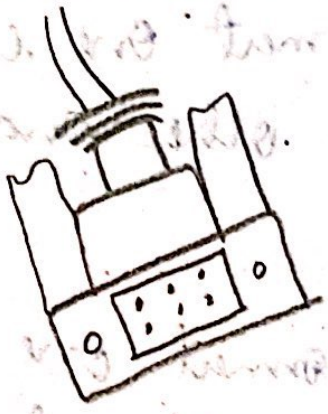
6. USB Cable : Connect one end to USB device. Connect other end to USB ports on computer.

7. Computer Power Chord [Kettle plug] : Connect one end to AC power socket. Connect other end to power supply, computer monitor.

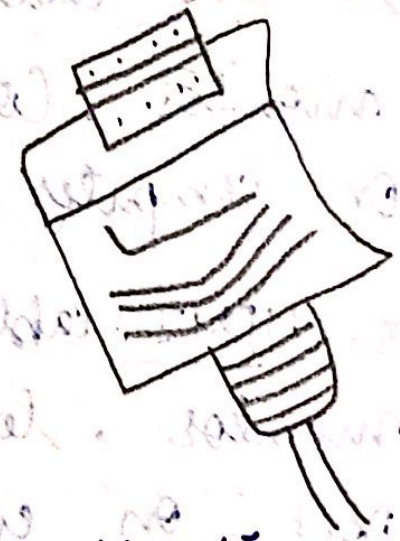
Diagrams



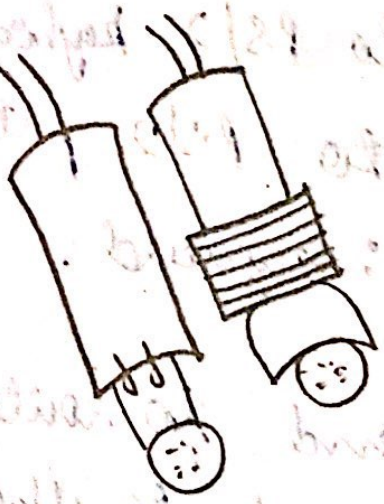
1. VGA Cable



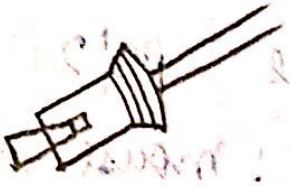
2. DVI Cable



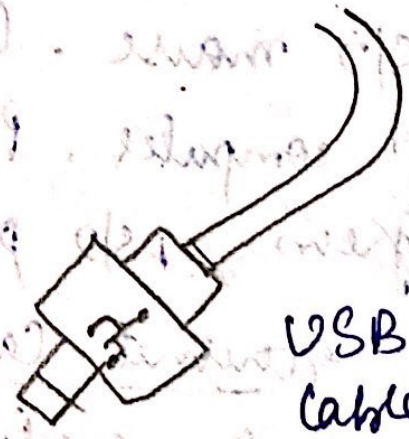
3. HDMI Cable



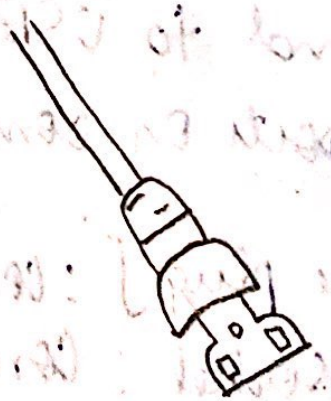
4) PS/2 Cable



5. Ethernet Cable



USB Cable



Computer Power chord - (Kettle Plug).

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Qs) 1) Fully shutdown and unplug the computer before you ~~start disassembling your computer tower to both your unit.~~ or make any attempts to disassemble the tower.

2. Take off any metal objects on your arms or fingers such as bracelets, rings, watches etc. Even if your unit is unplugged, there may still be some remaining electric charge.

3. Make sure your hands are completely dry to avoid damaging any mechanical parts as well as to avoid electrocutions.

4. Work in a cool area to avoid perspiration. ~~for the same person~~

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 screw you may remove. A container or a piece of paper, with labels for each part is ideal to avoid confusion btw similar-looking screws.

7. Handle all parts with care. Place each pin you remove carefully down onto a stable surface.

8. If a component does not come out easily, do not forcefully remove it.

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

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

12. Take not that the three most damaging thing to a computer are moisture, shock & dust.

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Tutorial -II

Programme: B.E
Course: Computer Organization

Term: Jan to May 2020
Course Code: CS45

Name: JAYANTH VIKRAM · M	Marks: 9/10	Date: 4/2/2020
USN: 1MS18CS051	Signature of the Faculty:	

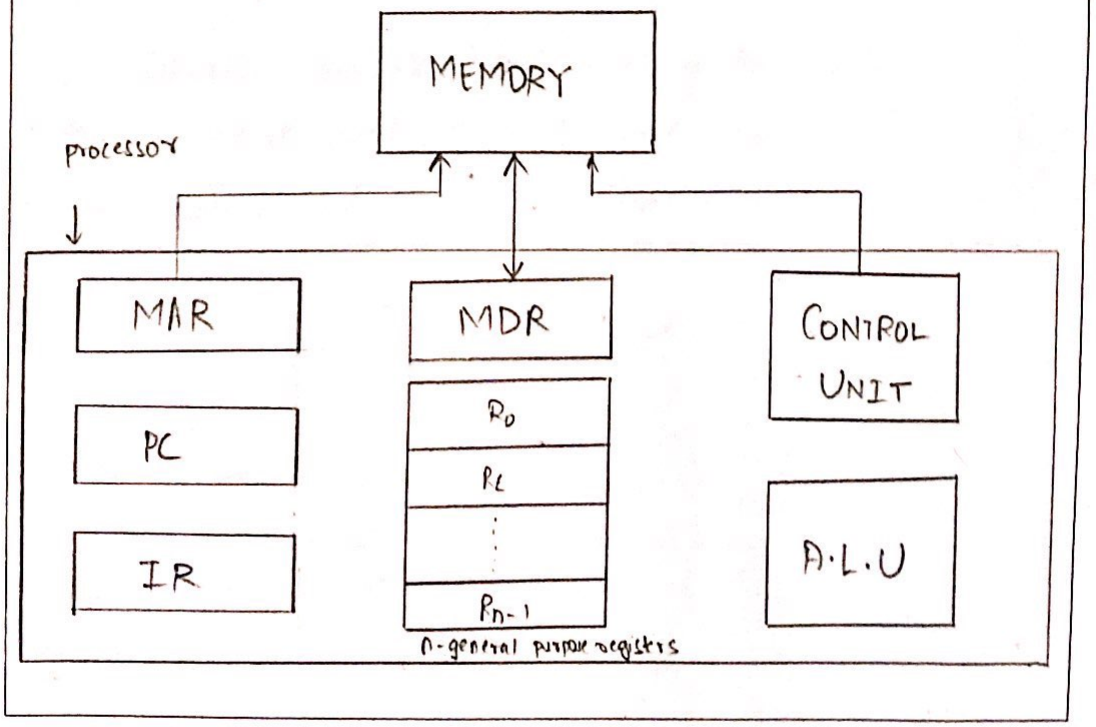
Activity II: Demonstrating Datapath and instruction execution stages using MarieSim Simulator

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

(Q2) The steps required to be executed for an instruction are :-

1- Fetch instruction :- The execution cycle starts with fetching instruction from main memory. The instruction at the addr current PC will be fetched and stored in IR.

2. Decode instruction: During this cycle, the encoded instruction present in the IR is interpreted by the decoder.

3. Results and Snapshots:

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3. Perform ALU operation : ALU is where two operands in the instruction will be operated on given operator in the instruction. ALU takes two values and output one, the result of the operation.

4. Access Memory: There are only two kinds of instruction that access memory: LOAD and STORE. LOAD copies a value from memory to a register, and STORE copies a register value to memory.

5. Update Register file : In this step, the O/p of the ALU is written back to the register file to update the register file. The result could also be due to a LOAD from memory.

6. Update the PC : At the end of the current instruction, the PC needs to be updated to the address of the next instruction, and step 1 repeats.

(Q3) (i)

```
        LOAD   G
        ADD    H
        STORE  A
    LOAD  I
    ADD   Y
    STORE   B
LOOP,       LOAD N
            ADD A
            STORE N
            LOAD B
            SUBT 0
            STORE B
            SKIPCOND 400
            JUMP LOOP

 LOAD N
OUTPUT
HALT
G,  DEC 5          N,  DEC 0
H,  DEC 10         0,  DEC 1
I,  DEC 5          B,  DEC 0
Y,  DEC 10
A,  DEC 0
```

(ii)
```
LOAD B
STORE D
LOAD B
ADD X
STORE X
SUBTONE
STORE D
JUMP FIRST

SECOND LOAD
ADD Y
STORE Y
LOAD C
SUBTone
STORE C
JUMP Second
```

third

```
LOAD four
ADD 2
STORE 2
LOAD X
SUBT one
STORE Y
Jump third

LOAD D
ADD X
SUBT 2
OUTPUT
A, DEC 6
B, DEC 3
C, DEC 2
D, DEC 0
X, DEC 0
Y, DEC 0
Z, DEC 0
```

one DEC 1
four DEC 4

(Q4) The peformance of a processor is affected by:

(i) Hardware :- For the best peformance, we have to always make sure that, the hardware, machine instruction set, and compiler in a coordinated way.

(ii) MIS / Machine Instruction Set

(iii) Compiler :- when "optimising compiler" make use of various features in the target processor to reduce N x S, which is the total no. of clock

cycles required to execute a program

(i) Elapsed Time :- The time (total) taken by the entire system to complete / execute a program. It is affected by the speed of the processor, disk and printer.

(ii) Processor Time :- The time taken by the processor for the program to be executed / The time during which the processor is active for course of execution of the program.

NOTE :- All the above characteristics have been taken in accordance to the eqn

$$T = \frac{N \times S}{R}$$ — Basic performance eqn of a processor

T = processor time N = avg. ~~no~~ no. of instructions in a program

S = avg. no. of basic steps to complete one machine instruction

R = Step Rate [calculated by $R = 1/p$; p = step length].

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Tutorial -III

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

Term: Jan to May 2020

Name: JAYANTH VIKRAM.M	**Marks:** 10/10	**Date:** 4/02/2020
USN: 1MS18CS051	**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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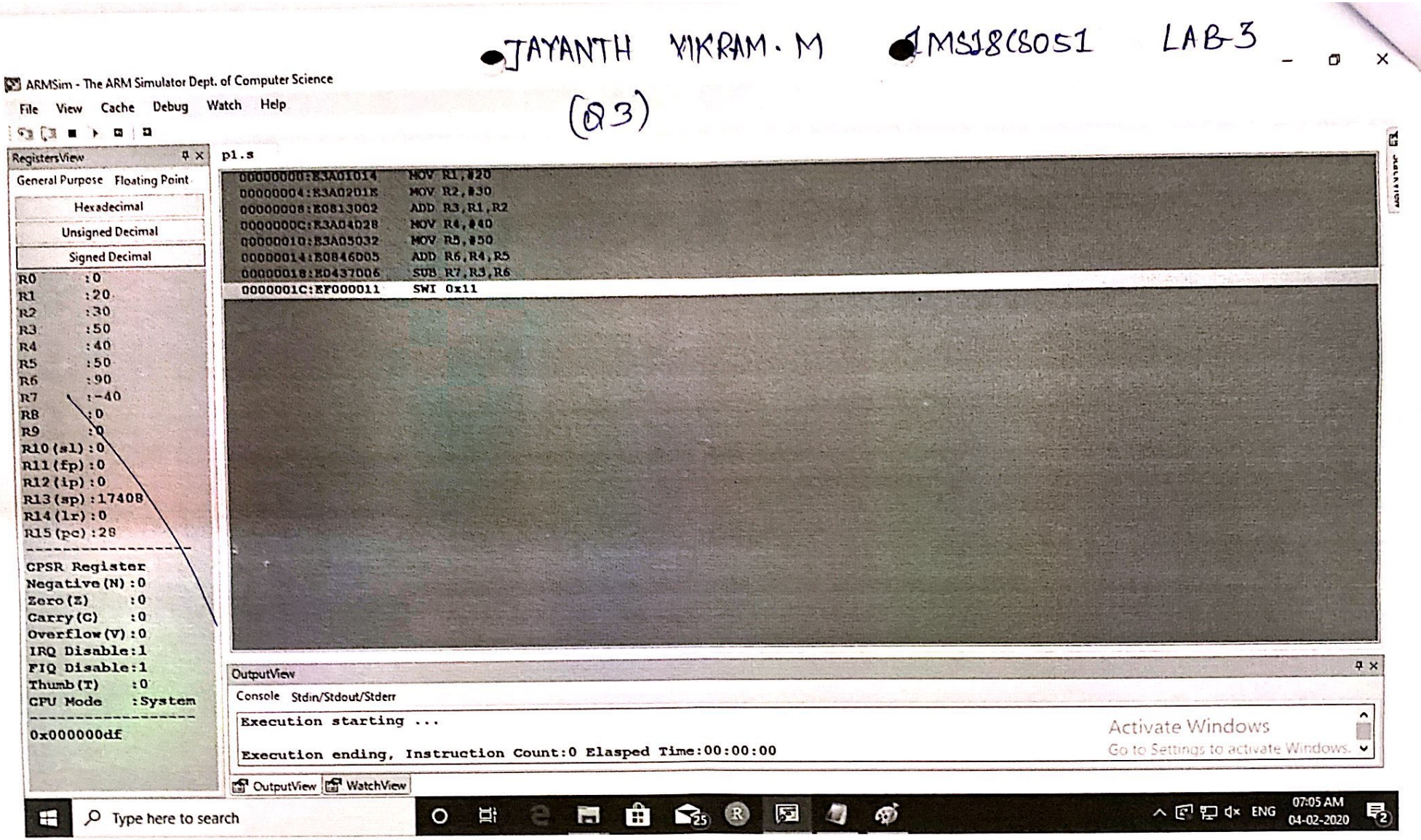
(Q3)



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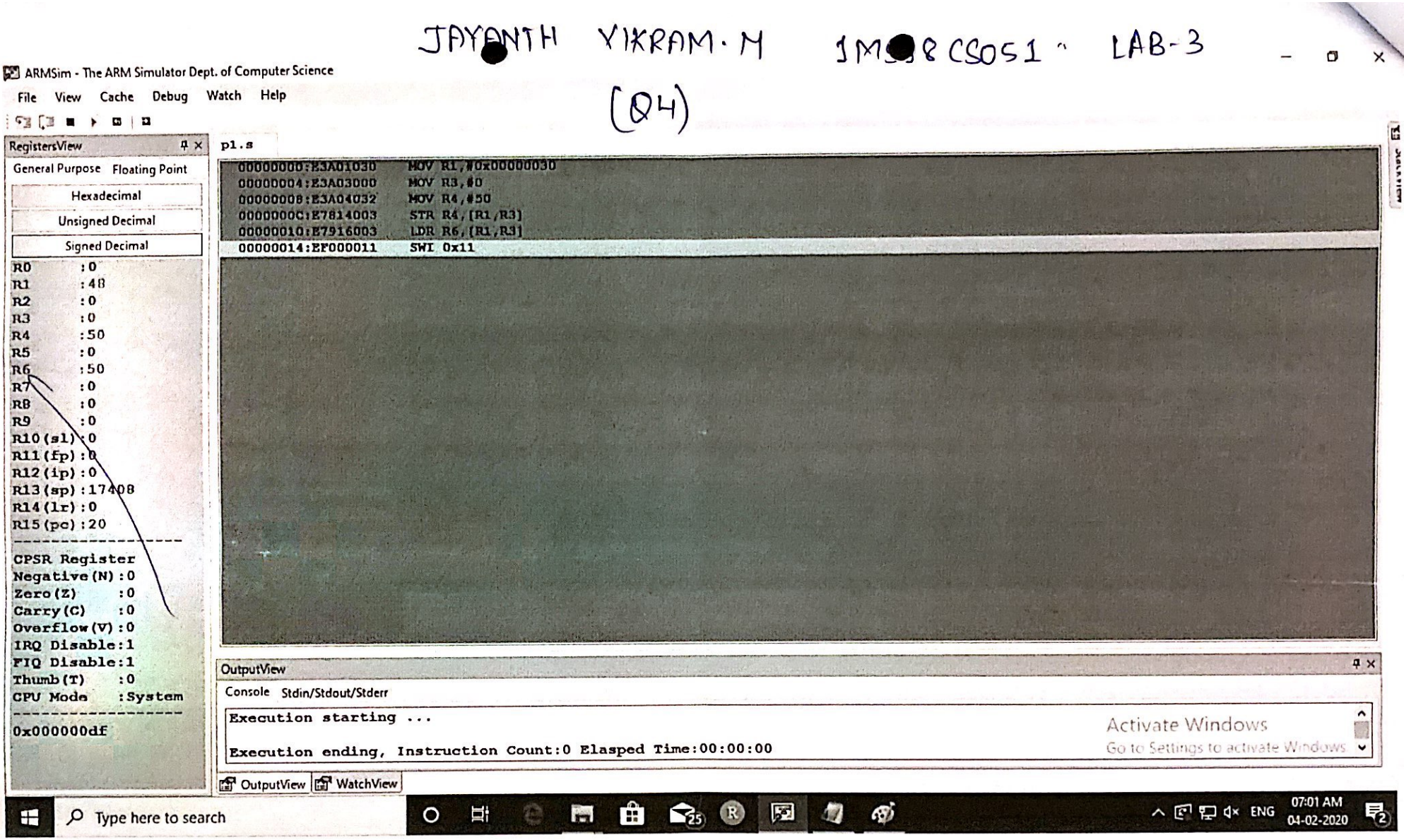
(Q4)



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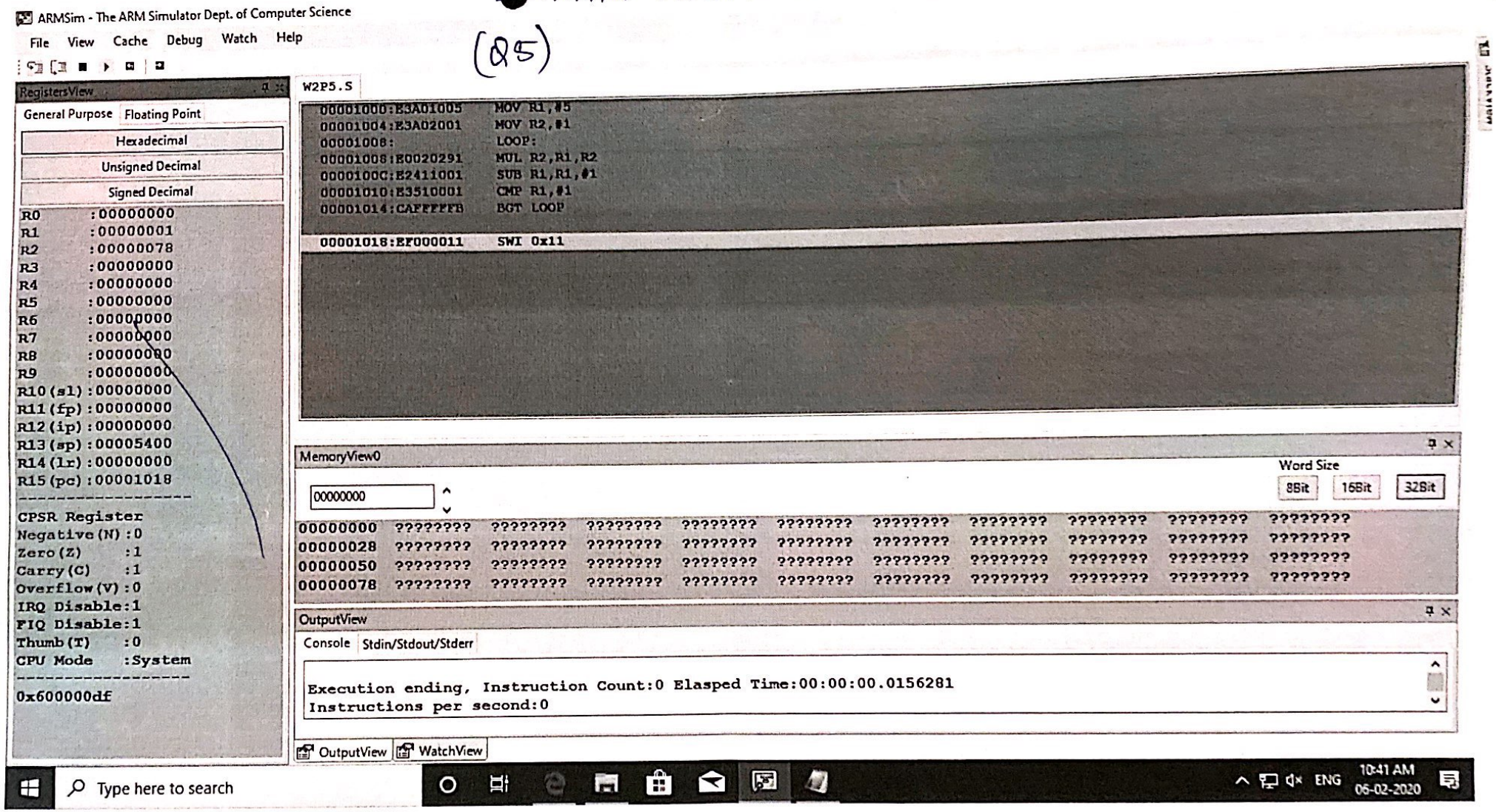
(Q5)



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Programme: B.E
Course: Computer Organization

Term: Jan to May 2019
Course Code: CS45

Activity IV: Executing ARM programs using ARMsim simulator.

Name: JAYANTH VIKRAM. M	**Marks:** /10	**Date:** 11/02/2020
USN: 1MS18CS051	**Signature of the Faculty:** J	

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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1MS18CS051
CO-LAB

CSE
IV-B

(Q1)

```
MOV   R0,#0
MOV   R1,#1
MOV   R2,#6
MOV   R4, #0x00001000
MOV   R5, #0
loop: ADD   R3,R0,R1
      MOV   R0,R1
      MOV   R1,R3
      STR   R3, [R4,R5]
      ADD   R5, R2,#1
      SUB   R2, R2,#1
      CMP   R2,#2
      BGT   loop
SWI   0x011
```

(Q2)

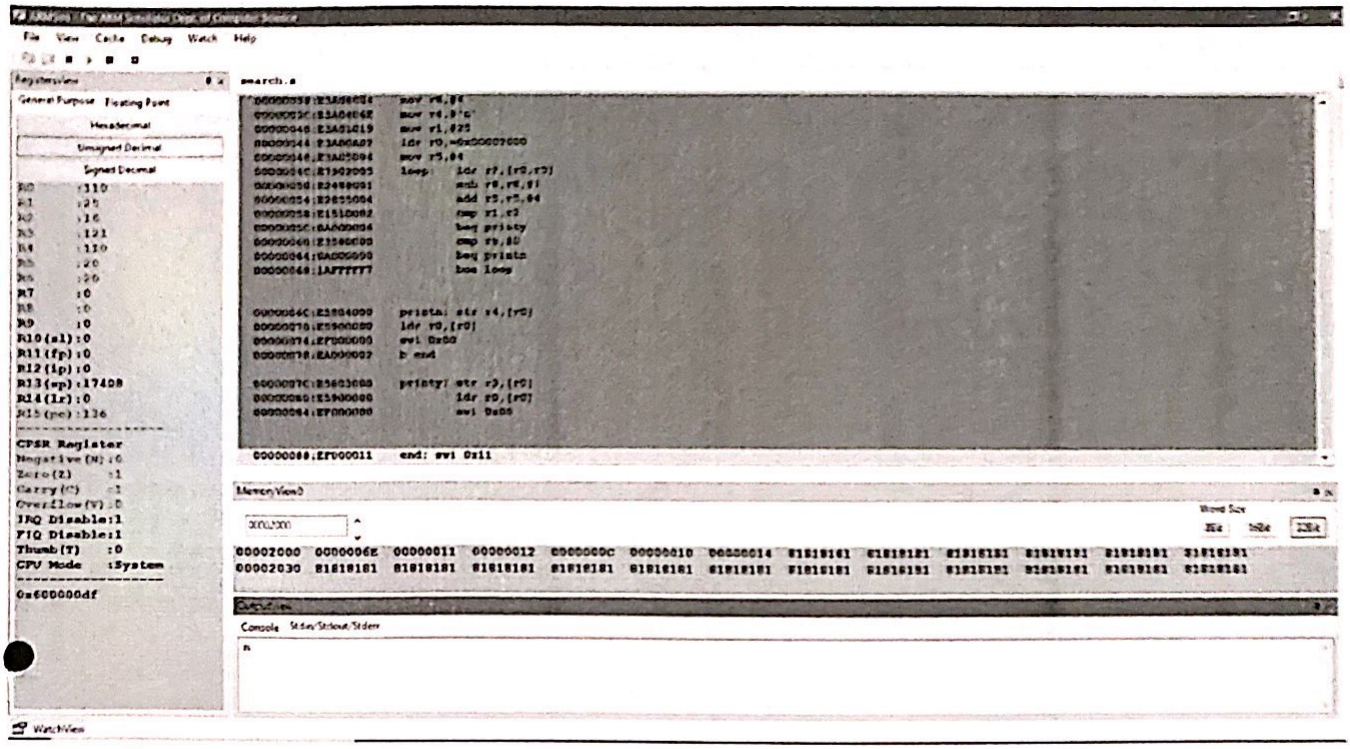
```
MOV   R0, #0x00001000
MOV   R1, #0
mov   R2,#5
MOV   R5,#1
MOV   R6#0
MOV   R4,#9
loop: ADD   R5,R5,#2
```

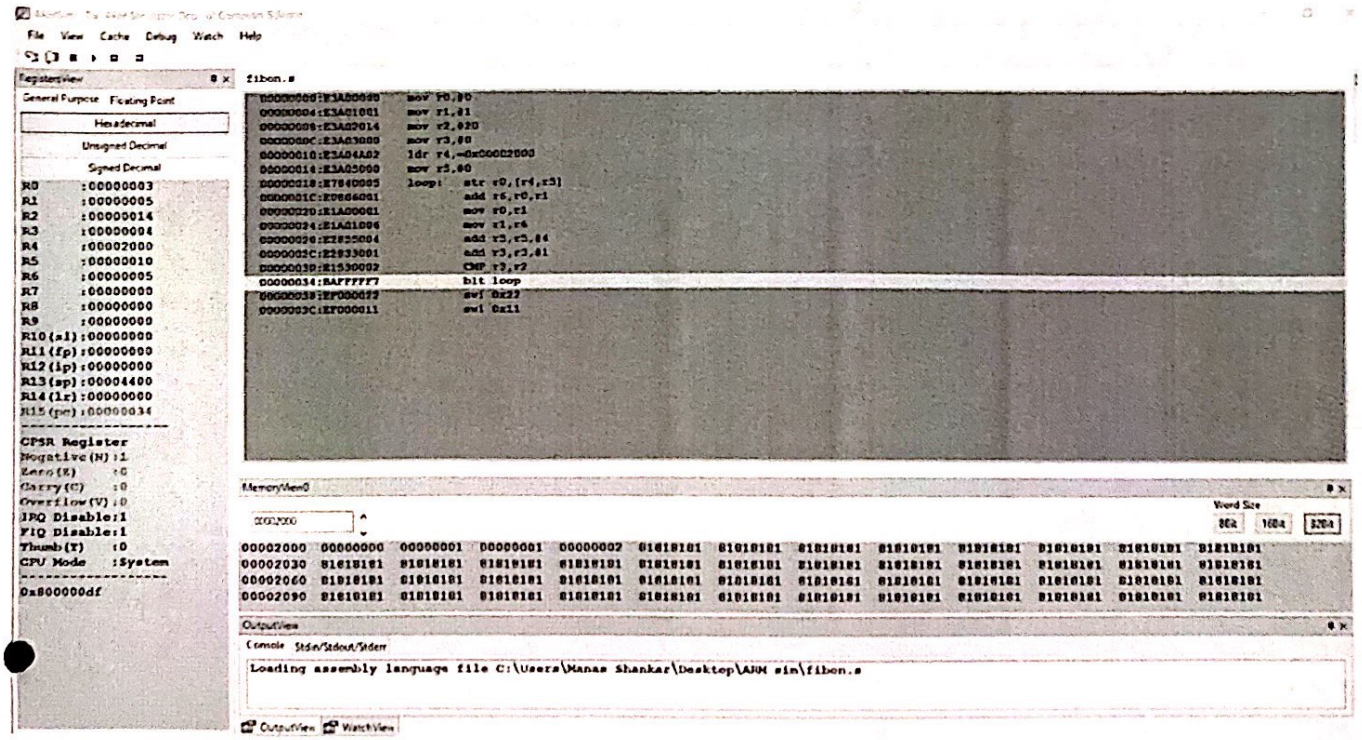
```
        STR   R5, [R0,R1]
        ADD   R1, R1, #4
        SUB   R2, R2, #1
        CMP   R2, #0
        BGT   loop
MOV     R0, #0x00001000
MOV     R1, #0
MOV     R2, #5
search:
        LDR   R0, [R0,R1]
        ADD   R1, R1, #4
        CMP   R4, R6
        BEQ   result
        SUB   R2, R2, #1
        CMP   R2, #0
        BGT   search
result:
        CMP   R4, R6
        BNE   end
        MOV   R7, #1
end:
        SWI   0x0011
```

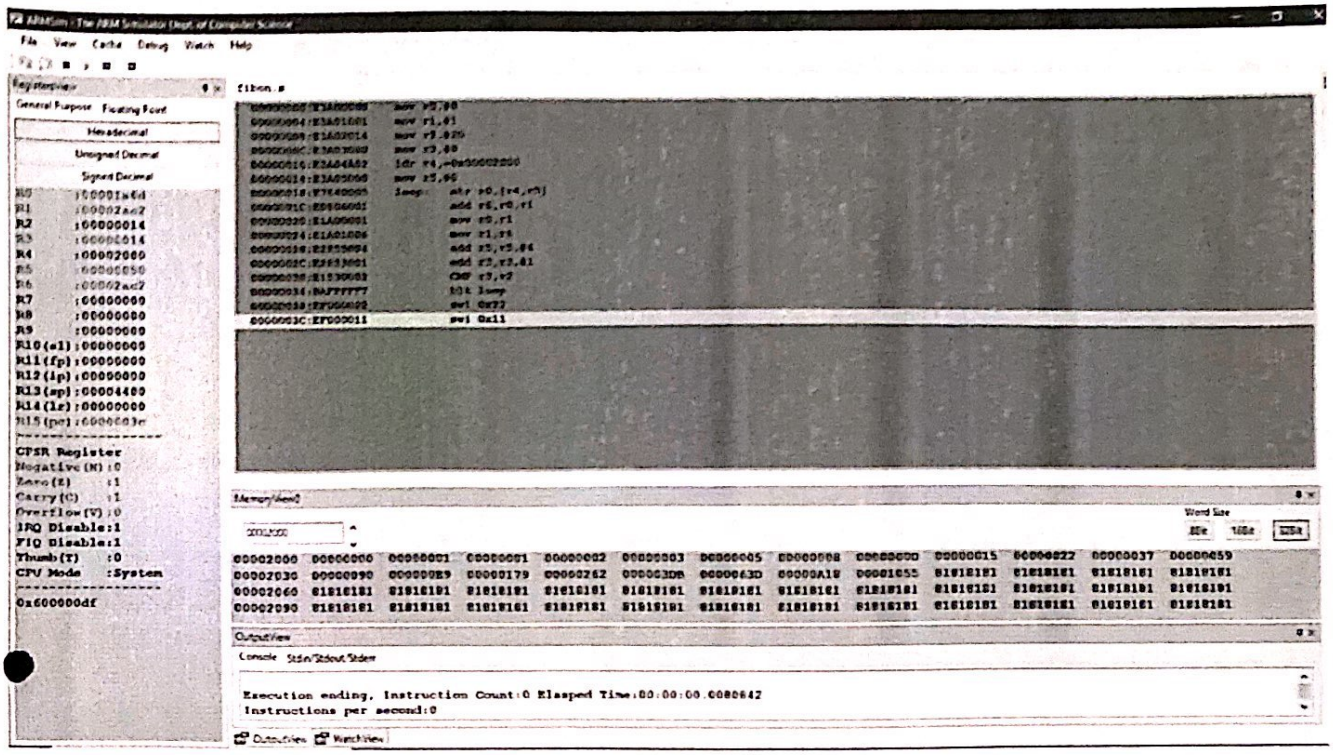
```
BGT     addd
STR     R1, [R0,R1]
SWI     0X0011
```

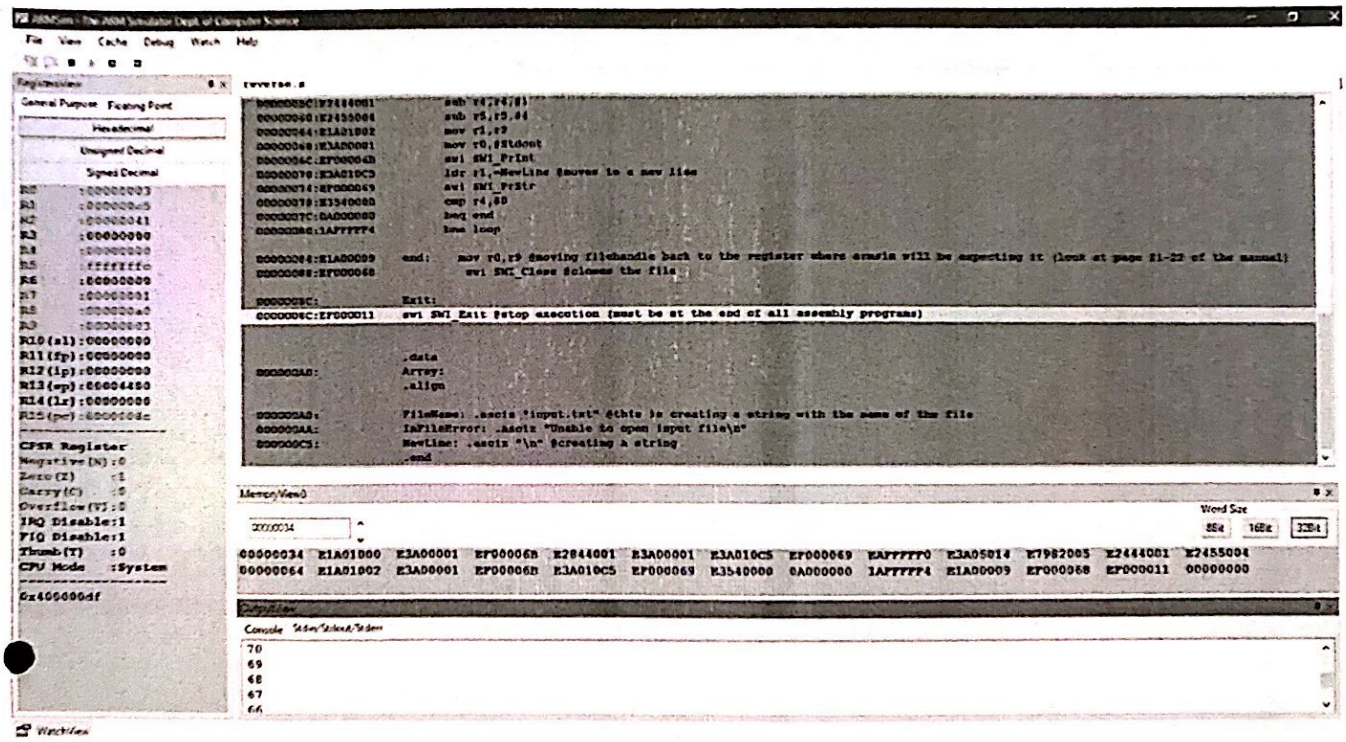
(Q3)

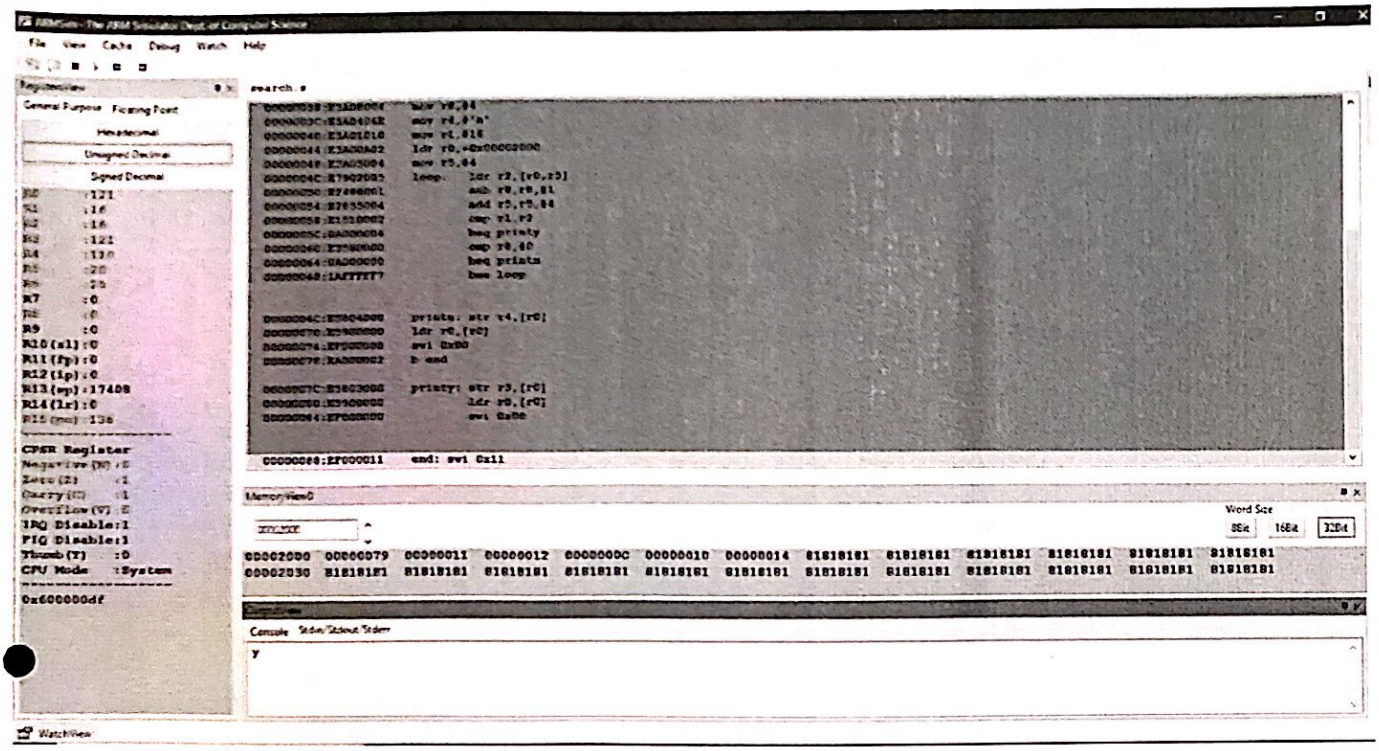
```
MOV   R0, # 0x00001000
MOV   R1, # 0
MOV    R2, # 5
MOV    R5, # 1
MOV   R6, # 0
MOV     R4, #0
loop:
        ADD     R5, R5, #2
        STR      R5, [R0, R1]
        ADD       R1, R1, #4
        SUB       R2, R2, #1
        CMP        R2, # 0
        BGT        loop

MOV     R0, # 0x00001000
MOV     R1, # 0
MOV       R2, #0

ADDD
        LDR     R6, [R0, R1]
        ADD     R1, R1, # 4
        ADD      R4, R4, R6
        SUB      R2, R2, # 1
         CMP       R2, # 0
```











NAME : JAYANTH VIKRAM.M

Date : 22/05/20

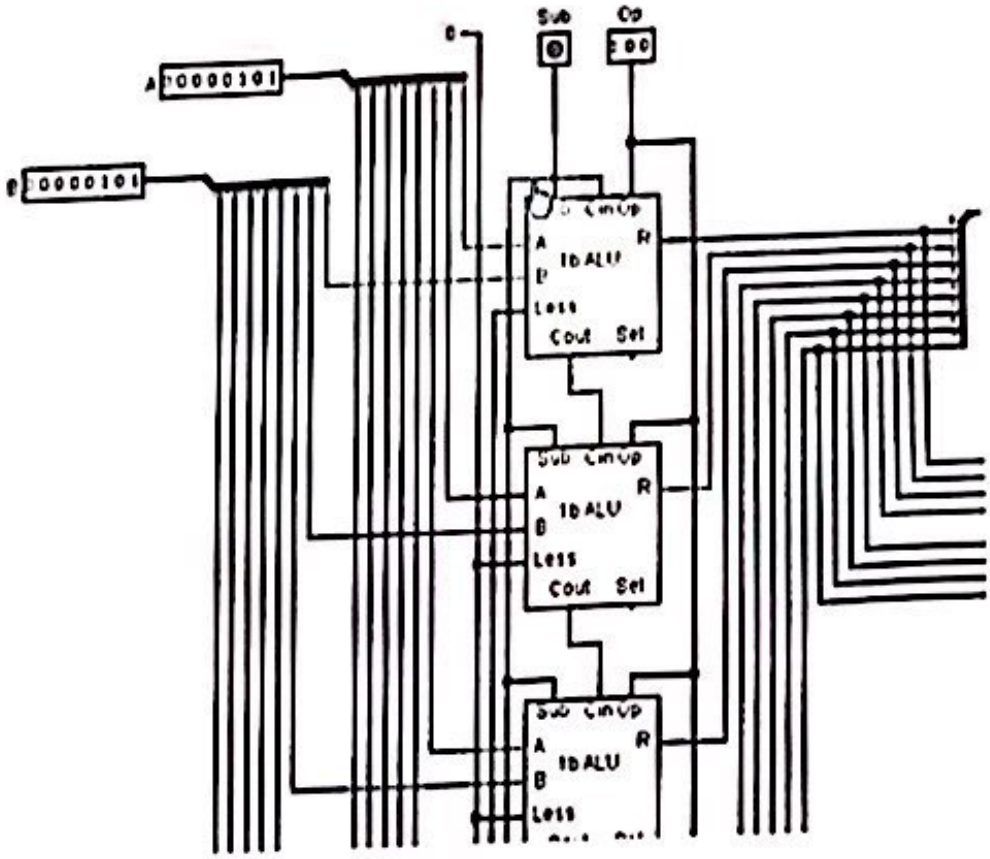
USN : 1MS18CS051

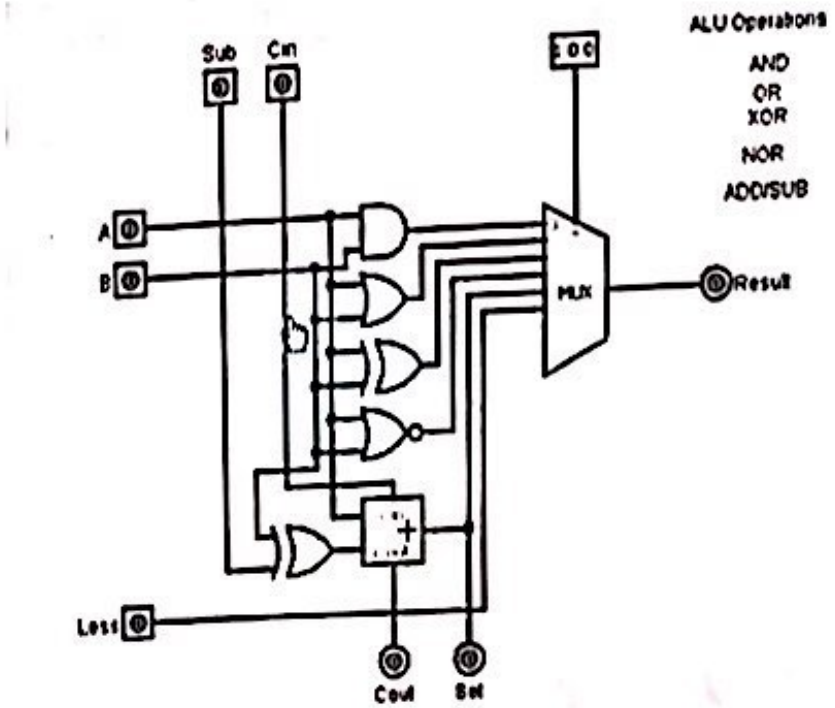
LAB-5

(Q1) List out the steps in designing ALU

1. Add the two ip pins. Name them A & 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 it Result
5. Add a 1-bit multiplexer with 3 select bits.
6. Connect outputs of all the gates to the mux.
7. Connect 3-bit input pin to mux.
8. Add ip pin to Cin, and output pin to Cout
9. Add an ex-or. Connect its o/p to Cout. The first ip must be connected to B, and the second to another ip pin sub.
10. Add another ip and name it Less. Connect it to mux.
11. Add an output pin and name it Set, connect it to the o/p of adder result.

Snapshots.





1MS18CS051

JAYANTH VIKRAM.M

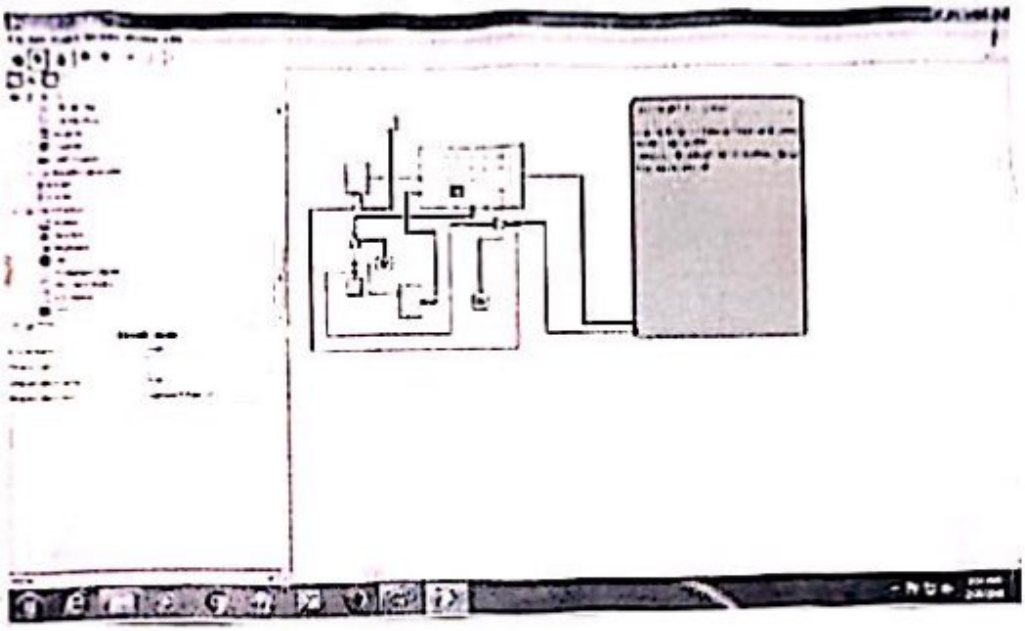
DATE : 22/05/20

LAB-6

Q1) List out the steps in designing memory system.

1. Add a RAM with seperate load and store selected
2. Add a counter and connect Q to A of the RAM
3. Add a controller buffer and connect its o/p to the RAM
4. Add a clock and connect to the ip of the buffer
5. Add a TTY unit with 32 rows and column. Make the connection with RAM
6. Add a 7-bit random number generator, connect Q to D.
7. Add another controlled buffer, connect it to TTY. Also add an ip pin to the buffer
8. Connect the output of the second buffer to the counter.
9. connect a button to the counter

Snapshots :



Date : 22/05/20

JAMANTH VIKRAM · M

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LAB 7

Write diagram demonstrate the execution the following instruction 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)

CC1	CC2	CC3	CC4	CC5	CC6	CC7	CC8	CC9
Instruction Fetch	Instruction decode	Execution	Data access	Write back				
	Instruction fetch	Instruction decode	Execution	Data Access	Write back			
		Instruction fetch	Instruction decode	Exec	Data access	Write back		
			Instruction fetch	Instruction decode	Exec	Data access	Write back	
				Instruction fetch	Instruction decode	Exec	Data Access	Write back

Program execution order

Time (in clock cycles →)

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