

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

Department of CSE

Programme: B.E
Course: Computer Organization

Term: Jan to May 2019
Course Code: CS45

Activity V: Designing an ALU to perform arithmetic and logical functions using Logisim simulator.

Name: Irfan Ahmad Nizam	Marks: /10	Date: 24/05/20
USN: 1M519CS403	Signature of the Faculty:	

Objective: To simulate the working of Arithmetic and Logical Unit using simulator.

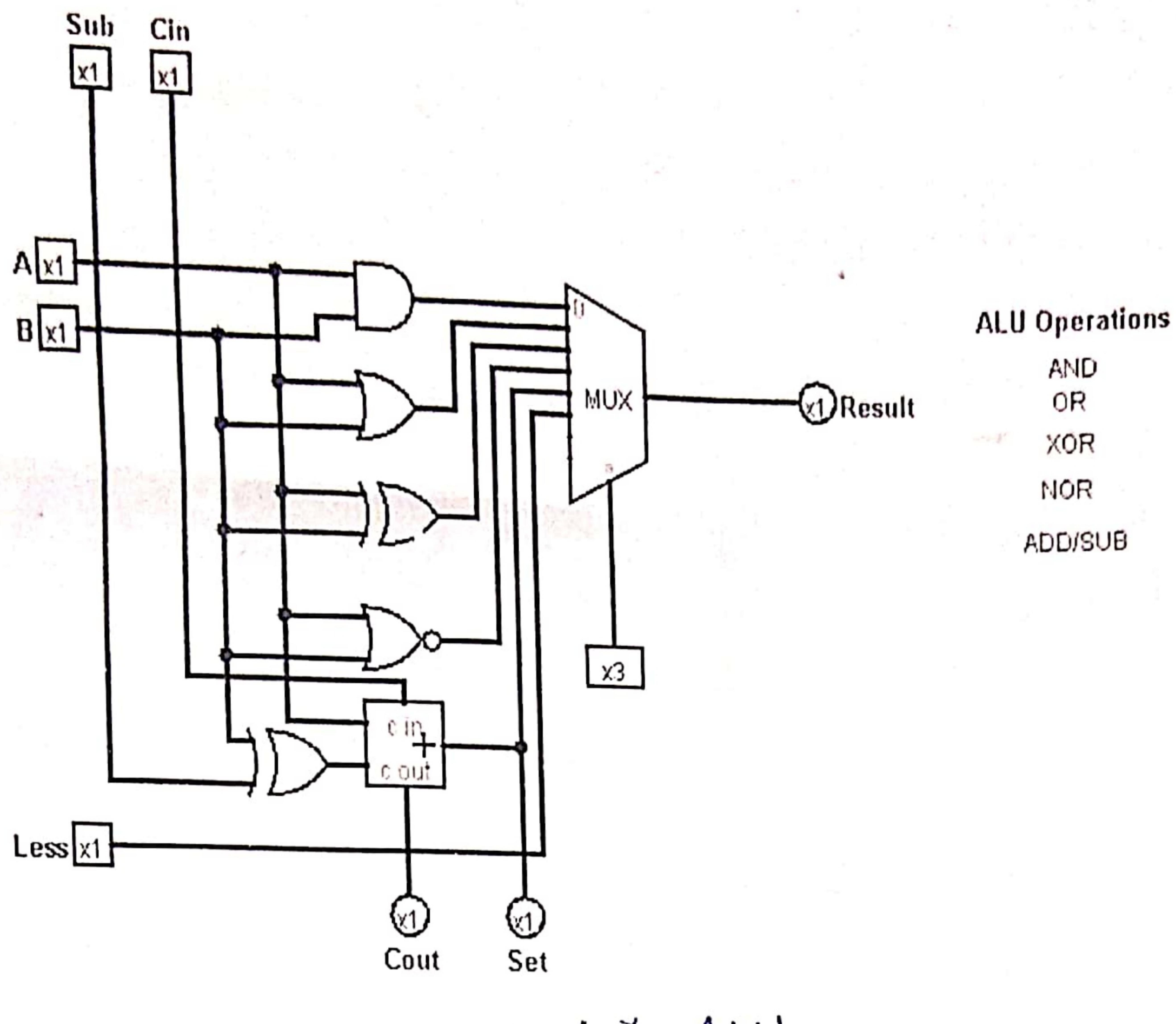
Simulator Description: Logisim is an educational tool for designing and simulating digital logic circuits. With its simple toolbar interface and simulation of circuits as you build them, it is simple enough to facilitate learning the most basic concepts related to logic circuits. With the capacity to 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:

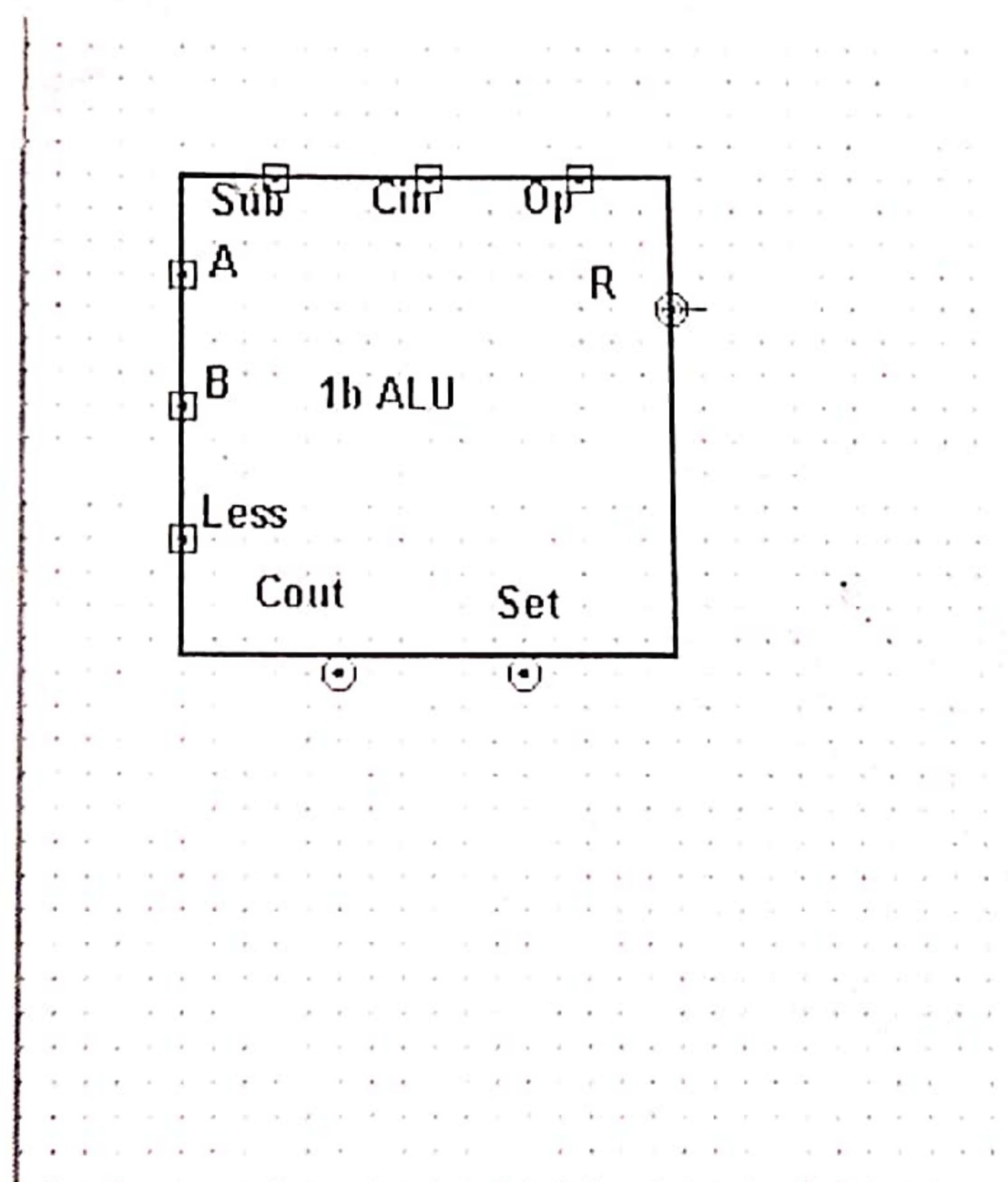
List out the steps in designing ALU

1. Add the two i/p pins. Name them A and B.
2. Add OR, AND, EX-OR, NOR gates and a 1-to-7 address.
3. Connect the A's and 1's of all the gates to their respective pins.
4. Add an output pin 8 name it Result.
5. Add a 1-to-7 multiplexer with 3 select bits.
6. Connect the output of all gates to the mux.
7. Connect a 6-bit input to mux.
8. Add i/p pins to C_{in} and output pin to C_{out}.
9. Add an EX-OR gate. Connect 9's o/p to C_{out}.
The first i/p must be connected to B & the second to other i/p pin 3.
10. Add another i/p of max. 1 less. Connect it to
11. Add an output pin 8 name it rot. Connect it to the multiplexer o/p of adder unit.

Snapshots




1-bit ALU



ALU object

Snapshots



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Activity VI: Designing memory system using Logisim simulator.

Name: Tufyan Ahmed N caluk	Marks: /10	Date: 24/05/20
USN: 1MS19CS403	Signature of the Faculty:	

Objective: To simulate the writing operation on memory.

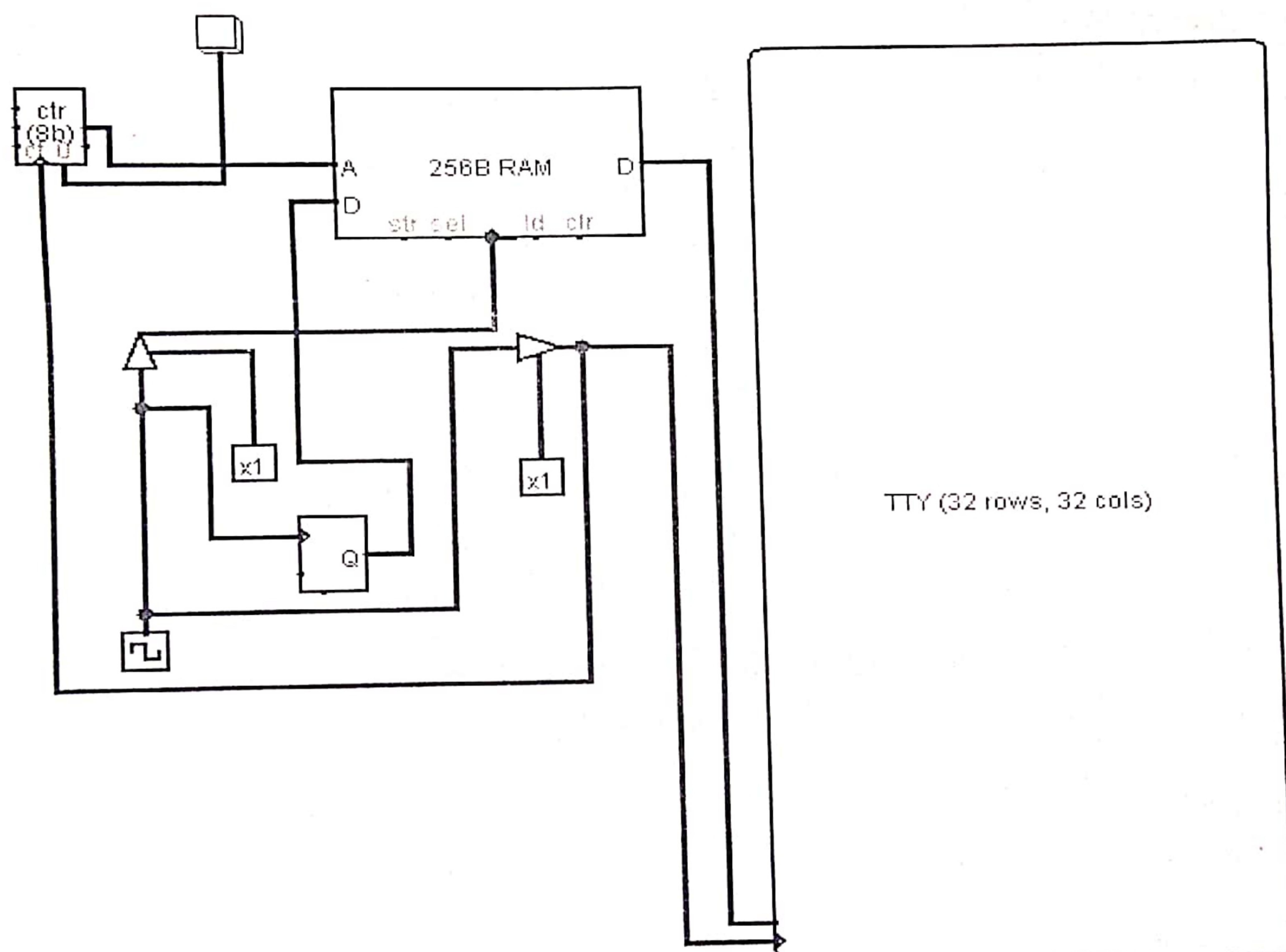
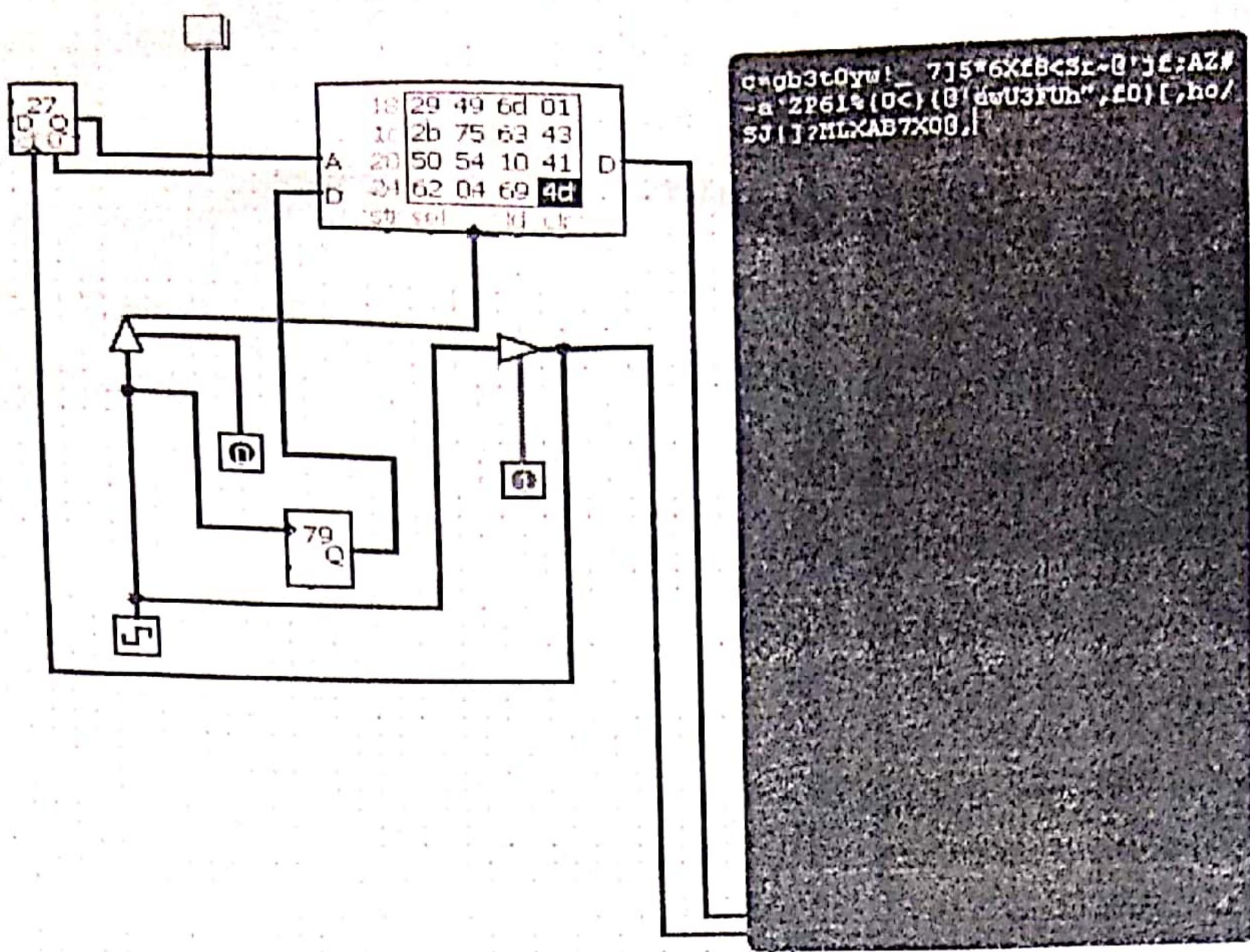
Simulator Description: Logisim is an educational tool for designing and simulating digital logic circuits. With its simple toolbar interface and simulation of circuits as you build them, it is simple enough to facilitate learning the most basic concepts related to logic circuits. With the capacity to 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 and storage selected.
2. Add a counter and connect Q to A of the RAM.
3. Add a controller buffer & convert it's O/P to RAM
4. Add a clock and connect to the :1p of the buffer
5. Add a RTY unit with 32 row & columns. Make the connections with RAM
6. Add a 7 bit random number generator. Connect Q to D
7. Add another controlled buffer. Connect it to RTY. Also add an :1p pins to the buffer
8. Connect the O/P of the second buffer to the counter
9. Connect a button to the counter

Snapshots -



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

Name: <u>Osman Ahmad N Icatali</u>	Marks: /10	Date: <u>20/05/19</u>
USN: <u>1ms19csu03</u>	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:

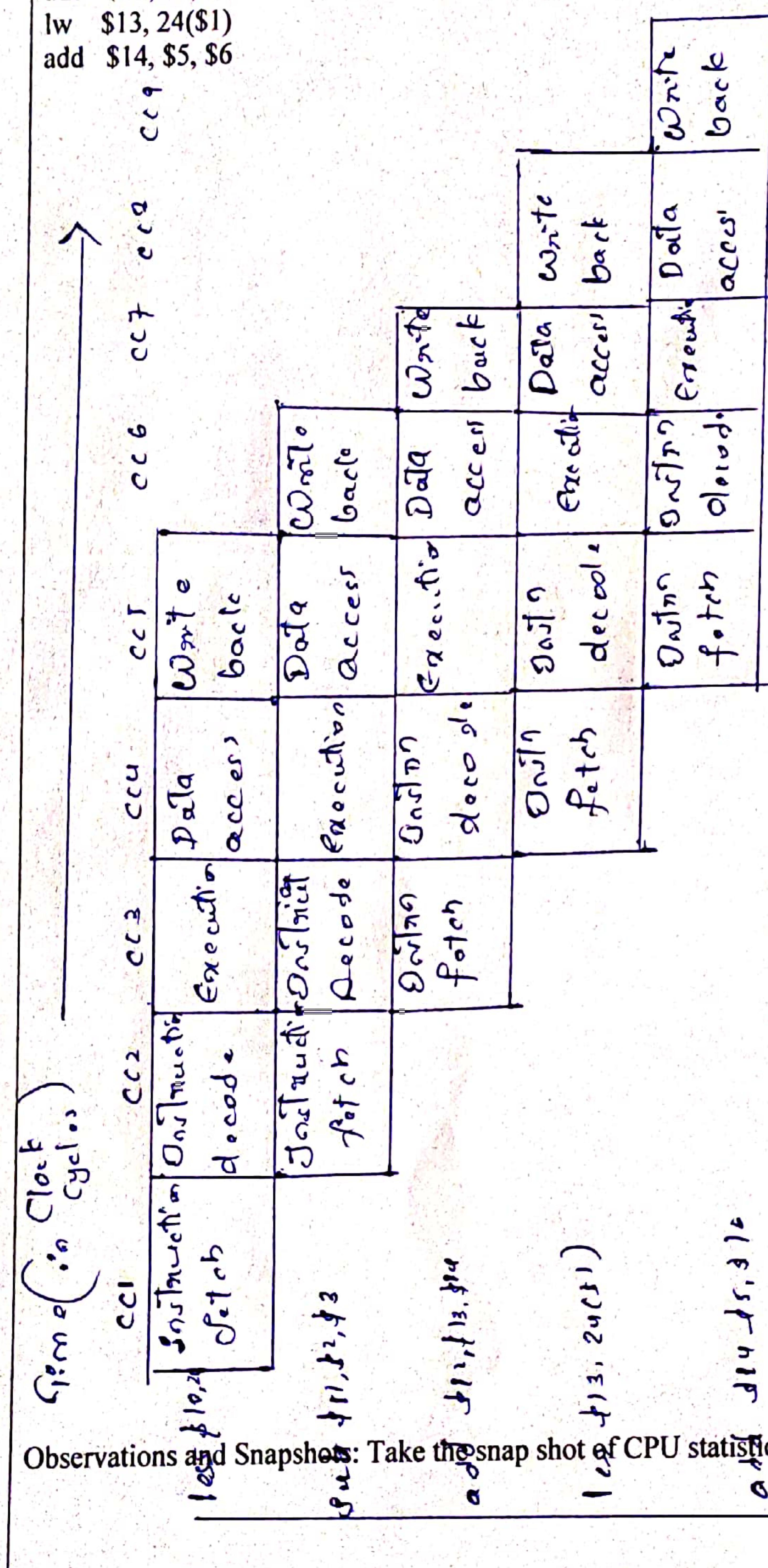
- Fetch the next instruction from memory into an internal CPU register.
- Decode the instruction to determine which function sub-circuits it requires.
- Read any input operands required from high-speed registers or directly from memory.
- Execute the operation using the selected sub-circuits.
- Write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



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

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