

CSE 3203 CT 4 Assignment

Roll No: 1803017

Assignment Problem:

Build CPU based on following requirements:

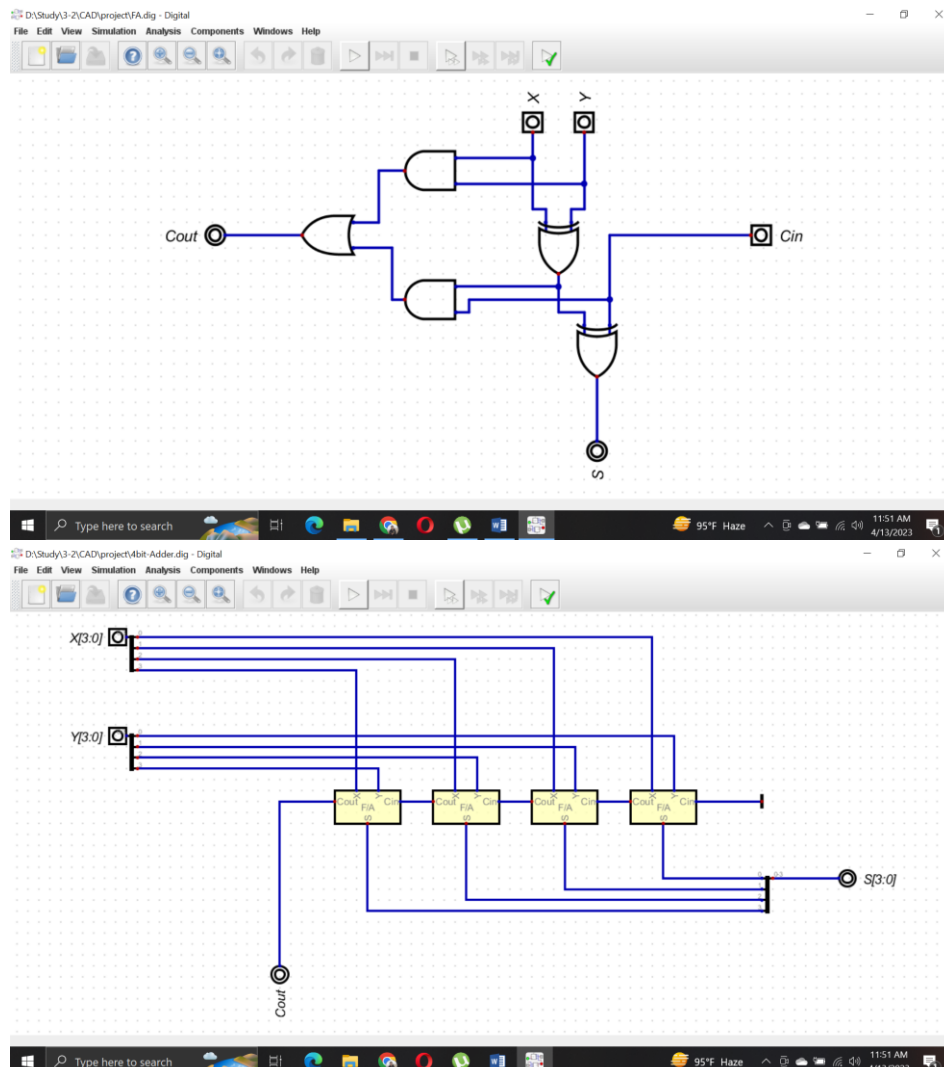
1. Word Size of CPU = 4
2. ALU Operations = OR, ADD, ROR
3. Register Number = 6
4. Size of RAM = 10
5. Word size of ISA and RAM = 16
6. CPU Instructions = Register Mode, Immediate Mode, JMP, JG

Solution:

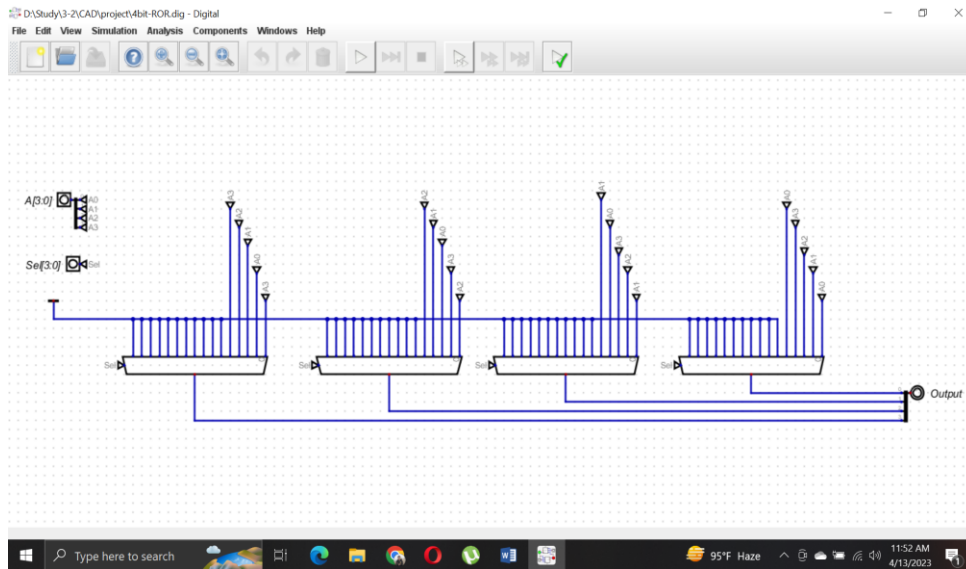
Simulator Design:

1. ALU Circuit (Top to Bottom all circuits):

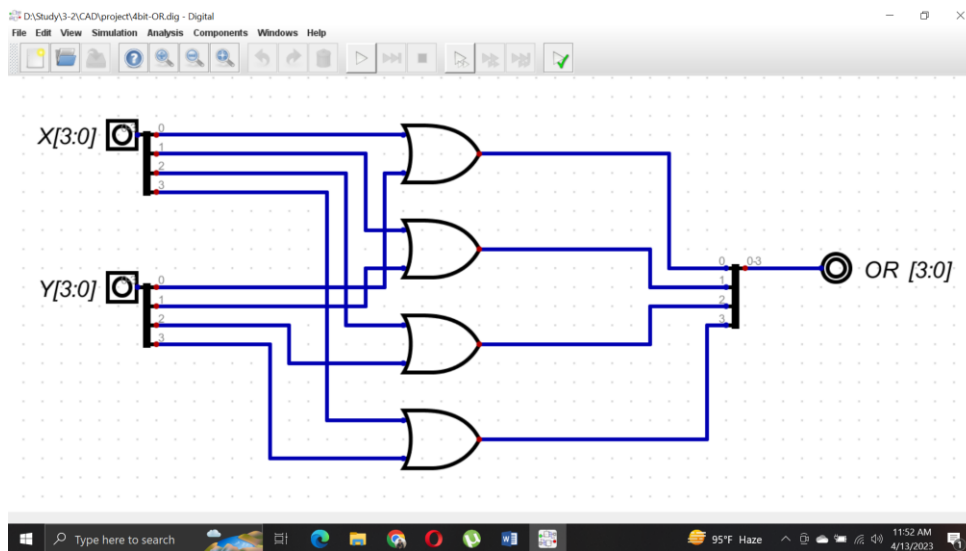
4-bit Adder



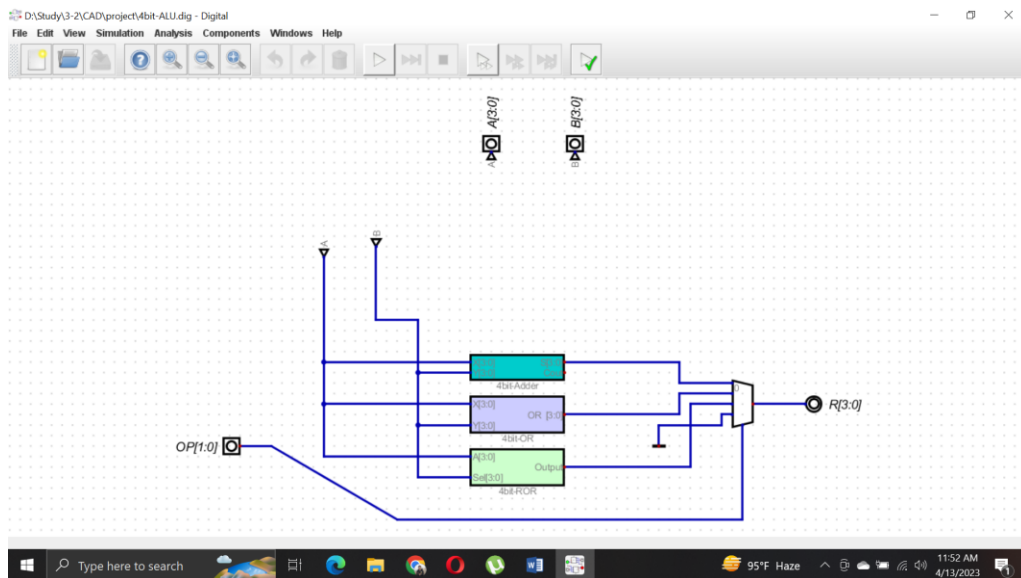
4-bit ROR



4-bit OR

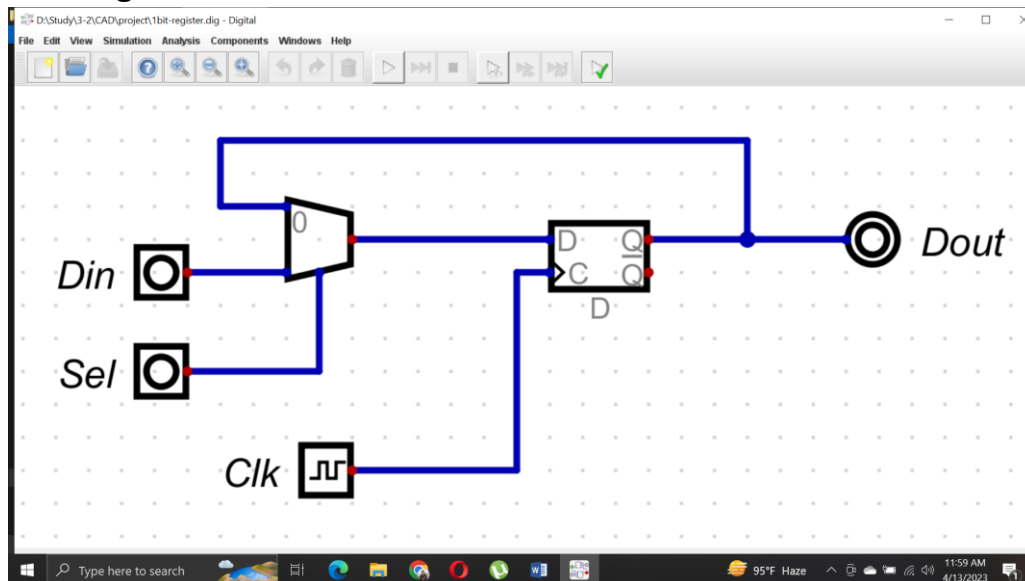


4-bit ALU

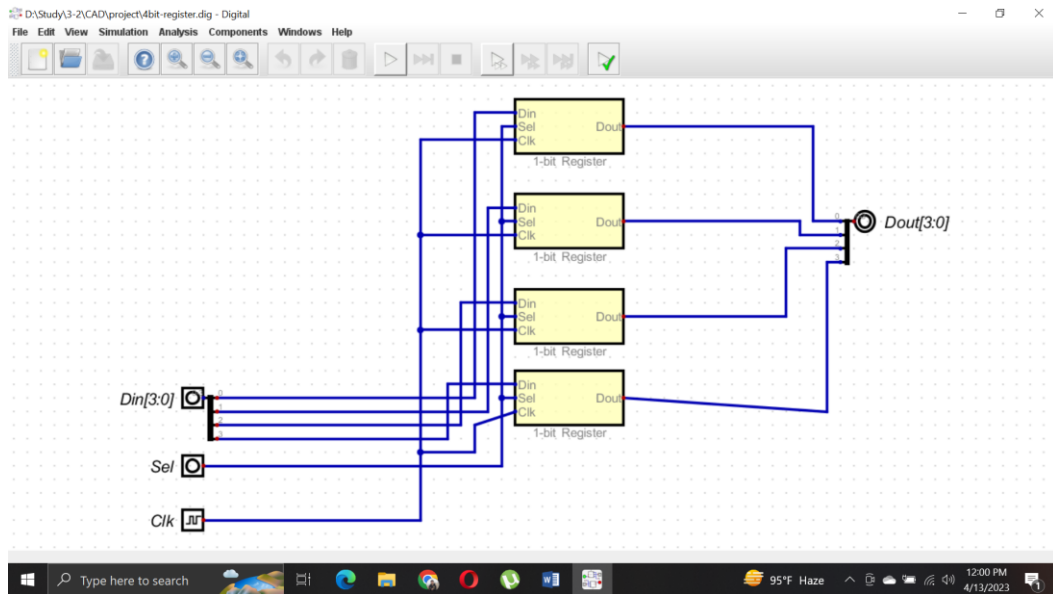


2. Register Set Circuit (Top to Bottom all circuits):

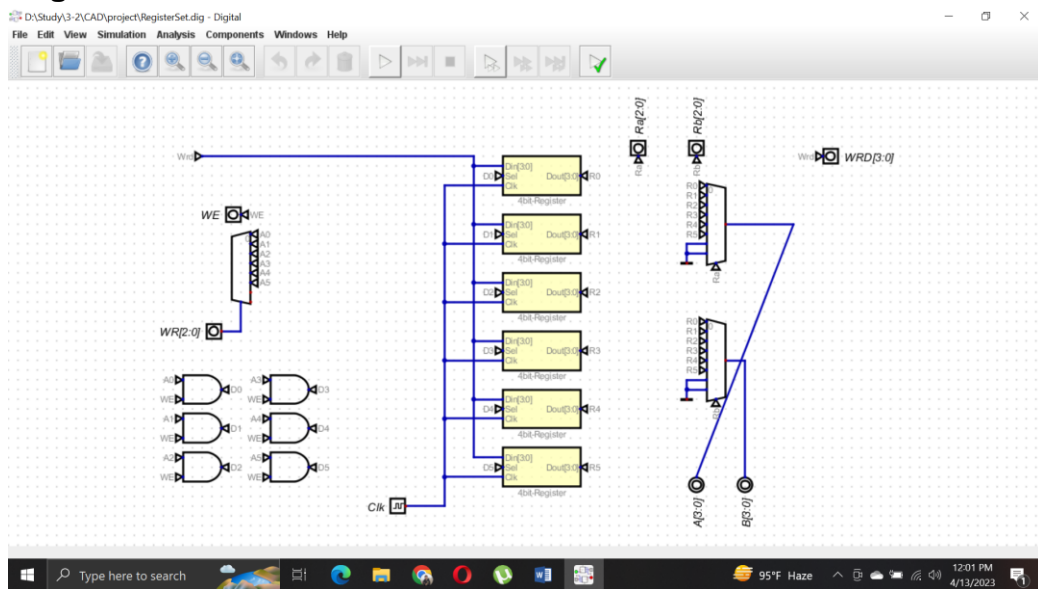
1-bit register



4-bit register

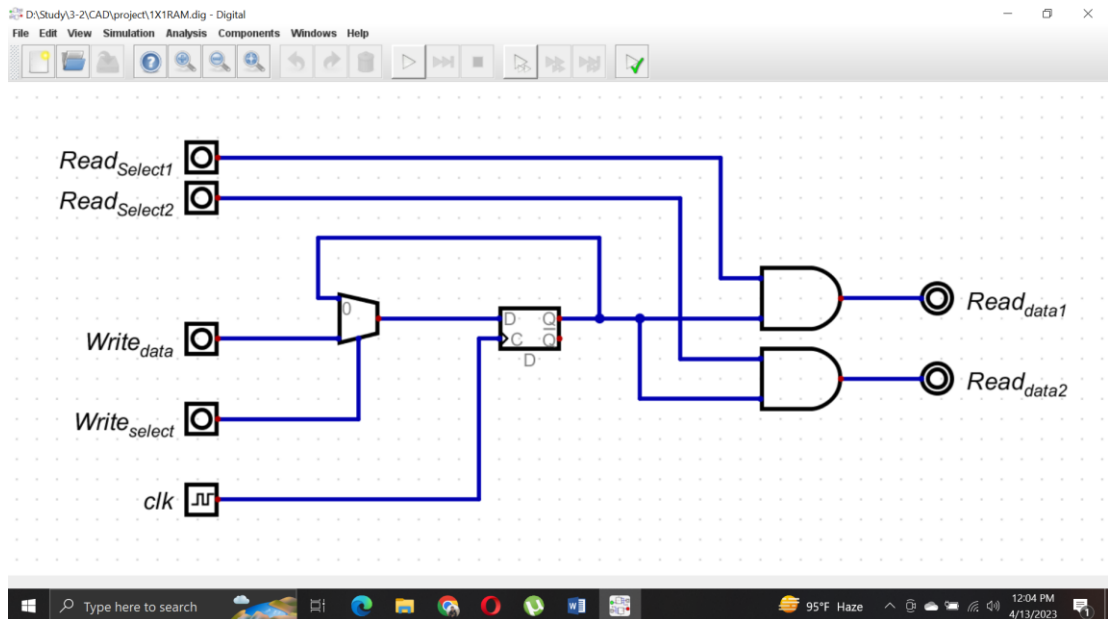


Register-set

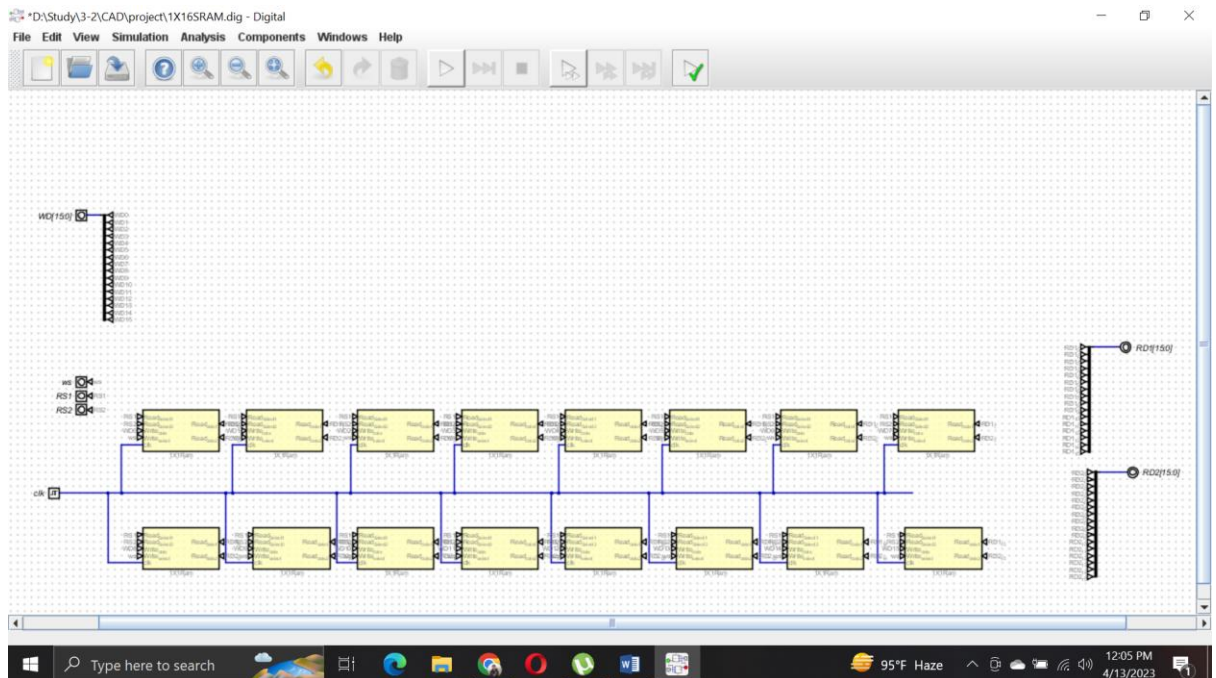


3. RAM Circuit (Top to Bottom all circuits):

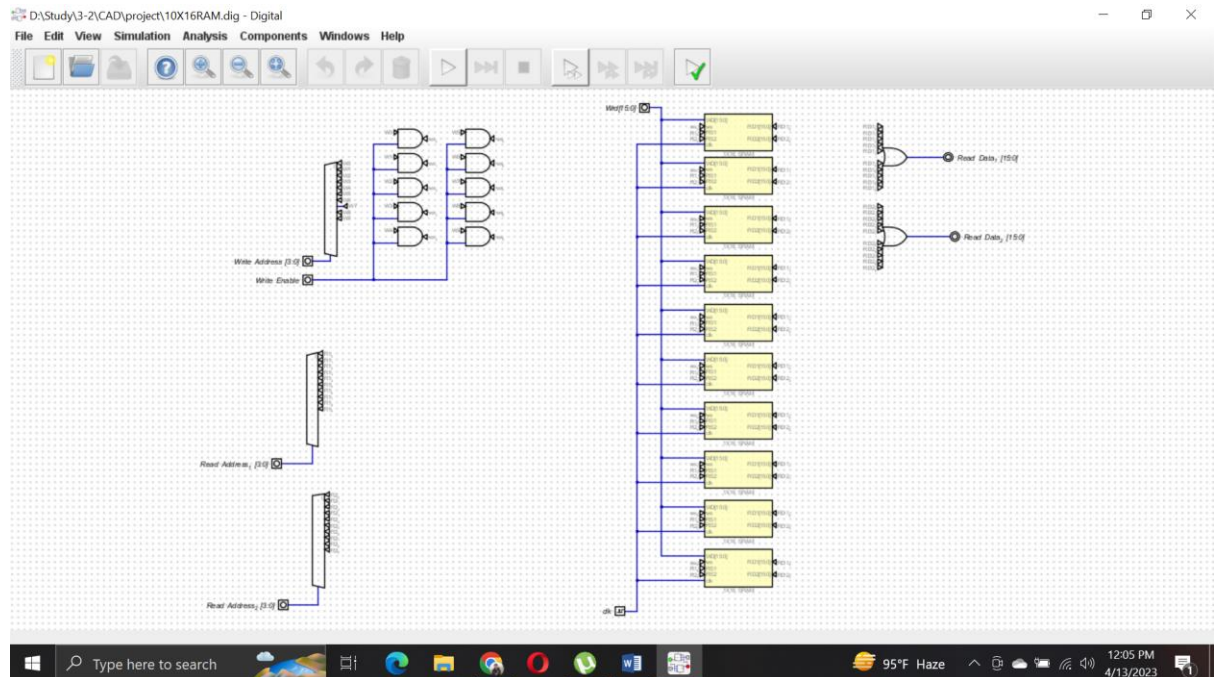
1X1 RAM:



1X16 RAM:



10X16 RAM:



4. ISA

Register mode (type of op:00) type of op(2bit) + op(2bit) + reg1(3bit) + reg2(3bit) + 6bit (dont care)

Immediate mode (type of op:01) type of op(2bit) +op(2bit) +reg1(3bit) +imm value(4bit) + 5bit (dont care)

Branching mode (type of op:10) type of op(2bit) +op(2bit) +Address(4bit) + 6bit (dont care)

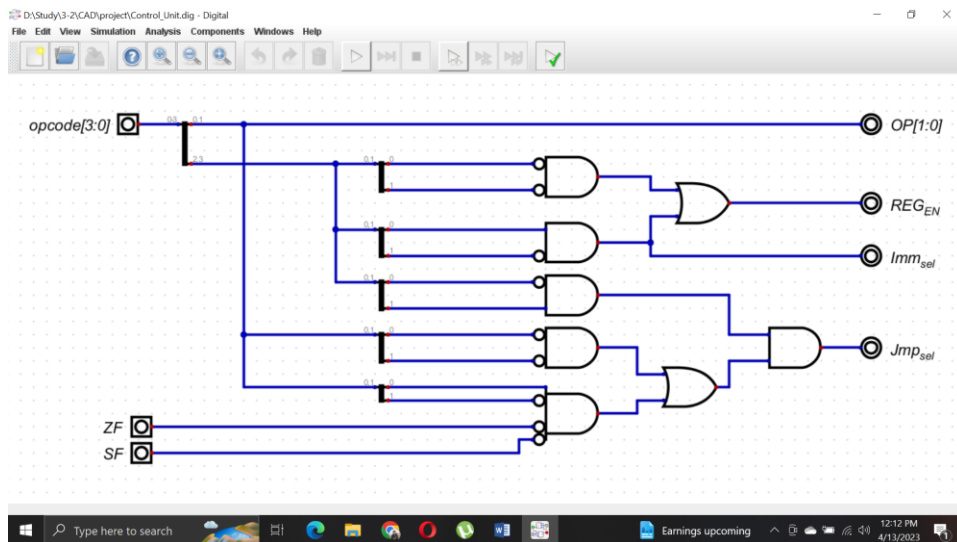
Operations:

ADD (00), OR (01) ,ROR(10)

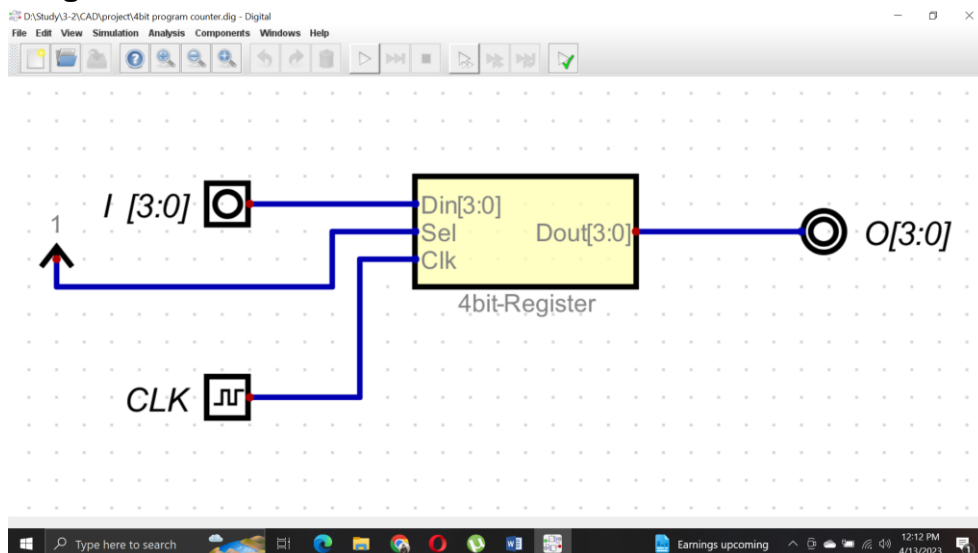
JMP (00), JG (01)

5. CPU (Top to Bottom all circuits):

Control Unit:



Program Counter:



Register mode (type of op:00) type of op(2bit)+op(2bit)+reg1(3bit)+reg2(3bit)+6bit(dont care)
Immediate mode (type of op:01) type of op(2bit)+op(2bit)+reg1(3bit)+imm value(4bit)+5bit(dont care)
Branching mode (type of op:10) type of op(2bit)+op(2bit)+Address(4bit)+6bit(dont care)

Operations:
ADD(00),OR(01),ROR(10)
JMP(00),JG(01)

Verilog Code:

1. **ALU Circuit (Top to Bottom all circuits):**

2. **Register Set Circuit (Top to Bottom all circuits):**

3. **RAM Circuit (Top to Bottom all circuits):**

4. **CPU (Top to Bottom all circuits):**