BLG222E - Computer Organization
Project 2

Part 1:

Design a 16-bit register as shown in Figure 1 that has the following control signals:

LD	INC	CLR	Function
1	X	X	loads from the input of the register ($R \leftarrow$ input)
0	1	X	increments the contents of the register ($R \leftarrow R + 1$)
0	0	1	clears the register ($R \leftarrow 0$)

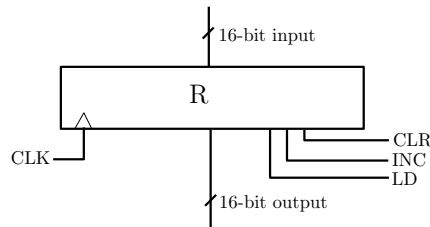Table 1: Control signals and corresponding functions for the register.

Figure 1: 16-bit register.

Make sure to connect pins (under Wiring group of logisim) to the inputs and control inputs of your register, so that different inputs and functions can be tested. Similarly connect the register output to a "Hex Digit Display" in logisim (under Input/output group of logisim) so that the test outputs can be observed. Use proper labelling to improve the clarity of your circuits.

Part 2:

Implement the simple computer shown in figure 2. **This is the NOT the same computer that is shown in class.** Modify the ALU that you implemented in previous project to take one input directly from DR register and other input from AC register **or** INPR register. If the ALU input is taken from INPR, upper 8 bit input of the ALU should be zero.

Use the register from Part I for 16-bit registers. Modify this register to obtain 12-bit register (for PC, AR, and SP registers) and 8-bit register (for CCR, INPR and OUTR). The register lengths are listed in Table 2.

Register	length
AC, DR, IR, TR	16-bit
AR, PC, SP	12-bit
INPR, OUTR, CCR	8-bit

Table 2: Register lengths for the simple computer.

Connect all necessary registers to the bus which you are going to design to finalize your circuit.

Make sure to connect pins (under Wiring group of logisim) to all inputs and control inputs of your computer, so that different inputs and functions can be tested. Similarly connect a "Hex Digit Display"
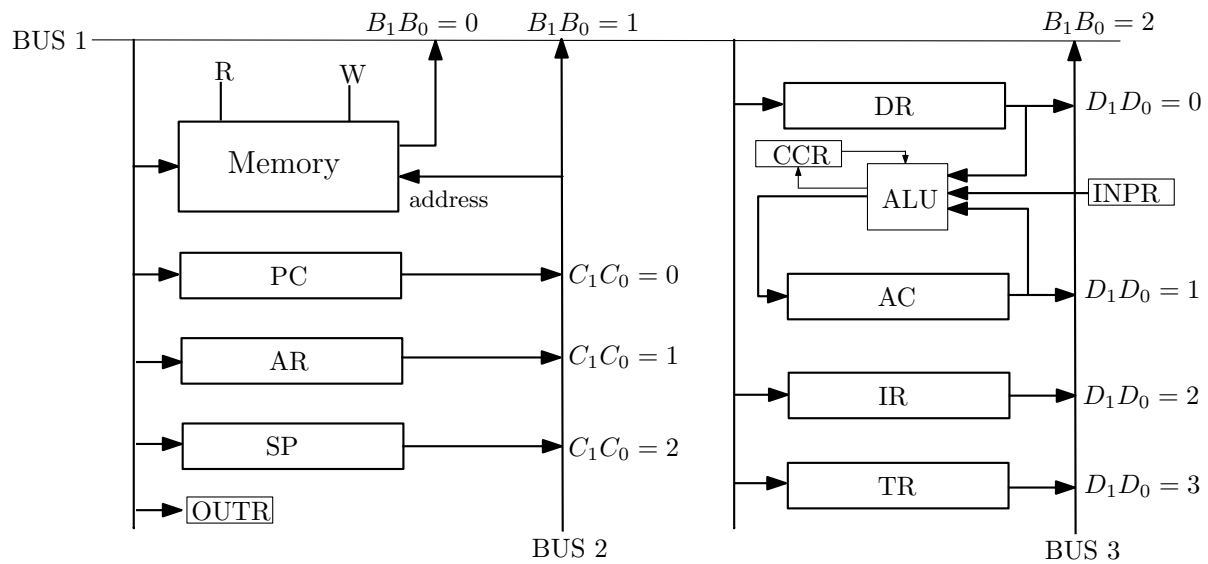
Figure 2: Simple computer structure.

to the common bus and to the output of AC register so that the test outputs can be observed. Use proper labeling to improve the clarity of your circuits.

You do not have to implement a control unit for this project. All control signals will be given manually as inputs to your circuit.

Groupwork:

Group work is expected for this project. Same group (from the previous project) of students should design together. You might be asked to make a 10-minute demonstration of your design with a few test cases.

What to turn in:

Implement your design for the register and simple computer in **logisim** software, upload a single compressed (zip or rar) file to ninova before the deadline. Only one student from each group should submit the project file. This compressed file should contain:

- the student number&names of the students in the group

- design (.circ) file for the register

- design (.circ) file for the simple computer

- a short report that lists of control inputs and corresponding functions of the simple computer