

CS2100 Computer Organisation  
Lab #10: Using Logisim II  
(Week 13: 14 - 18 April 2025)

Remember to  
bring this along  
to your lab!

[ This document is available on Canvas and course website <https://www.comp.nus.edu.sg/~cs2100> ]

Name: \_\_\_\_\_ Student No.: \_\_\_\_\_

Lab Group: \_\_\_\_\_

This is your final lab! 😊  
Please complete at least ten minutes before the hour.

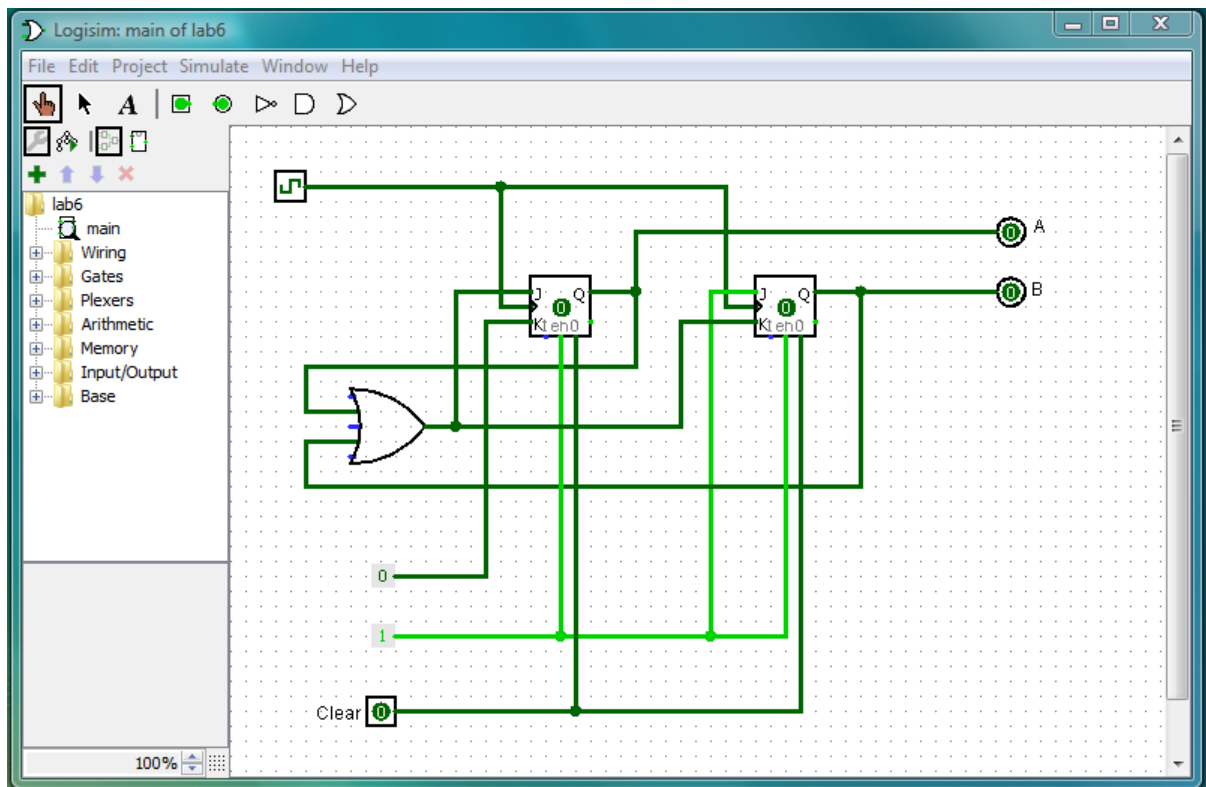
**Objective:**

In this experiment, you will use **logisim** to analyse and design sequential circuits.



**Complete Part I before coming to your lab!**

**Part I**

1. Run logisim, open the file **lab10.circ**. The circuit is shown below.



2. The circuit consists of two JK flip-flop and an OR gate. Note the following:

- The outputs of the two JK flip-flops are labelled *A* and *B*, which form the state of the circuit.
- The Clock  is connected to the clock inputs of the flip-flops.
- The logic constant 1 is connected to the Enable inputs of the flip-flops.
- The Clear switch  is connected to the clear inputs of the flip-flops. Hence when Clear = 1, it clears the contents of both flip-flops to 0, bringing the circuit to the initial state of  $AB=00$ .

- The flip-flop inputs are as follows:

For flip-flop A:  $JA = A + B$ ;  $KA = 0$

For flip-flop B:  $JB = 1$ ;  $KB = A + B$

3. Complete the following table:

[6 marks]

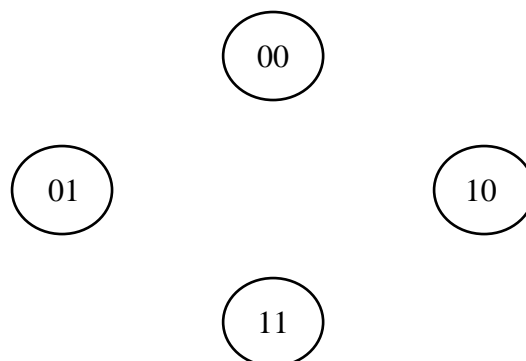
Present state		Flip-flop inputs				Next state	
A	B	JA	KA	JB	KB	A <sup>+</sup>	B <sup>+</sup>
0	0						
0	1						
1	0						
1	1						

4. Verify the correctness of your table above by testing the circuit in Logisim.

- Click on “Clear” input to get 1. This clears both flip-flops to 0, bringing the circuit to the initial state of  $AB=00$ .
- Click on “Clear” input to get 0 before you proceed. This puts the flip-flops in their normal operation mode.
- Clicking the “Clock” input toggles its value. When the “Clock” value changes from 0 to 1 (i.e. a rising edge), the flip-flops react according to the commands at their J and K inputs.
- Click the “Clock” input several times to simulate the square wave, and watch the outputs of the flip-flops change their values. Do the values follow your table above?
- If at any point of time you want to reset the flip-flops to the initial state of 00, go to step (a) above.

5. Complete the state diagram below.

[4 marks]



**Part II**

6. During the lab session, you will design a sequential circuit. Your labTA will provide you with the flip-flop inputs. Copy down the flip-flop inputs below:

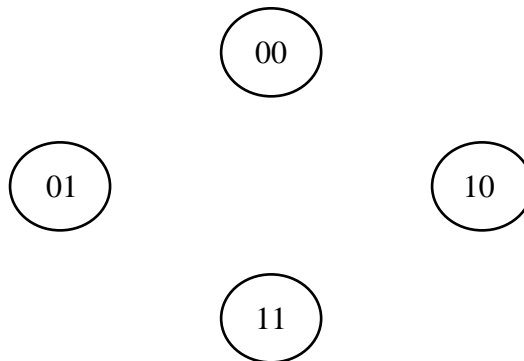
For flip-flop *A*:  $JA = \underline{\hspace{2cm}}$ ;  $KA = \underline{\hspace{2cm}}$

For flip-flop *B*:  $JB = \underline{\hspace{2cm}}$ ;  $KB = \underline{\hspace{2cm}}$

7. Complete the following table: [6 marks]

Present state		Flip-flop inputs				Next state	
<i>A</i>	<i>B</i>	<i>JA</i>	<i>KA</i>	<i>JB</i>	<i>KB</i>	<i>A</i> <sup>+</sup>	<i>B</i> <sup>+</sup>
0	0						
0	1						
1	0						
1	1						

8. Complete the state diagram below. [4 marks]



9. You do not need to implement this circuit.

10. As this is your final lab, your lab report will not be returned to you.

Total: 20 marks