

CS2100 Computer Organisation
Lab #10: Using Logisim II
(Week 13: 13 - 17 April 2026)

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.

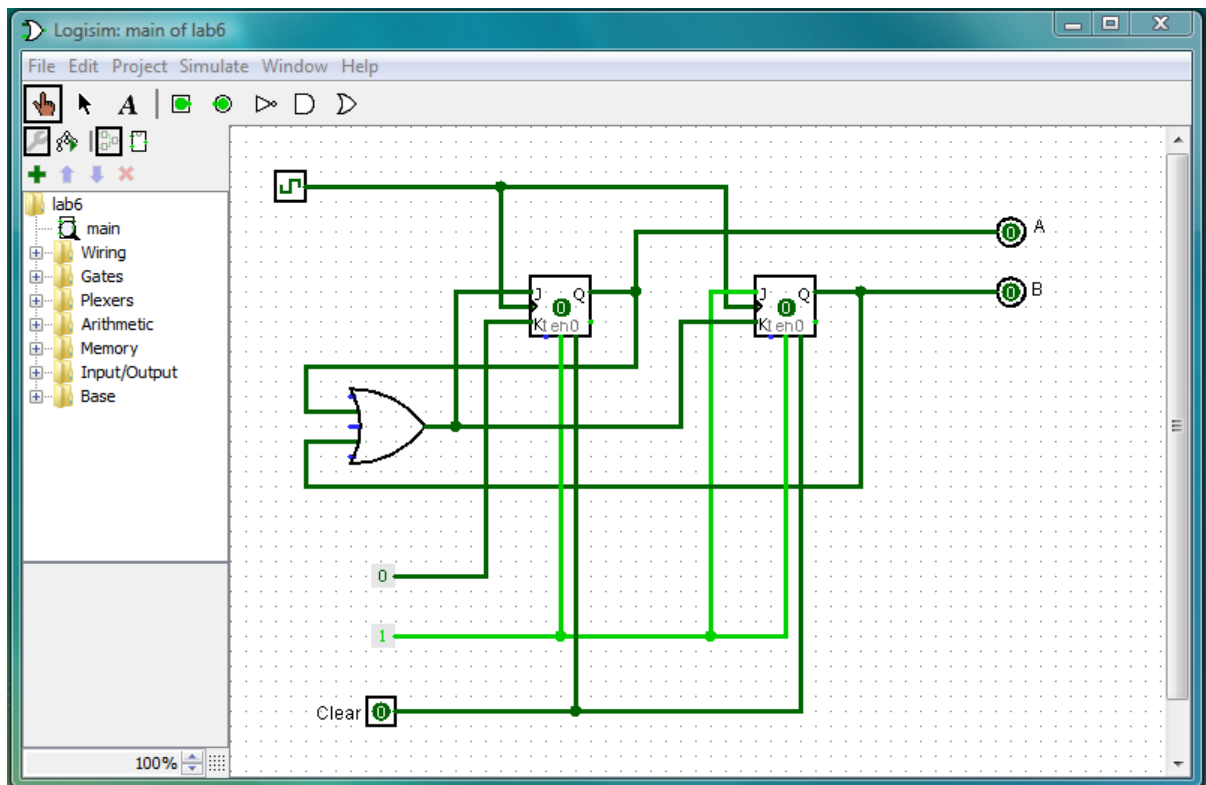
Objective:

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]

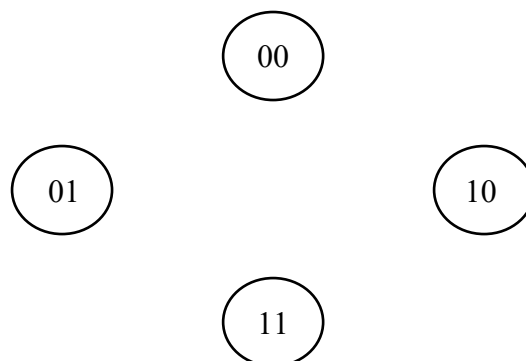
Present state		Flip-flop inputs				Next state	
A	B	JA	KA	JB	KB	A^+	B^+
0	0						
0	1						
1	0						
1	1						

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:

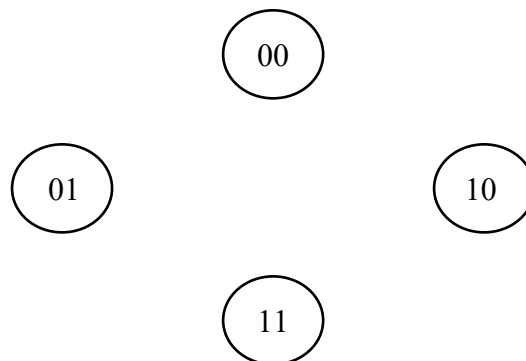
For flip-flop *A*: $JA = \underline{\hspace{2cm}}$; $KA = \underline{\hspace{2cm}}$

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> ⁺	<i>B</i> ⁺
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