2020/2021 SEMESTER 1

LAB 4: 2 BIT XEROX MACHINE

SUBJECT:

SECR1013-02 DIGITAL LOGIC

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DEDICATION & ACKNOWLEDGEMENT

Firstly, we would like to express our sincere gratitude to our Digital Logic's lecturer who is Nur Haliza Binti Abdul Wahab. She has answered our questions patiently and contribute her time to give our extra class on the explaination of this lab in order to help us success in completing this lab.

Our passionate lecturer has also taught us all the knowledges so that we can apply it in this lab. Without the effort and commitment of her, we will not able to complete our work on time and focus on our final exam.

Besides, we would also like to thank to our family because they also give us support in many aspects such as financial and mental. Only with the support from our family, we have the motivation to continue our study no matter how hard is it.

Last but not least, our friends and coursemate also help us a lot in completing this lab. When we got a question, they will always willing to give their help to answer us although we never meet before due to pandemic.

BACKGROUND

This mini project will implement 3 different components on a single ATMEL device, those components are:

1. Count Up Counter
2. Comparator
3. Clock Disabler

PROBLEM

User will initially enter amount of copies, the counter will count the number of copies that has been photocopied. The machine will stop once the required number of copies produced.

PROPOSED SOLUTION

A block diagram of a component required is shown in Figure1. Three core components are counter, comparator and clock disabler. Counter will determine the number of copies that has been made while the comparator will determine whether the required number of copies has been met. Once the number of copies has been met, the clock disabler will disable the clock and stop the counter from counting. The machine will display the required number of copies and the amount that has been produced.

To implement this, the user has to key in the required number of copies by using 2 switches, which allow the required number from 0 to 3. He/she will reset the counter (assuming pressing a START button), the counter will count and its output will be compared with the value of the switches, if the value is not the same it will continue counting up. A signal will be generated to stop the counting if the output of the counter has the same value as the digital value of the switches.

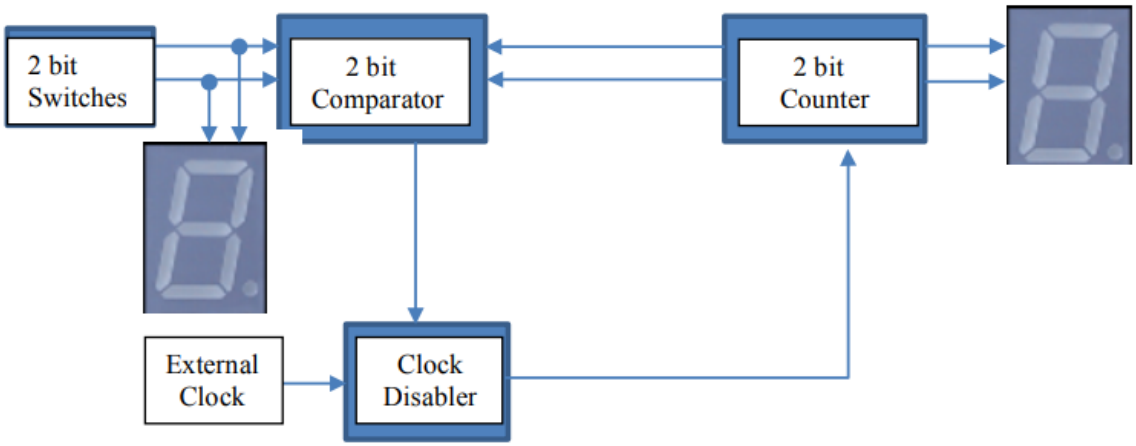

Figure 1. A block diagram of a complete system

COMPONENTS & REQUIREMENT

- ✓ Switches: to set the required no of copies

- ✓ Counter: to count the number of copies that has been made

- ✓ Comparator: to compare the number of copies required with the number of copies produced

- ✓ Clock Disabler: to stop the operation of the counter If Copies produced < Required Copies, Counter will count up Else Counter will stop counting

IMPLEMENTATION

A drawing of deeds is shown in Figure 2. The xerox machine has 2 switches for the user to enter number of pages that required. User is able to enter number of pages from 0 to 3 and the printing number will show by a 7-segment display in hexadecimal number.

There is also 2-bit comparator which is built by 2 XOR gate. The first comparator will compare the least significant bit(LSB) of the input and first JK flip-flop. If both of the sources have different bit, the comparator will produce a high output and inverter will implement the output become low. After passing NAND gate, the output will become high again and send this as an input to clock enabler.

For the 2-bit count up counter, the counter will start when receive the signal from clock enabler. Both of the inputs JK are connected to a high input. The counter will stop counting when no high signal from clock enabler which is when the number of printing output equal to the required input.

To control the number of output meet the number of input, a clock enabler is used. This is because when the number of input and output is equal, comparator will send a high signal to NAND gate which will cause the output become low. The signal send by clock enabler will also low and this means the counter will stop counting and the printing process will end.

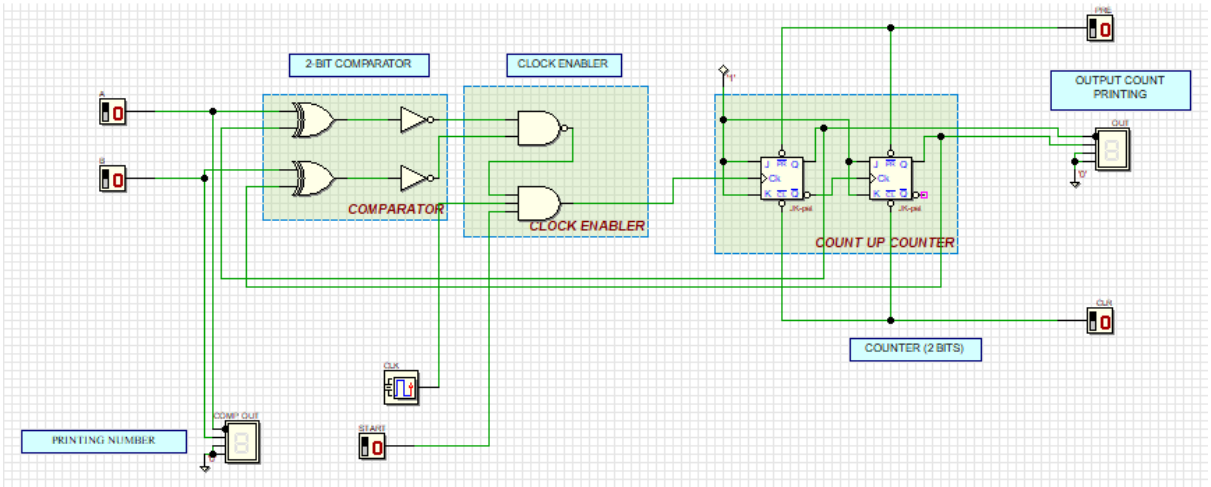

Figure 2. The drawing of deeds

CONCLUSION

This lab 4 is about a 2-bit xerox machine. We simulate it by using three core components, which are counter, comparator, and clock disabler. Same with the mini-project, we learned a lot of knowledge from them on how they handled the problem when the xerox machine did not work initially. We also researched to increase our understanding as Digital Logic is one of the main subjects that offer us countless knowledge in computer science.

In this lab 4, we have summarized and simplified it with a 2-bit Xerox machine from our mini project with 3-bit Xerox machine. In this 2-bit Xerox machine, we have completed it using On/Off, 2-bit comparator, clock enabler and count up counter. In my opinion, it is not as complete in terms of function by comparing it to our mini project. For example, colour selection and also 3-bit can input up to 8 but for 2-bit only 3. This lab 4 has also increased my understanding and made me able to see the difference between a more complex and simple system.

From this lab, we have learnt the implementation of a xerox machine although it is the basic machine but it let us know how the functions of combination logic circuit which are comparator, counter and clock enabler used in our real life as we only learnt about the theory without practical before this lab.

In conclusion, we have successful complete this lab in a short time period and understanding what is the purpose of lecturer to give us this task. We are able to draw the circuit of machine by ourselves although we are not familiar with the application.

Furthermore, we have also learnt some soft skill from this lab such as problem solving skill. This is because we need to think how the connection of components in circuit by using deeds. When there is no desired output, we must think how to overcome ourselves like searching from google and discussing with our friends. I think this is also the strengths of us because we have overcome all the problems that faced.

However, we do not have the opportunity to implement the real circuit due to this pandemic. This is the biggest weakness and we only know about the theories without really apply it to our life.

Lastly, we are really feel appreciate for giving us the opportunity to conduct this lab. As a computer science student, we think this is a necessary skill for us to enhance our understanding about implementation of circuit in order for us to apply in future. We will keep the effort to increase our knowledges and skills.