SCHOOL OF COMPUTING
Faculty of Engineering

SECR1013 - DIGITAL LOGIC

Mini Project: Programmable Logic Device (PLD) Photocopying (Xerox) Machine

Group number: 14

Group name: 5 FLAT

No.	Name	Matric no.	Section
1	Cha Zhi Ye	A20EC0022	04
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Acknowledgement:

We want to communicate our most profound appreciation to every one of the individuals who gave us the likelihood to finish this report. An extraordinary appreciation we provide for our last year project chief, Ms. Marina binti Md Arshad, our instructor for this course Digital Logic who commits in invigorating proposals and support, assisting us with planning our tasks and in writing this report. A special thanks to everyone on this team who have put full efforts in completing this Report and project, to produce the best output possible.

Background:

This mini project would have included the usage of 3 unique segments on a solitary GAL gadget. The parts included are 3-bit Count Up Counter, 3-bit Comparator and Clock Disabler. However due to the rise of COVID-19 and students needing to use online learning, this project was completed on deeds. This project included the client which will at first enter measure of duplicates required. The counter will tally the quantity of duplicates that had been copied. The machine will stop once the necessary number of duplicates created had been reached. There are three center segments, which are counter, comparator, and clock disabler. Counter will be utilized to decide the quantity of duplicates that has been made while the comparator will decide if the necessary number of duplicates has been met. When the quantity of duplicates has been met, the clock disabler will debilitate the clock and prevent the counter from checking. The machine will show the necessary number of duplicates and the sum that has been created.

Problem:

To handle the issue which we confronted we were required a photocopy machine. Though, this machine contains a display of seven segments addresses, the quantity of duplicates that entered by the client from the earliest starting point. And afterward the counter will tally the quantity of duplicates that have been made. Ultimately, the machine stops once the necessary number of duplicates created has been reached.

Objectives:

Due to COVID-19 our main objectives were a bit different from the people in the past. Our main objective was to make a modified xerox circuit in deeds, the modifications had to be unique for each member. The instructor showed us a block diagram of a 2-bit xerox circuit and using that as a base we were supposed to modify it with new functions and additions depending on the number of members in the group (1 each). This main objective would be met after a slew of smaller tasks would be completed. First by recreating the instructors 2-bit xerox ourselves making sure the instructions of its working are added and understandable. Making a block diagram of every added function and finally converting it into our version of the xerox.

Flowchart of Work
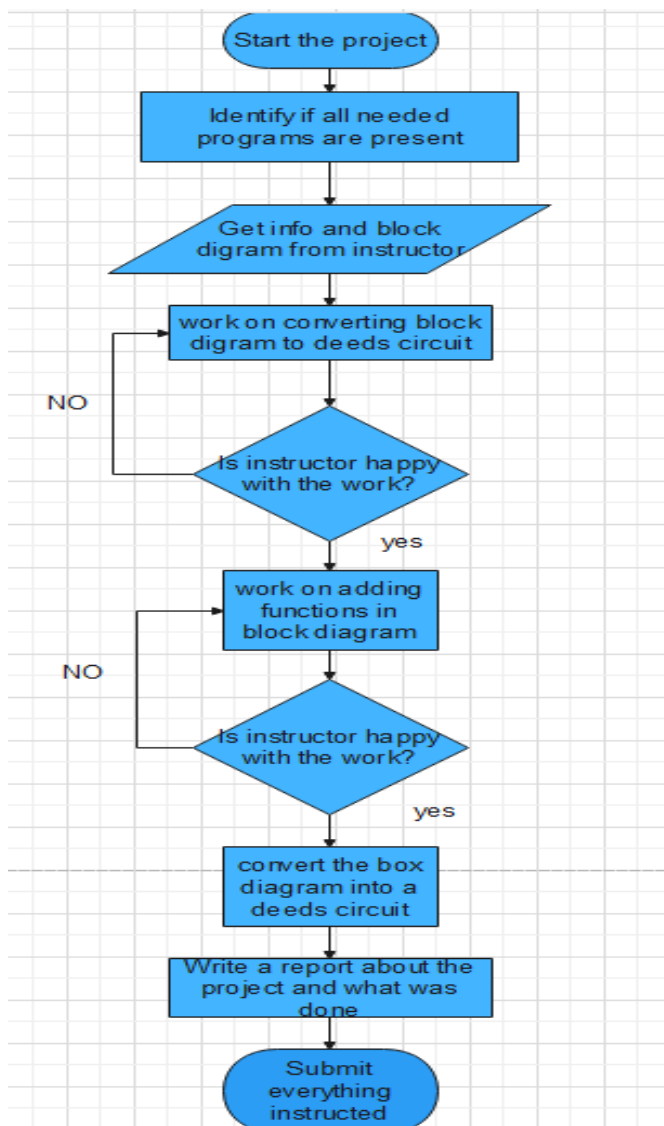
Software Used:

All software used to complete this project are present in table below. (Note for e draw and smart draw can be used for both flowchart creation and block diagram creation but due to each task being done by different people, different software was used).

Name	Purpose	Icon	Where to access.
DEEDS DcS	Circuit creation		https://www.digitalelectronicsdeeds.com/downloads.html/
TELEGRAM	Discussion		https://telegram.org/ (also available on phones as an app)
Wondershare EdrawMax	Flowchart creation		https://www.edrawmax.com/
Smart draw	Block diagram		https://www.smartdraw.com/
WPS office	Report creation		https://www.wps.com/
Cisco	Class to get information and explanation.		https://www.cisco.com/

Pre modification circuit:

The pre modification circuit is essentially the block diagram given by the instructor converted by the team into a deeds circuit. There were a few errors by us that made us make a modified version assuming that this was the first task then we showed the instructor the modified version, luckily the instructor consulted with us and told us what we were supposed to do, one of the members then made a conversion of the block diagram in deeds, now as for the working of the circuit the steps are clearly explained on the deeds circuit making it easier to use even for people that would normally not know how to use such a machine.
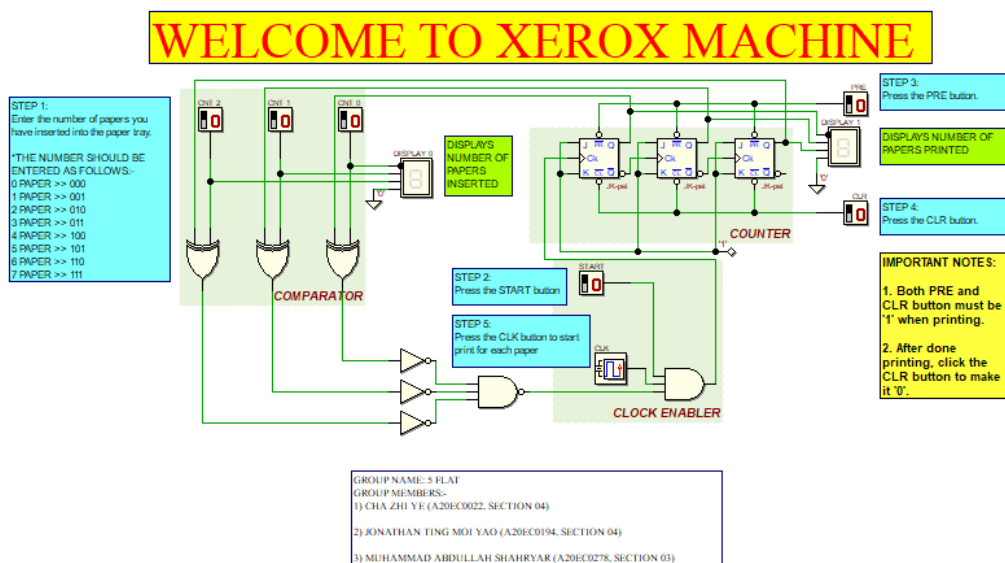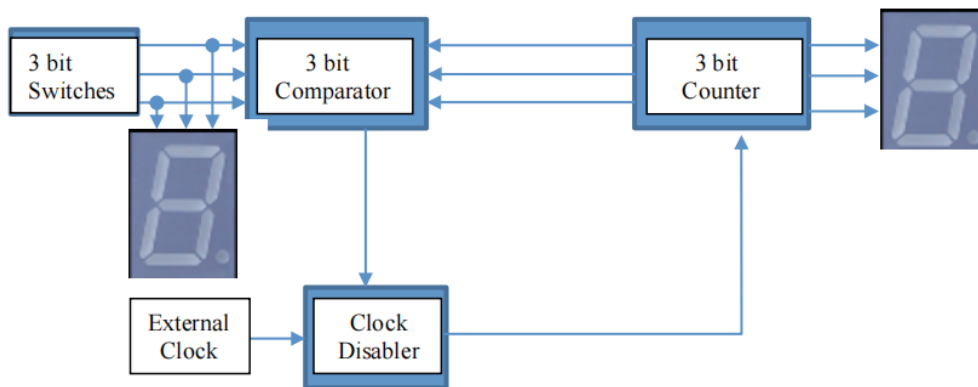
Post modification circuit:

The post modification circuit is after each member has contributed a new part to the circuit and they have been added in the circuit. First, we modified the block diagram to see what the circuit would look like then creating the circuit by following the deeds. A few errors were made in the block diagram by not putting the right amount of input wires and not writing the function in the box but later this was worked on thanks to directions from the instructor. Both pictures are currently hard to see but image is given to get a basic idea. A proper version can be viewed through the pbs file uploaded in e learning.

These 2 are the block diagram that we have done and modified. However, there are mistakes that soon pointed out by our lecturer.

This is the block diagram that was done by Jonathan at first. However, it does not label the function and we are not sure whether to use the gates inside it or not.
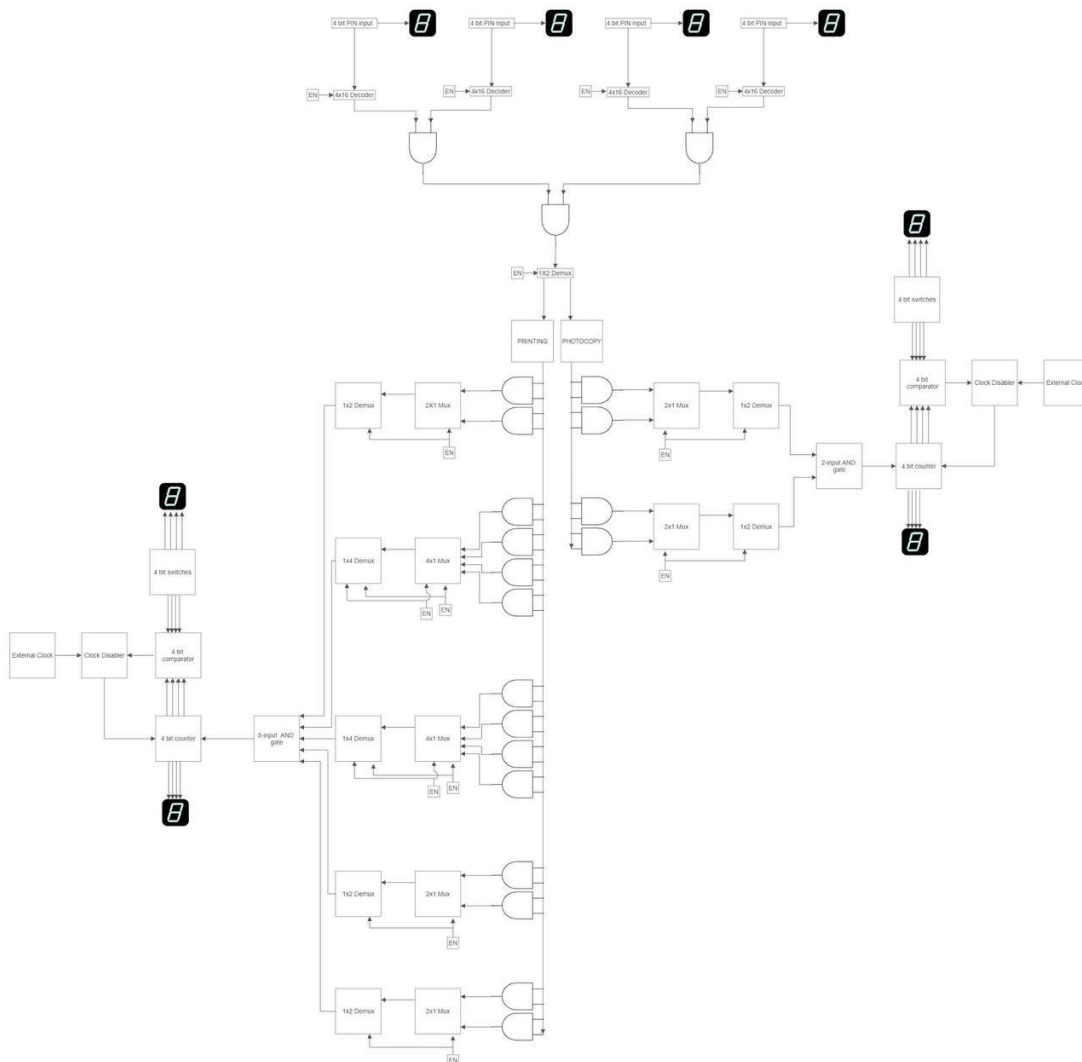
So, Zhi Ye modify the block diagram by adding the function of each part.
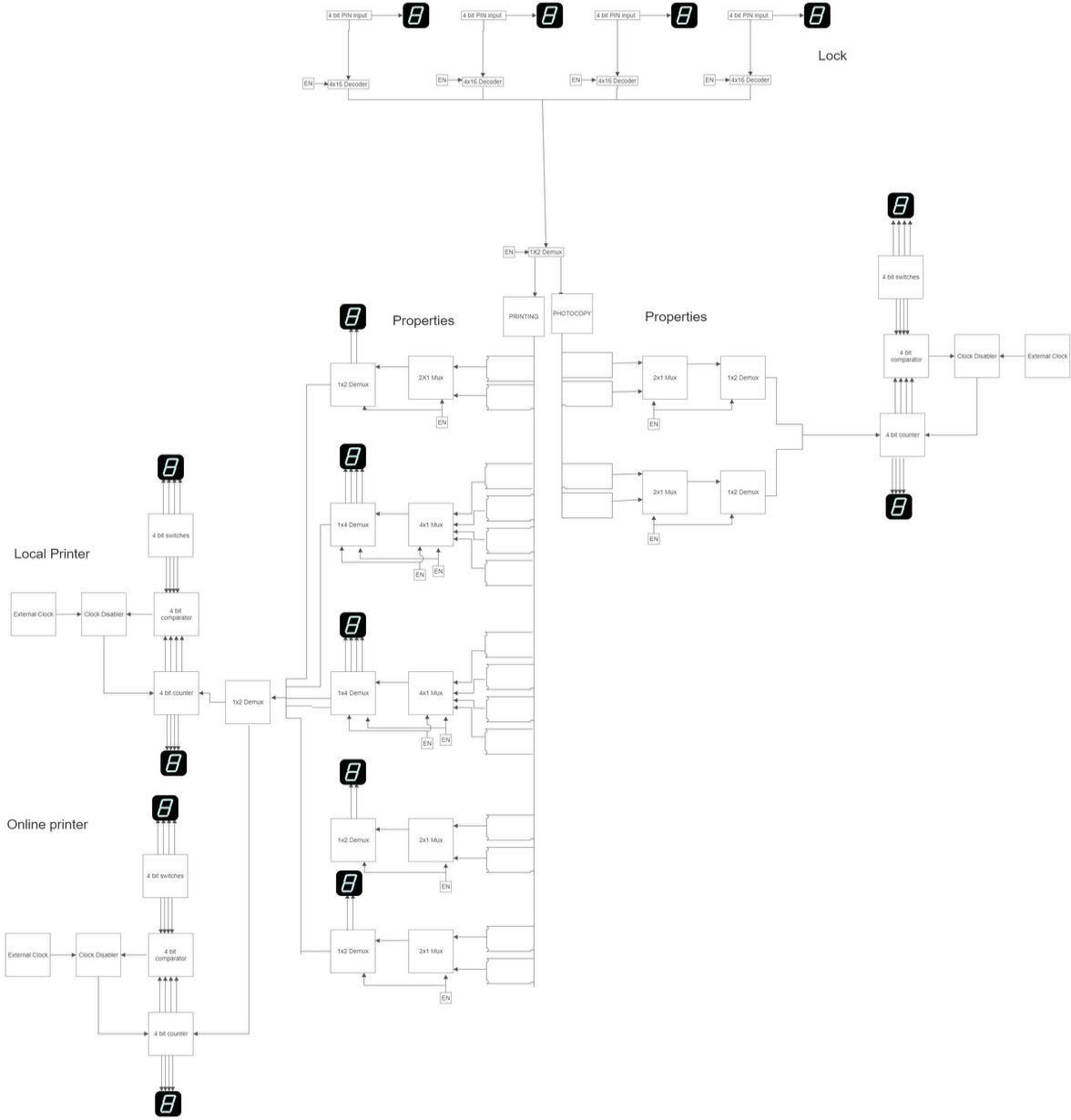
This is the final block diagram that Zhi Ye has done by adding more function inside the machine and we immediately start to do the circuit in Deeds:
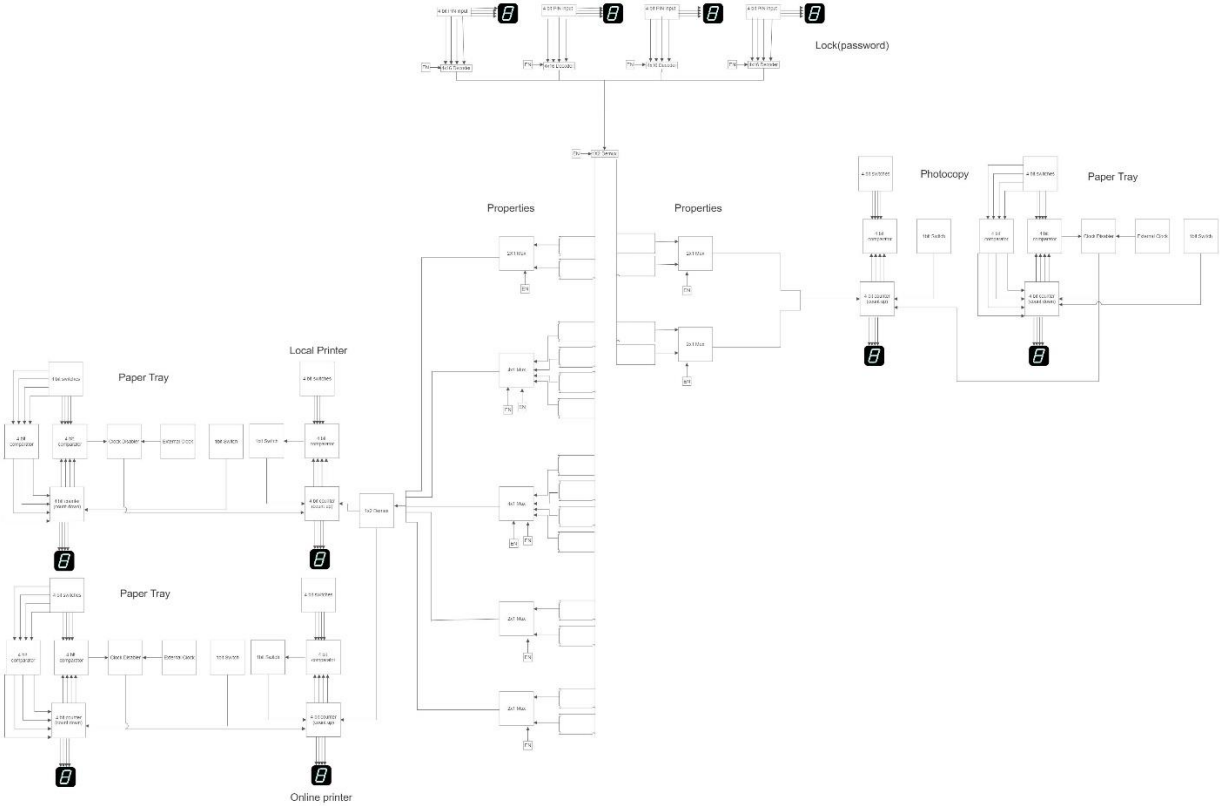
System implementation:

As soon as we start, Jonathan has done the overall of the Xerox machine and Shahryar added a few components in the printing properties. However, this machine is not truly like a printer yet. Jonathan has figure out that the circuit can be improved by adding a photocopy selection.

This is the xerox machine firstly done by Jonathan and Shahryar:
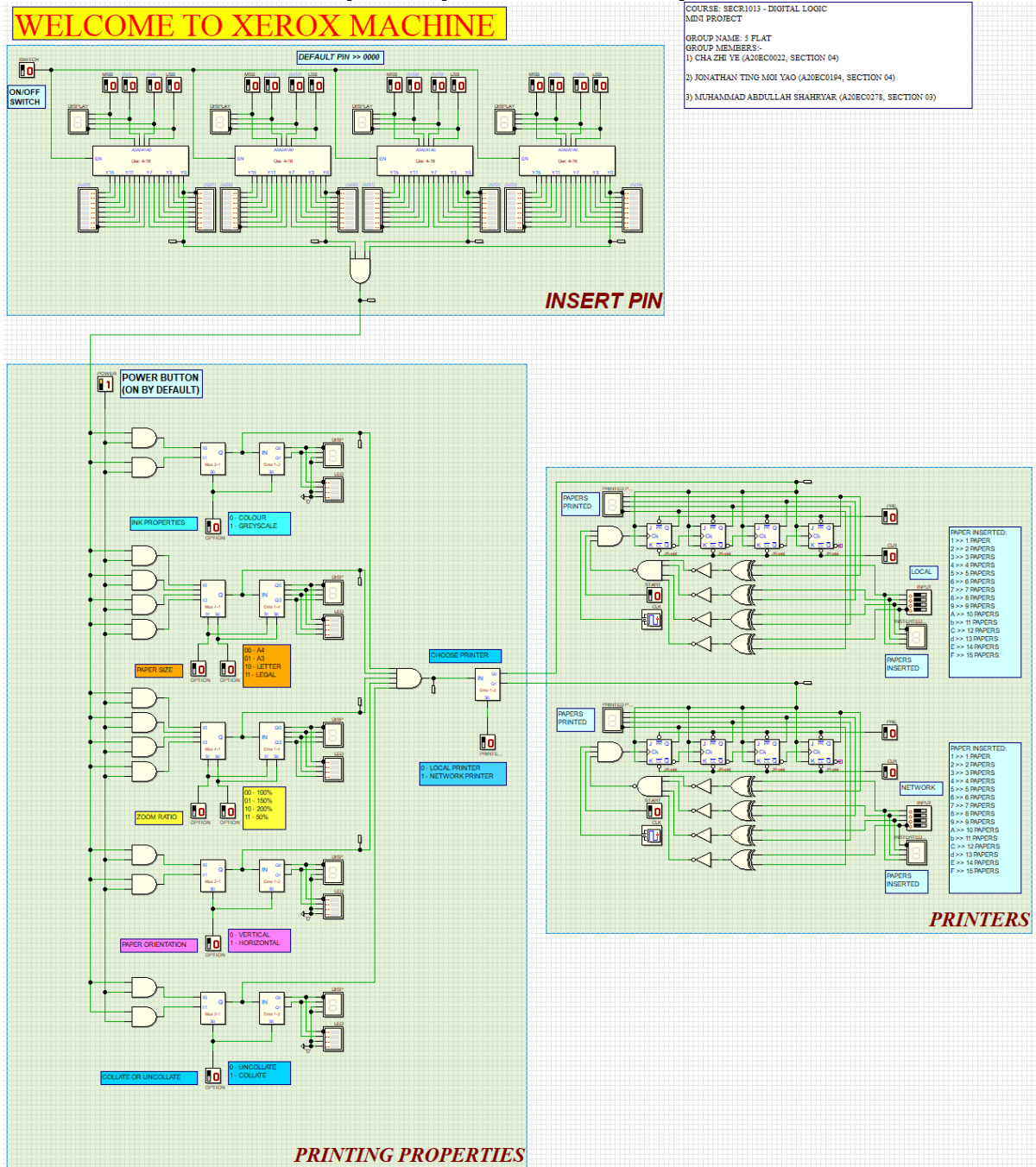
Then, Zhi Ye tried to modify the machine. The machine was added the paper tray to count the numbers of paper inserted to the printer and the papers left during the printing. Besides, Zhi Ye has removed and adjusted the places of LED and output displays in properties that does not needed by the user to make it become clearer. This is the final circuit that he has modified:
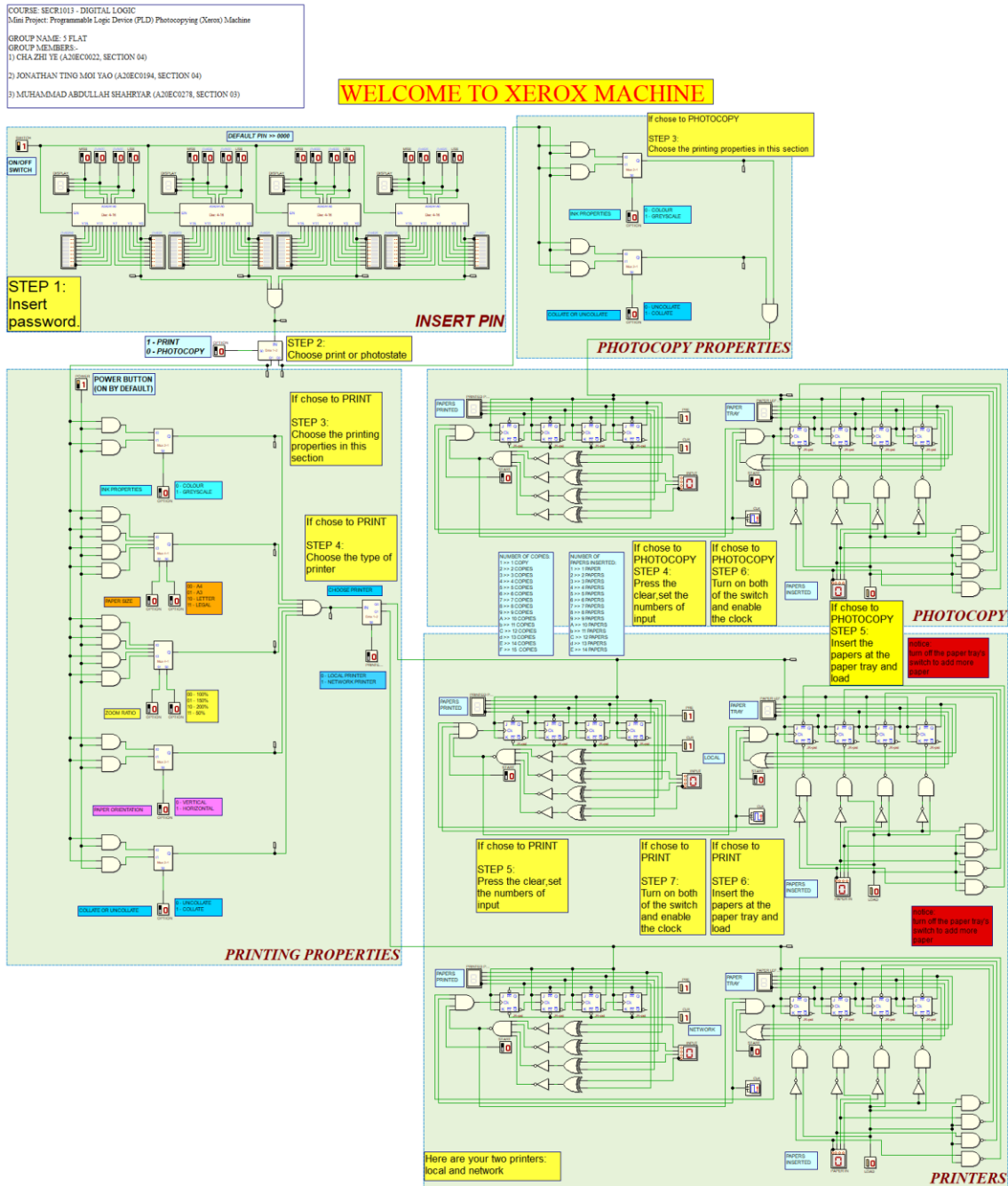
Instruction:

Referring to the xerox machine above, user can change the password number by changing the line in decoder. To let the user use the machine easier, the password was set to 0000 by default. To use the machine, turn on the machine (initially on) and make sure the password is correct. Then, the user should choose either he needs to photocopy or print something. After that, he should choose the printing properties, which is labelled there such as colour, paper orientation and zoom ratio. Then finally we get into the printing part. If the user chooses to print, he needs to choose either he wants to print locally or online. To start the printer, he should set the number of printing he want and the number of papers inserted. For the number of papers inserted, the user should press load after he has confirmed the number he wants. Then, press the clear button of the printer. After that, turn on the switch of both printer and paper tray. Make sure the clock has already ticking. If the number of papers inserted is not enough, he can switch off the paper tray and add on some papers, click the load button. Then, switch on again and the printer will continue printing.

Discussion:

All in all, we had the option to accomplish our objective by completing two capacities in the machine utilizing two and three pieces. We have made each made strides to stay away from any blunders, we however still made a few errors that we managed to fix after we consulted with the instructor, we each kept an eye on each other's errors and made sure to correct the person if any were found, we managed to allocate tasks smoothly and were able to complete this project through our joint team efforts. We added functions only if everyone agreed that it would fit and works well with the project. In the end we managed to create our xerox machine.

Conclusion:

Muhammad Abdullah Shahryar:

In the end, we have managed to finish the venture on time. Each part we utilized worked and the whole machine can function well. The arrangement we proposed has likewise tackled the issue to upgrade the photocopy machine. Absence of openness to the utilization of segments, all things considered, would acquire us a few challenges in the project. It is regretful we could not play out this practically. I trust soon we will have the option to try out this or different undertakings like this in the lab practically. This will assist the students with having a more profound comprehension on what they have studied in the books. I would like to thank to our instructor again for instructing us a ton of information in Digital Logic and consulting with us to finish the project. I would also like to thank everyone on this team and congratulate them on a job well done, at least from my opinion and hope the instructor may think the same.

Cha Zhi Ye:

In the project, I have revised many things learned in chapter before, such as multiplexer, decoder, flip flop, counter and many else. Thus, I have realized that there are so many things I have forgotten since the first chapter. There are also parts that I have learnt but I cannot apply in this project. So, I must strive hard in the exam by studying from the start of the chapter. In the project, I have actually proposed to add on an adder in the printer to calculate the total papers wanted to printed on the second printing but I have failed to do it. The adder that needs to add 4-bit is too big and not enough space to put inside the circuit and the circuit is hard to create. Besides, the function can be replaced and thus it is not a useful modification. However, I have successfully added on the function of paper tray that uses count-down counter and I can feel the sense of accomplishment. Actually, I tried to modify it so that the user need not close the switch to load more papers inside the paper tray but I failed again. So, in future, I want to make this project become better by automatically clear the printing output and stop after printing as now, the user needs to press clear if he wants to continue a new printing.

Jonathan Ting Moi Yao:

Before we start the project, I had searched only all related stuffs related to the PLD Xerox Machine and only found DEEDS example done by our senior. After analyzing their DEEDS circuit, I decided to start ahead of the whole group and started making the initial phase, that is, building the password function and the printing properties. Before that, I did a few circuits for Lab 4 but was rejected because I modified it making to be the mini project. During the last day of consultation for Lab 4, I finally got it right and Ms. Marina accepted it. Next, I started with the mini project. During the consultation with Ms. Marina, I only remembered that we need to present our block diagram to Ms. Marina before we could proceed to building the DEEDS circuit. We were left less than 24 hours to complete the block diagram. The final block diagram was presented by Cha Zhi Ye but we only gave Ms. Marinna 6 minutes to read through, which is impossible. Ms. Marina however asked us to proceed with the DEEDS circuit. The only thing we need to do is to enhance the circuit to make it cleaner because I had already done most of the part before we present the bock diagram. After Cha Zhi Ye had finalize the DEEDS circuit, I labelled the steps and instructions to use the XEROX machine.

References:

1. Project Briefing 20202021-1.pdf
2. Lab sheet Project 20172018 ver6 latest
3. Digital Logic 5th Edition by School of Computing, UTM
4. https://www.youtube.com/watch?v=gAj14RykSdg

Appendices:

MEMBERS	Role	Added functions in circuit	Tasks done	Overall work done
Jonathan Ting Moi Yao	Representative	Password function.	Made the circuits and block diagrams and Report writing	40%
Cha Zhi Ye	Member	Paper tray and LEDs	Modification of circuit and block diagram and Report writing	30%
Muhammad Abdullah Shahryar	Member	Colour and paper size properties.	Modification of circuit and Report writing	30%