UNIVERSITI TEKNOLOGI

MALAYSIA JOHOR BAHRU

(UTM JB),

81300 JOHOR

BAHRU, JOHOR

SCHOOL OF COMPUTING

FACULTY OF ENGINEERING

GROUP ASSIGNMENT

Students Name	Nur Hidayah binti Hamri	B19EC0046
	Nuramyra Natasha binti Ismalludin	B193C0035
Course Code & Name	SCSR1013-Section03 Digital Logic	
Lecturer	Miss Rashidah binti Kadir	
Submission Date	1st January 2020	

DEDICATION & ACKNOWLEDGEMENT

In performing our report of mini project, we had to take the help and guideline of some respected persons, who deserve our most enormous gratitude. The completion of this report gives us much pleasure. We want to show our appreciation **Miss Rashidah binti Kadir**, Lecturer Digital Logic, UTM for giving us a good guideline throughout numerous consultations. We would also like to expand our deepest gratitude to all those who have directly and indirectly guided us in writing this report. Besides, we thank the teaching assistant that contributed to help us during the mini project session. Many people, especially our classmates and team members themselves, have made valuable comments suggestions on this mini project which inspired us to improve our report. We thank all the people who, directly and indirectly, help to complete our task.

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THE BACKGROUND

This mini project requires winCUPL software as the first way to complete the process. Then use the Wellon Programmer to insert coding into the IC and then run this mini project process using the ETS5000 Training Kit. The results are then included in the report.

THE PROBLEM

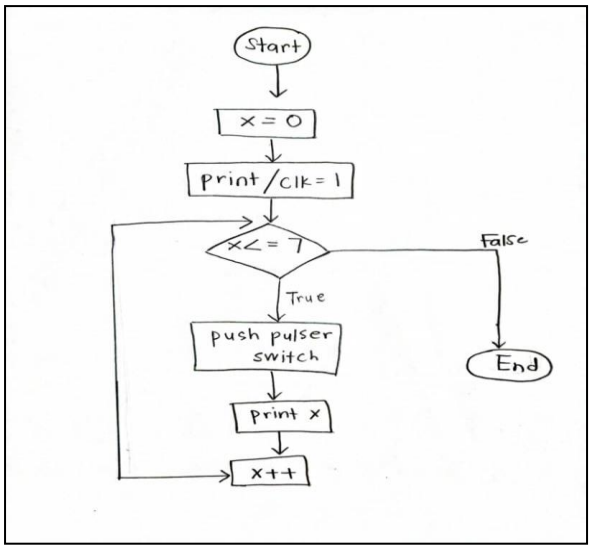
User will initially enter amount of copies, the counter will count the number of copies that has been photocopied. The machine will stop once the required number of copies produced.

OBJECTIVE

The objective of this laboratory are to introduce students to:

- The development of a PLD device.
- A simple Hardware Description Language.

FLOWCHART



COMPONENT

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

- 3-bit Count Up Counter
- 3-bit Comparator
- Clock Disabler
- Switches

MATERIALS AND SOFTWARE'S USED

- **Breadboard**

Breadboard is a tool for temporary prototypes with electronic circuit design and testing. We use the Breadboard for test our IC that already that has been coded into it. This electronic circuit can be connected by inserting their leads or terminals into the holes and then connecting via appropriate wires that is prepared.

- **GAL 22V10**

GAL 22V10 is a CMOS device which is students must handle it with care.

- **ETS-5000 Digital Training kit**

The ETS-5000 Digital Training kit is designed for beginners to advance their understanding of digital theory. The design of the Advanced Digital Training System is easy to operate and easy to understand.

- **PLD**
- **ATMEL**
- **Wellon Universal Programmer & Tester**

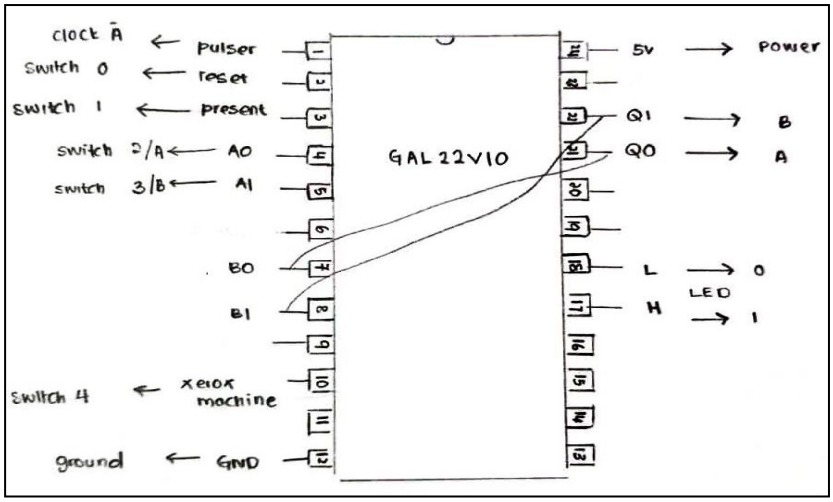
Wellon programmer is used to insert coding that has been created into the IC. To program the IC, the student must first place the IC in the socket programmer and then click *PLD* for type, select *ATF22V10CQ* for device and *ATMEL* for manufacturer. Then, select the load file in the form of JEDEC that has been created and then burn it right into the IC. Finish inserting the coding into the IC, removing it from the socket programmer and testing it in the ETS-5000 Digital Training kit

- **WinCUPL 5.0 Software**

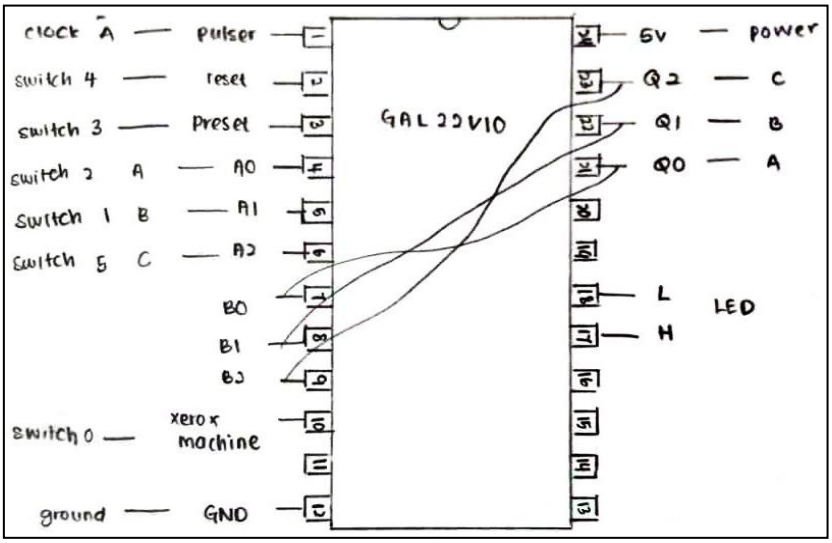
WinCUPL is a software for coding and then it can be saved to some files like JEDEC, PLD, PDF, Word and others. The most important file for running this mini project is JEDEC because Wellon Programmer can only read JEDEC files.

CIRCUIT IMPLEMENTATION

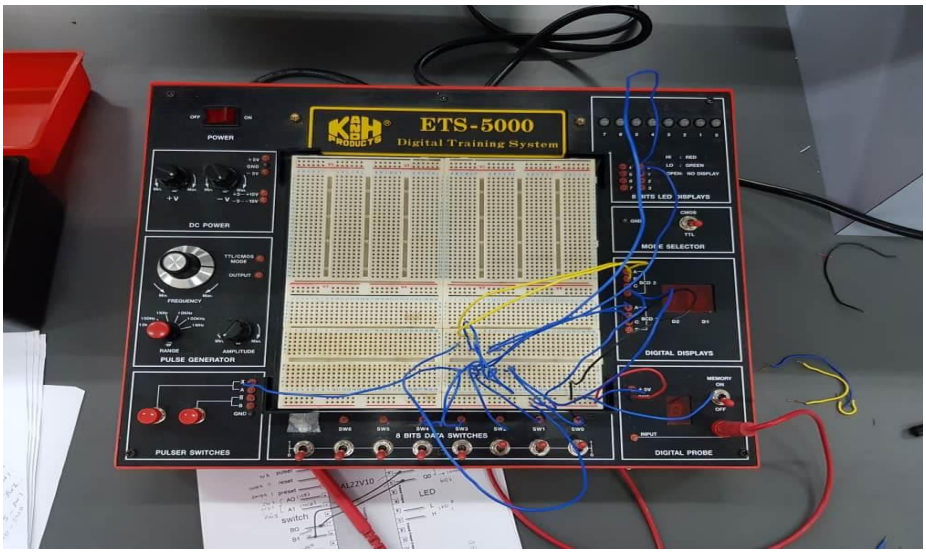
Block Drawing (2 BIT)



Block Drawing (3 BIT)



XEROX system (2 BIT)



For 2 bits, there are only 5 switches that are B0, B1, Reset, Preset and Clk. In the Digital Display section, A is LSB and B is MSB while for C and D is connected to Ground.

XEROX system (3 BIT)

For 3 bits, plus another one switch. Thus all have 6 switches namely B0, B1, B2, Reset, Preset and Clk. In contrast to 3bit, in the Digital Display section, A is LSB and B and C is MSB while for D only connected to Ground.

DISCUSSION

This mini project provides students with experience in photocopying (Xerox) machines using the material provided. The strength of this project is based on the coding that has been practiced and the achievement that has been given to patient and teamwork. Problems encountered when the IC was unusable and unreadable during the trial run on the ETS5000 programming kit.

- Give some new function suggestions for improvement and future works for your system

CONCLUSION

a) There are several soft skills that can be apply in this mini project. First of all, is team skills. Since we are doing this project in a group, team skills are very important to make this project success. Moreover, communication skill between the member and problem solving to enhance the 2-bit counter up to 3-bit counter using the coding that given by lecturer Miss Rashidah. Besides that, time management skills. We are given 3 hours to do this project.

b) Digital logic using signal and sequences of a digital circuit through numbers. It is the basic for digital computing and provides a fundamental understanding on how circuits and hardware communicate within a computer. This course introduces digital electronic and provides broad overview of many important concepts, components and tools to students. Moreover, digital logic is important in programming. As a computer student this subject suitable people that take computing and technology such as engineers, repair technician and security network.

REFERENCES

1. ETS-5000 Advanced Digital Training System, *Mutiara Nata Abadi,* http://www.mutiaranata.com/product/detail/ets-5000-advanced-digital-training-system
2. What is a Breadboard, *Wiring* http://wiring.org.co/learning/tutorials/breadboard/

APPENDIX

2-bit XEROX System

```
Name     Lab4 2bit ;
PartNo   03 ;
Date     17/12/2019 ;
Revision 01 ;
Designer Engineer ;
Company  UTM ;
Assembly None ;
Location Digital Logic Lab ;
Device   G22V10 ;

/* *************** INPUT PINS *********************/
PIN 1 = clk ;                /* clock */
PIN 2 = reset ;              /* reset */
PIN 3 = preset ;             /* preset */
PIN 4 = a0 ;                 /* Comparator A */
PIN 5 = a1 ;                 /* */
PIN 7 = b0 ;                 /* Comparator B */
PIN 8 = b1 ;                 /* */
PIN 10 = startPrt ;          /* Start Printing */

/* *************** OUTPUT PINS *********************/
PIN 17 = diffCmp ;           /* XOR (A B not equal HIGH) */
PIN 18 = sameCmp ;           /* XNOR (A B equal HIGH) */
PIN 21 = q0 ;                /* output counter */
PIN 22 = q1 ;                /* output counter */

/***** Function Comparator************************/
sameCmp = !(a0$b0)&!(a1$b1);
diffCmp = !sameCmp ;

/**** Function Clock Enabler *********************/
clkEn=startPrt & diffCmp;

/*** Function Counter 2 Bit UP ********************/
field count =[q1..0];
$define s0 'b' 00
$define s1 'b' 01
$define s2 'b' 10
$define s3 'b' 11
```

```
count.ar=reset;      /* connect reg AR to reset (Asyn Mode) */
count.sp=preset;     /* connect reg AR to preset (Syn Mode) */

sequence count{
       present s0 if clkEn next s1;
              default next s0;
       present s1 if clkEn next s2;
              default next s1;
       present s2 if clkEn next s3;
              default next s2;
       present s3 if clkEn next s3;
              default next s3;
}
```

3-bit XEROX System

```
Name     Lab4 3bit ;
PartNo   00 ;
Date     17/12/2019 ;
Revision 01 ;
Designer Engineer ;
Company  UTM ;
Assembly None ;
Location Digital Logic Lab ;
Device   G22V10 ;

/* *************** INPUT PINS *********************/
PIN 1 = clk ;                /* clock */
PIN 2 = reset ;              /* reset */
PIN 3 = preset ;             /* preset */
PIN 4 = a0 ;                 /* Comparator A */
PIN 5 = a1 ;                 /* */
PIN 6 = a2 ;
PIN 7 = b0 ;                 /* Comparator B */
PIN 8 = b1 ;                 /* */
PIN 9 = b2 ;
PIN 10 = startPrt ;          /* Start Printing */

/* *************** OUTPUT PINS *********************/

PIN 17 = diffCmp ;           /* XOR (A B not equal HIGH) */
PIN 18 = sameCmp ;           /* XNOR (A B equal HIGH) */
PIN 21 = q0 ;                /* output counter */
PIN 22 = q1 ;                /* output counter */
PIN 23 = q2 ;                /* output counter */
/***** Function Comparator**************************/
sameCmp = !(a0$b0)&!(a1$b1)&!(a2$b2);
diffCmp = !sameCmp ;

/**** Function Clock Enabler *********************/
clkEn=startPrt & diffCmp;
```

```
/*** Function Counter 3 Bit UP ******************/
field count =[q2..0];
$define s0 'b' 000
$define s1 'b' 001
$define s2 'b' 010
$define s3 'b' 011
$define s4 'b' 100
$define s5 'b' 101
$define s6 'b' 110
$define s7 'b' 111

count.ar=reset;      /* connect reg AR to reset (Asyn Mode) */
count.sp=preset;     /* connect reg AR to preset (Syn Mode) */

sequence count{
       present s0 if clkEn next s1;
              default next s0;
       present s1 if clkEn next s2;
              default next s1;
       present s2 if clkEn next s3;
              default next s2;
       present s3 if clkEn next s4;
              default next s3;
       present s4 if clkEn next s5;
              default next s4;
       present s5 if clkEn next s6;
              default next s5;
       present s6 if clkEn next s7;
              default next s6;
       present s7 if clkEn next s7;
              default next s7;
}
```