- Times New Roman 12 font

• 1.5 spacing

• Turn on MS Word spell and grammar checker

**DIGITAL LOGIC**

1. Background

- asalnya xde lif

- owner flat bru nk wat lif 7 tingkat

- lif tu nk kena display certain number bila berhenti kat certain tingkat

- bila sampai dekat tingkat

2. Problem

- takde led , taktahu dekat tingkat mana berhenti.

-

3. Suggested Solution (must Include the block diagram and explain)

- use 3 d flip flop to get the lift to go up until $7^{th}$ floor

-


UTM

UNIVERSITI TEKNOLOGI MALAYSIA

**REPORT FOR MINI PROJECT**
**LAB 4**

**DIGITAL LOGIC**
**SECTION 10**

**GROUP MEMBERS:**

| | |
|---|---|
| NUR AYUNI BINTI NOOR AZMAN | A23CS0257 |
| AINNUR ASHIKIN BINTI ASDAR | A23CS0208 |
| INTAN SERINA BINTI ANUAR MUS | A23CS0085 |
| ABID HUMAYRAA BINTI HARDISURA | A23CS0032 |

**LECTURER:**

DR. MOHD FOAD BIN ROHANI

## DEDICATION AND ACKNOWLEDGEMENT

We dedicate this report to our Digital Logic's lecturer, Dr. Mohd Foad Bin Rohani whose unwavering dedication to education and guidance has continuously been a source of inspiration throughout our academic journey in UTM, especially in this subject.

We want to thank our lecturer, Dr. Foad, for his invaluable guidance, explanation in detail, and unwavering support throughout this project. His encouragement, insightful feedback and dedication in helping us complete our project have played a crucial role in shaping our understanding of the project better. We are truly fortunate to have Dr. Foad as our Digital Logic's lecturer.

We are also grateful to each other as the team members, Ayuni, Ashikin, Abid and Intan, for the shared enthusiasm in completing the project together by finishing the tasks we divided between us. Everyone cooperates fully in doing all the tasks given and actively helping each other while also conveying ideas for our project.

On top of that, we would also like to express gratitude to our friends whether from the same course or a different one because they gave us advice or suggestions for our project and sometimes for the subject's topics overall.

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## THE BACKGROUND

Our project's purpose is to design a lift electronic controller system followed by adding advanced features to it. Our group decided to implement advanced features to an apartment's lift controller system based on our ideas and creativity.

The advanced features are password, 'OPEN' and 'CLOSE' LED display and the floor's level display.

## THE PROBLEM

To initialize or open the door of the lift, a switch is acquired as a button to enable the lift to open at the level they're currently on.

To prevent unauthorized usage of the apartment's lift, the user who is also the resident of the apartment, is required to enter a password to access the lift. An output component is used to implement that the entered password by a user is true. If entered an invalid password, the lift will not be accessed to be used.

Then, the user is required to select the floor they want to go to. The lift is reaching levels displayed on the screen. An output component is required to verify this process.

The user needs to set the PRESET and CLEAR button to reset the counter. The lift contains a counter to count the floor's level that has been reached. The two one-digit 7-segment displays are used to show the floor's level where the lift is at.

User will initially enter the floor's level they required; the counter will count the number of levels that has been reached. The lift will stop once it reaches the required level.



## SUGGESTED SOLUTION

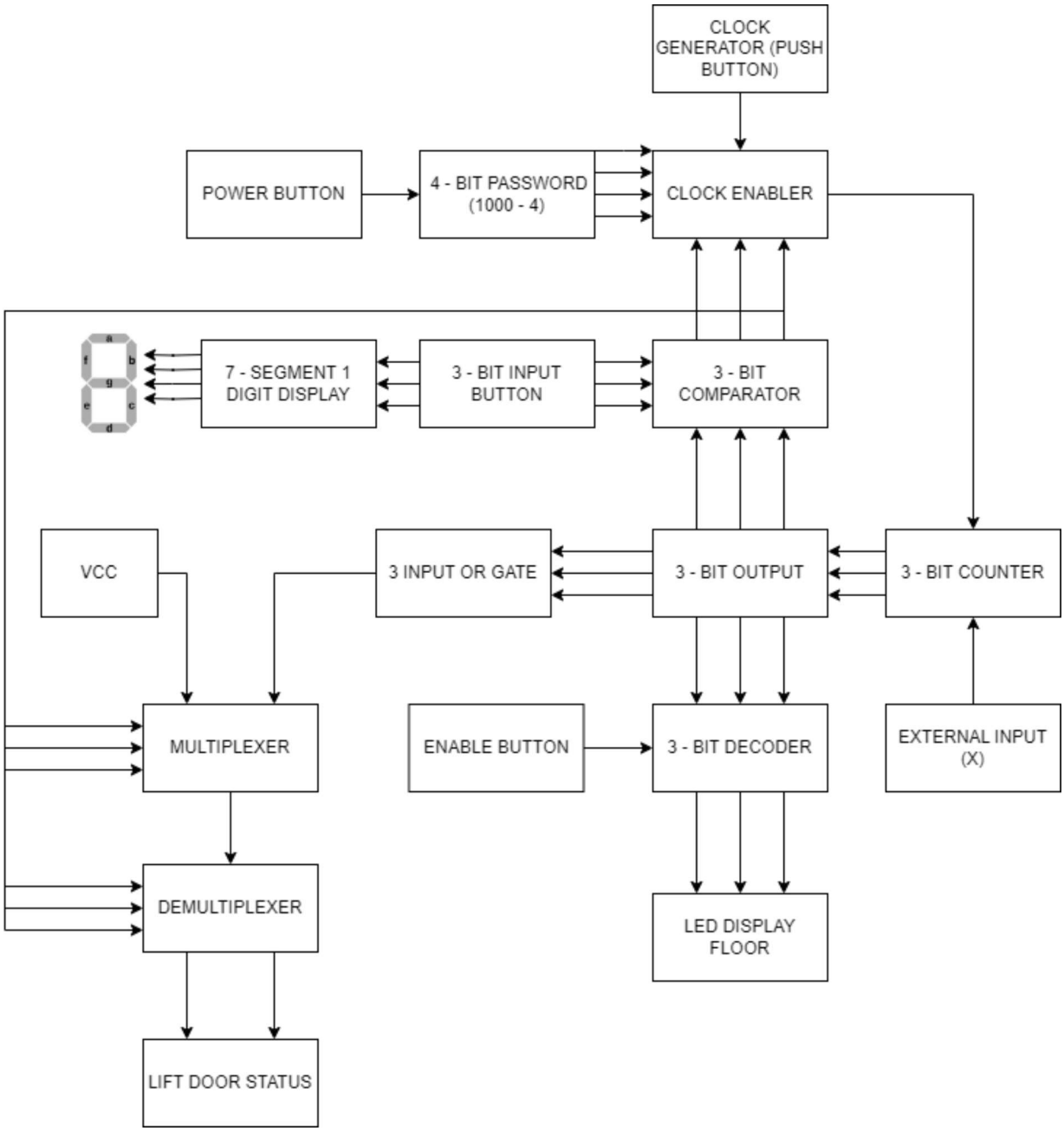
The block diagram below shows the components required to implement the control system for the lift in an apartment. Firstly, the user is required to turn on the power button to ensure the system is in the "on" state. Then, the system will require the user to input a 4 – bit password to ensure that only the authorized people or the residents of the apartment can use the lift. Next, the user will be able to input the floor that they want to go to from ground level to level 7. A 7-segment display output is utilized to show the designated level of the lift. Then, the external input will be entered from the input button to determine whether the counter will count-up or count-down. The clock will then be triggered after both the PRESET and CLEAR button is set to "high" to start the 3 – bit counter. The output will then be shown on the 3 – bit output.

The 3 – bit output will be compared with the 3 – bit input by the user using the 3 – bit comparator. The results will then be sent to the clock enabler. If the output is not the same as the input entered by the user, the comparator will send output "high" to the clock enabler and the counter will continue to count when the clock is triggered. If the input is the same as the output, the comparator will send the output "low" to disable the clock and the counter will stop at the desired floor entered by the user.

To ensure that the door will be opened as soon as the lift reaches its desired level, Multiplexer and Demultiplexer will be implemented in the system controller. The Mux will select the input to be sent to the DeMux and the DeMux will select the output whether it is close or open to send the data from the input. If the lift has not reached the designated floor, the door will stay closed until it reaches the designated floor.

Next, the decoder is also utilized to display the level users are currently on. On this pretext, the decoder will receive the data from the 3 – bit counter and decode the data to display the level that the lift is currently on. The LED floor display will light up to show the level of the lift.

To reset the 3 – bit counter, the PRESET button will be set to "high" meanwhile the CLEAR button will be set to "low". By doing so, the lift will start again at the ground level and will start counting again.






## THE REQUIREMENT

### 1. Input Switches

Input switches are used to control the opening and closing of the lift doors. When a passenger enters or exits the lift, they can use these switches to manually operate the doors.

**2. Clock Disabler**

To stop the operation of the counter. If the floor's level displayed is less than the required floor's level, the counter will continue to count up. If the floor's level displayed is more than the required floor's level, the counter will continue to count down. If the required floor's level has been met, the counter will stop counting.

**3. 3-bit D positive edge count-up and count-down Counter**

To count the number of apartment's floor level that can be reached by the residents which were displayed in the lift.

**4. Multiplexer**

Allows digital information from several sources to be routed onto a single line to a common destination.

**5. Decoder**

To decode the specified combination of bits on its inputs which would be accepted as the output which is the correct password.

**6. Demultiplexer**

To take digital information from one line and distribute it to a given number of outputs lines.

**7. Comparator**

To compare two 3-bit binary values to determine whether the value is lower, equal or higher.

**8. Seven Segments Displays**

To display the required floor's level pressed by the user and display the floor's level in hexadecimal.

## SYSTEM IMPLEMENTATION

1. **Password**

   The set of binary passwords is decoded using a 4-bit decoder. When the user enters the correct password, which is "1000," this password will become active. The AND logic gate, to which the decoder is connected, is linked to each D FLIP FLOP clock. The lift

will not function if the user enters a password other than 1000 because the D flip flop is not function.

2. **3-bit Comparator**

   The comparator compares values from two sources which are the input switches and the counter—using three 2-input XOR gates. The least significant bit (LSB) from each of the two sources is compared in the first XOR gate. If they are identical, the output is "0," which is then sent to a NOT gate to be converted to "1." For the second and third XOR gates, the same procedure is followed. After that, a NAND gate will receive the signal from all three gates and convert it to the opposite signal. Consequently, the photocopying machine will stop when the XOR gate sends an output of"0" to the clock disabler after receiving the same input from the counter and input switches.

3. **Clock Disabler**

   Using a 4-input AND gate, the clock disabler is configured. A signal from the comparator, a signal from the decoder, and the clock source generate the signal to the AND gate's input. When each of the three inputs is high, the disabler will simply activate. When a certain number of copies and printed copies have been made, it is used to stop the counter from working.

4. **Input switch**

   In simple terms, the input switch determines whether the lift is going up or down. The lift will go up if the user enters the high input number, which is '1;' otherwise, it will descend. Based on the completed equation, an AND and OR gate connects the input switch to each D flip flop.

5. **3-bit bidirectional saturated counter**

   Our 3-bit counter was a 3-bit D positive edge bidirectional counter. The counter starts counting when the user inputs the correct password, the power switch, the clock enabler, and the comparator receive a high input. The counter will stop if any of those are not in an active mode or have low input.

6. **Display system (decoder)**

   We used a 3 to 8 decoder to show the floor at which the lift is located. There are eight available outputs on this decoder. Output number five will be chosen if the input is "101."

The same applies for other inputs, like "100," "111," "011," and more. To display the number in decimal format, we connected the decoder to an LED

7. **Display system (Mux and DeMux)**

   Lifts will show "OPEN" on an LED once they arrive at the designated floor. When it still not reaches that floor, LED "CLOSE" will continue to be shown. We used 2-1 mux for the Multiplexer. The output will follow the input if the selector's input is high. We use 1-2 DeMux for the Demultiplexer process. The LED that is supposed to light up gets input from the Mux's output, which is distributed by DeMux.

## CONCLUSION AND REFLECTION

Despite starting behind schedule and facing a few constraints while doing this project, we were able to complete this project successfully. We also were lagging because we got this project just right before our final exam study week. Through commitment and effective communications between us, we are still able to complete the project with the help from our lecturer and cooperations between the group members, doing each of our part as best as we can. We put our best efforts into completing this project because this is our final and last project before the semester ends. We also made sure the final product of our project, from the report and the simulation were done seamlessly and precisely. It is safe to say that we were proud of our work for this project.

Other than that, this project did help us to broaden our field of understanding on logic circuits topics because we only learned this in theories before and we also have a lack of chances to apply this in the real-life problem. We do face a few difficulties understanding the configuration of how the counters work in the lift electronic controller system and how we can apply some advanced features to it. Thus, to increase our understanding, we did some research and learned much deeper from the slides the lecturer gave us. Our lecturer also helped explain the configuration of counters in class. After all these extra efforts, we were able to understand the process and then begin to plan the modification and addition of advanced features to the common lift electronic controller system. Therefore, by doing this project, it is proven that it has helped us in applying our theoretical knowledge into real-life problems and practical work, and at the same time increase our understanding of the topics of this course.

By doing this project, our greatest strength would be how we were able to complete the project in the given time, even when each one of the group members were busy studying for our finals. We also were able to have a discussion to discuss the task division between us, so that each of us would have some work to do. We will discuss any questions and problems we faced while completing the circuit through our Telegram group. Fortunately, we were able to come up with solutions together. Against all odds, we navigated every challenge and improved creatively to achieve the project's success.

Although all our advanced features and enhancement work just the way we want, we do have certain things that we think can be improved. The system only required the user to enter a 4-bit password, which is a very short password and only allows limited password combinations. A malicious user might potentially try all combinations to gain access to the building. Thus, we wish to improve our system and add more advanced features which implies a higher bit password for better security.

**APPENDICES**

| Group Members | Task |
|---|---|
| Abid Humayraa binti Hardisura | - Contributing to creating the mini project.<br>- Writing the report title, table of content, dedication and acknowledgement.<br>- Writing the report content for background, problem and system requirements.<br>- Creating and presenting the slide. |
| Ainnur Ashikin binti Asdar | - Contributing to creating the mini project.<br>- Writing the report content for system implementation.<br>- Creating and presenting the slideshow. |
| Intan Serina binti Anuar Mus | - Contributing to creating the mini project.<br>- Writing the report content for reflections and conclusion.<br>- Creating and presenting the slideshow. |
| Nur Ayuni binti Noor Azman | - Contributing to creating the mini project.<br>- Writing the report content for suggested solution.<br>- Creating and presenting the slideshow. |

**REFERENCES**


Abd. Bahrim Yusoff, Mazleena Salleh, Mohd Fo'ad Rohani, Ismail Fauzi Isnin. (2023). *Digital Logic Fifth Edition 2023* (Fifth). ESKTOP PUBLISHER.

Reyes, S. (2019, April 16). *How to Write An Effective Lab Report*. Princeton Correspondents on Undergraduate Research. https://pcur.princeton.edu/2019/04/how-to-write-an-effective-lab-report/

"Multiplexers in Digital Logic - GeeksforGeeks." *GeeksforGeeks*, 21 Mar. 2017, www.geeksforgeeks.org/multiplexers-in-digital-logic/.

vlsiverify. "Demultiplexer." *VLSI Verify*, 10 Dec. 2022, vlsiverify.com/verilog/verilog-codes/demultiplexer/.

Kushal Gowda (2020, December 07), Block Diagrams of Control Systems 1.4, https://www.circuitbread.com/tutorials/block-diagrams-1-4