**A Project Report on**

# "LIFT CONTROLLER"

**Submitted By**

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A Project Report submitted as a partial fulfillment towards Project for term-III of Bachelor of Electronics Engineering,

University of Pune, Pune.

Guide
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# C E R T I F I C A T E

*This is to certify that Anshul Choudhary (SEE003), Yash Pamnani (SEE012), Mrudul Hirekhan (SEE013), Durgesh Kolte (SEE021), of MIT Academy of Engineering, Alandi (D), Pune have submitted Project report on "**LIFT CONTROLLER**" as a partial fulfillment of Term III for award of degree of Bachelor of Electronics Engineering, from University of Pune, during the academic year 2018-19.*

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| **Project Guide** | **Dean School of Electrical Engg.** |
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# ABSTRACT

Elevator was built to help the people in moving from one floor to another without consuming a lot of people energy. With elevator people can move faster to higher floor. Elevator controller is a device that controls the movement of the elevator. Each request from each floor will go to the controller before it starts command the elevator to move. The controller will control the entire request from floor, elevator door and the up/down movement of the elevator.

Different building has different elevator. Elevator controller will depend on elevator design, higher building will need a complex controller compare to small building with low number of floor. In my project I only focus on to design an elevator controller base on 8 floor building with one elevator.

# CHAPTER 1- INTRODUCTION

## 1.1 Problem Statement:

To design a Lift Controller with the help of Digital logic and VHDL.
Definition: An Elevator controller is a system to control the elevators, either manual or automatic.
The goal of our development of the elevator control system is to control an existing elevator model. In this we will be going to compare the current floor and the desired floor and according to that the lift will either move up or down.

## 1.2 History and background:

An elevator by definition is a platform or an enclosure raised and lowered in a vertical shaft to transport people and freight. The shaft contains the operating equipment, motor, cables, and accessories.
Primitive elevators were in use as early as the 3rd century BC, operated by human, animal, or water wheel power. In 1743, a counter-weighted, man-powered, personal elevator was built for King Luis XV connecting his apartment in Versailles with that of his mistress, Madame de Chateauroux, whose quarters were one floor above King Luis.
In 1853, American inventor Elisha Otis demonstrated a freight elevator equipped with a safety device to prevent falling in case a supporting cable should break. This increased public confidence in such devices. In 1853, Elisha Otis established a company for manufacturing elevators and patented (1861) a steam elevator. While, Elisha Graves Otis did not actually invent the first elevator, he did invent the brake used in modern elevators, and his brakes made skyscrapers a practical reality.
In 1857, Elisha Otis and the Otis Elevator Company began manufacturing passenger elevators. A steam-powered passenger elevator was installed by the Otis Brothers in a five-story department store owned by E.W Haughtwhat& Company of Manhattan. It was the first public elevator.

## CHAPTER 2- WORKING

The lift controller consists of eight floors- ground, 1$^{st}$, 2$^{nd}$, 3$^{rd}$, 4$^{th}$, 5$^{th}$, 6$^{th}$ and 7$^{th}$ floor. If reset is pressed, the lift will go to ground floor. Here we used synchronized reset in which we have given priority to reset and then we are checking for clock. Once the clock is positively edge triggered, then we check for the condition of the door. If door is open, lift will remain on the same floor. If door is closed, and up key is pressed, then count will increase by 1, and then accordingly lift will move upwards. But, if we press the down key, the lift will move downwards according to the desired condition. In this code we used signals to temporarily update the desired floor. In this code we are also comparing the desired floor with the current floor. If desired floor is greater than current floor, lift will move upwards and vise versa. In this code we have used multiple processes. In first process we check for the clock, reset and comparing the current floor and desired floor. We are using second process to open and close the door of the lift. These processes are running simultaneously.

## CHAPTER 3- LITERATURE SURVEY

The project title is Design and Implementation of Elevator Controller on Very Large scale Integrated Circuit Hardware Description Language (VHDL). The elevator controller will be fully design on the VHDL and simulation will be observed on the testbench waveform.

The software that uses to write the programming language is Xilinx ISE. When the programming design is done, the next step is the simulation of the behaviour of the system.

This project will build an elevator base on 8 floor building. The elevator will move up and down depend on the request from the user. By using the VHDL simulation the result is will be easily to upgrade due to the reconfigurable of the input.

If the elevator requires more floor, it will easier to redesign.

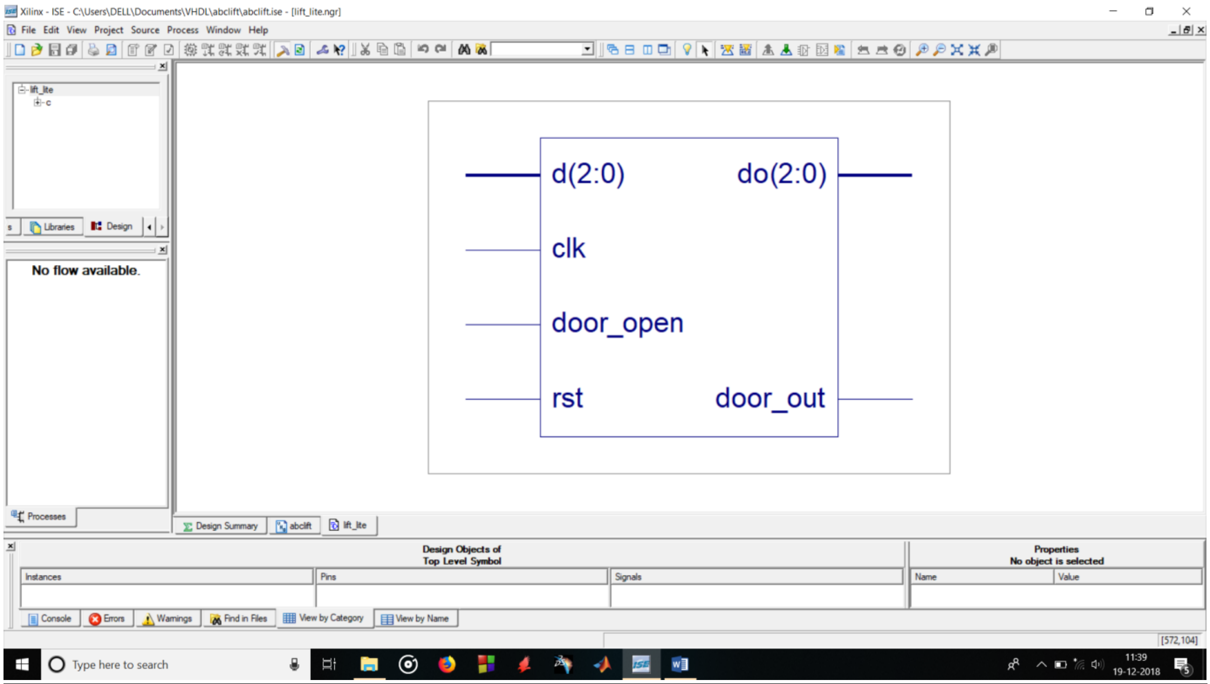
**CHAPTER 4- VHDL code, RTL schematic, Testbench Waveform**

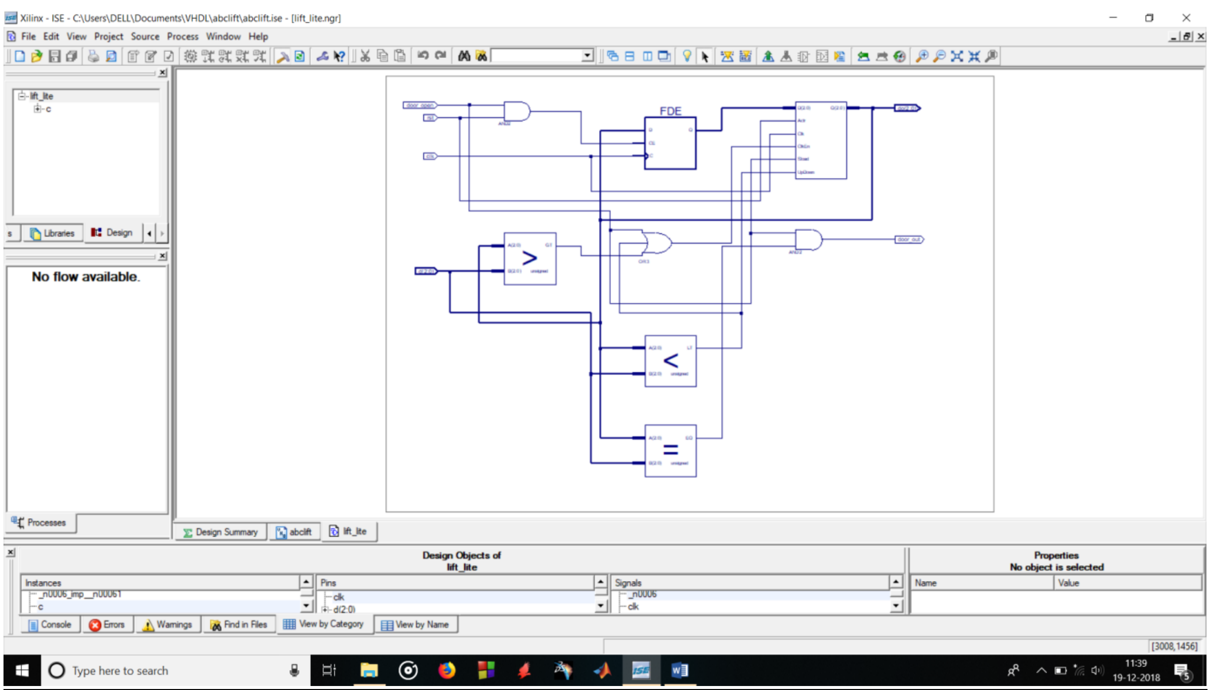
**VHDL CODE:-**

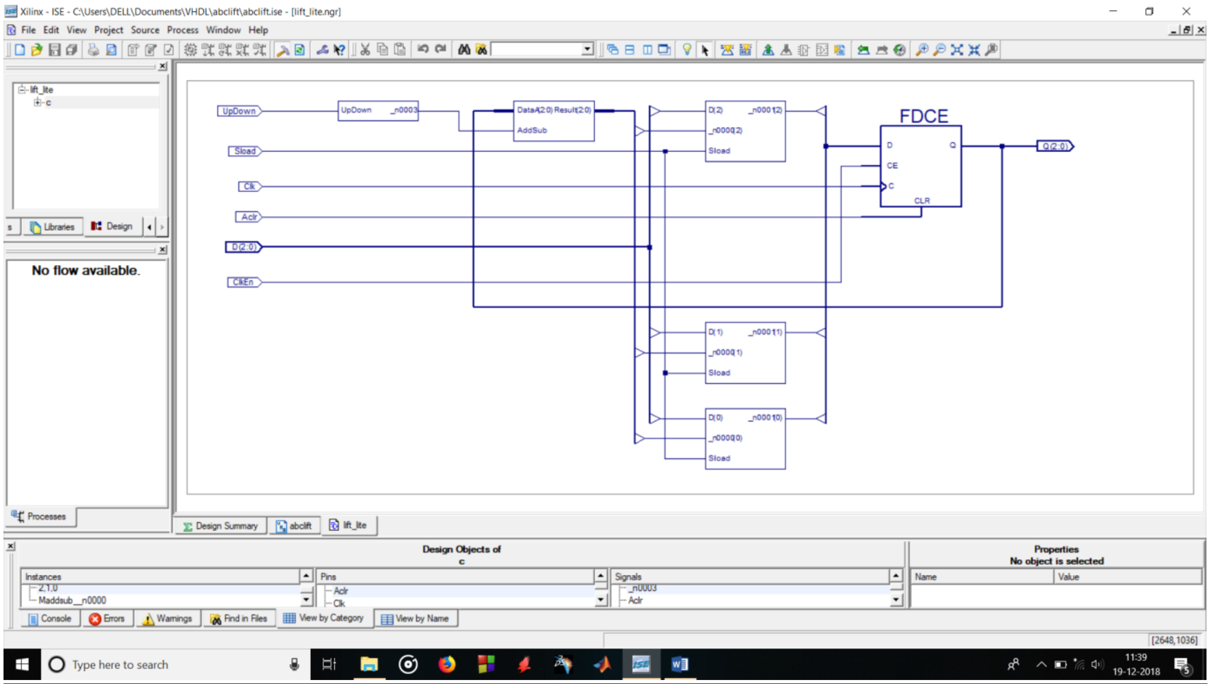
```
library IEEE;
use IEEE.STD_LOGIC_1164.ALL;
use IEEE.STD_LOGIC_ARITH.ALL;
use IEEE.STD_LOGIC_UNSIGNED.ALL;

entity lift_lite is
    port ( rst, door_open,clk :in std_logic ;
                              d: in std_logic_vector (2 downto 0);
                              door_out : out std_logic;
                                 do:out std_logic_vector (2 downto 0));
end lift_lite;

architecture Behavioral of lift_lite is
SIGNAL c,temp :std_logic_vector(2 downto 0);
begin

compare : process(rst,clk,door_open) is----------for comparing states of lift
begin

if (rst='1') then
          c<="000";
elsif (clk'event and clk='1') then
          if (door_open='1') then
          if (c /= "ZZZ") then
          temp<=c;
          end if;
          c<="ZZZ";
          c<=temp after 200 ns;
          elsif (c<d) then
          c<=c+1;
```

```
        elsif (c>d) then
        c<= c-1;
        end if;
end if;
do<=c;
end process compare;

door_auto : process(c)---------------------for door automation
begin
if(c=d) then
        door_out <='1';
        door_out <='0' after 75 ns;
else
        door_out <= door_open;
end if;
end process door_auto;

end Behavioral;
```

## RTL SCHEMATIC:-





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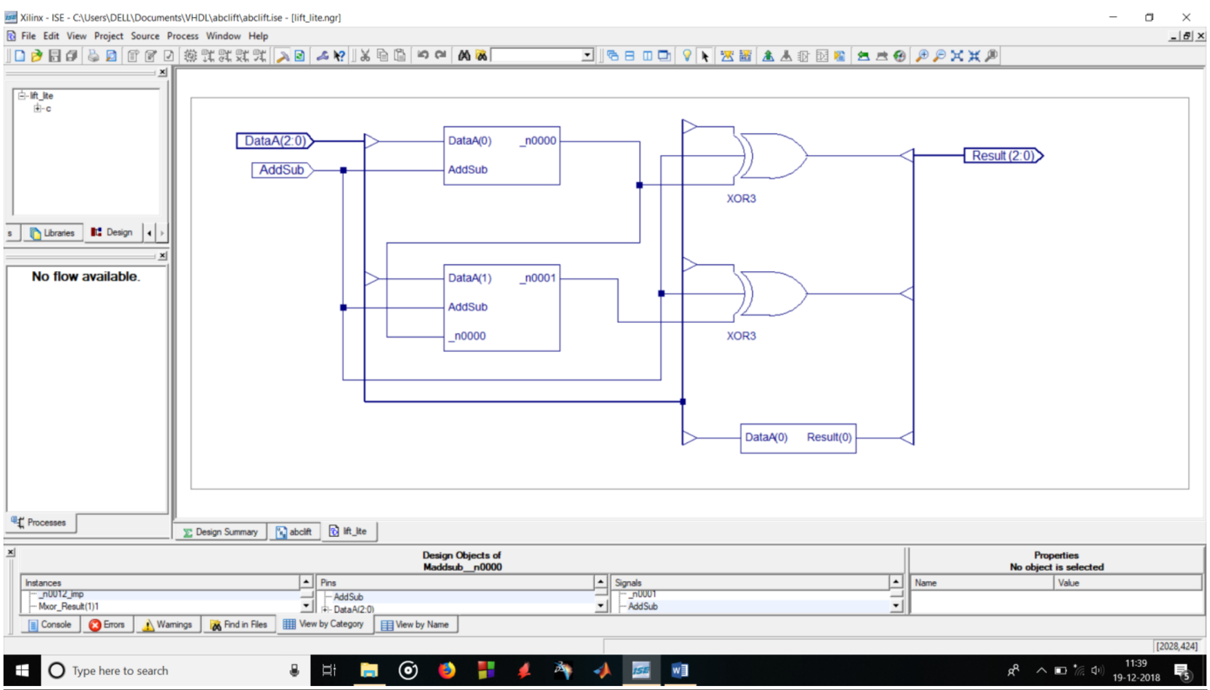
UpDown
Sload
Clk
Aclr
D(2:0)
ClkEn
Q(2:0)
Design Summary
Type here to search

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No flow available.
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AddSub
DataA(0)
_n0000
DataA(1)
_n0001
XOR3
Result (2:0)
DataA(0)
Result(0)
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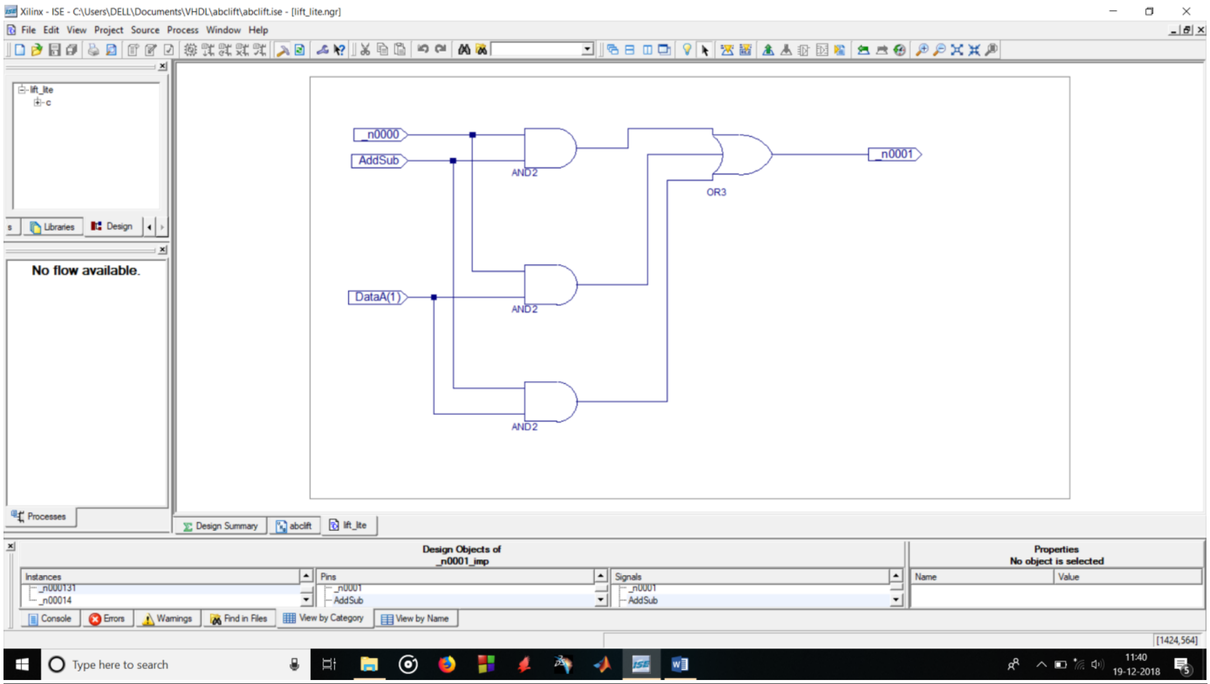
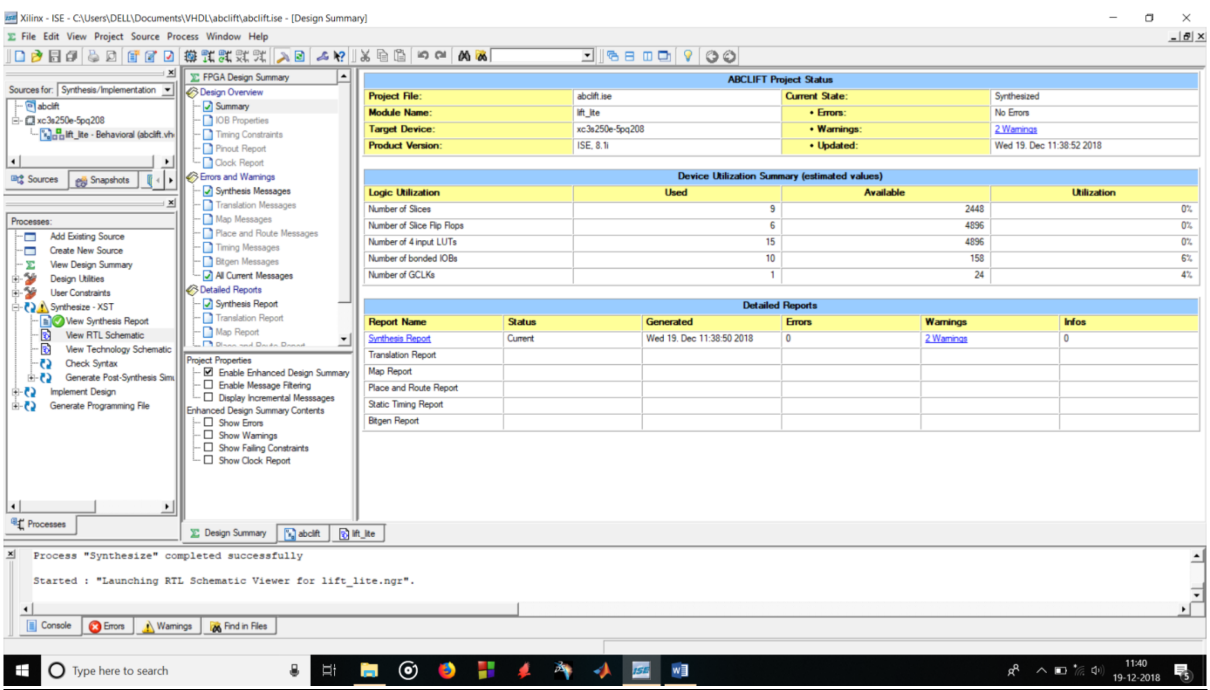
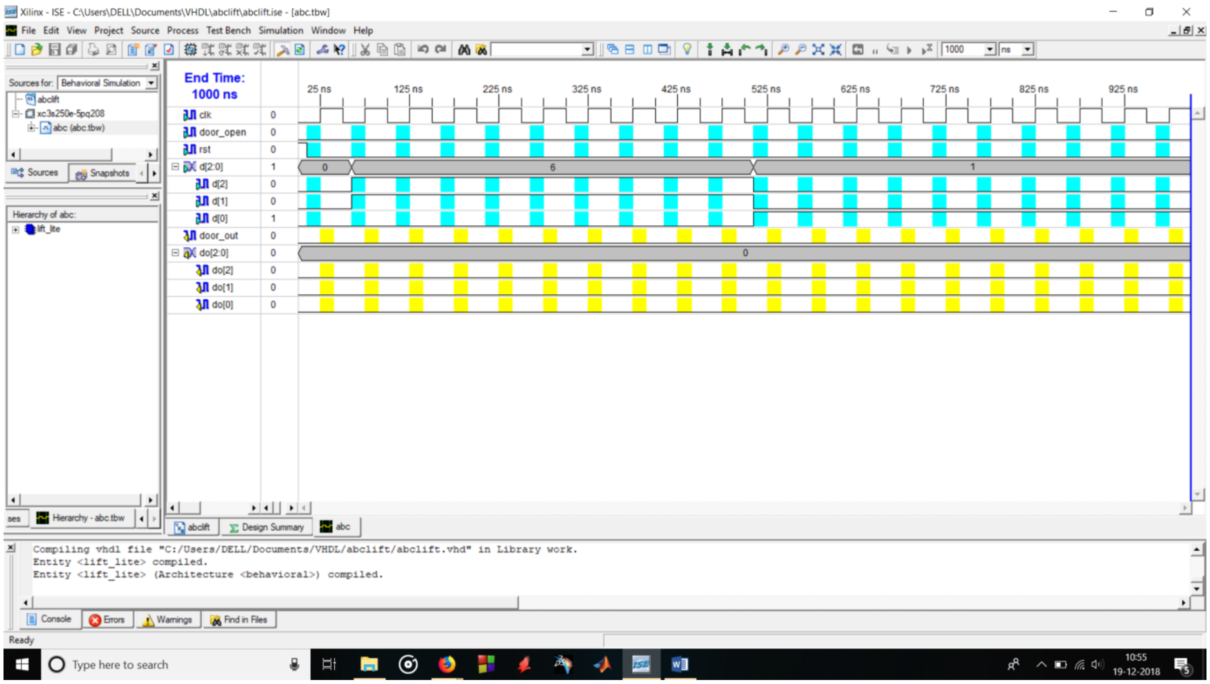


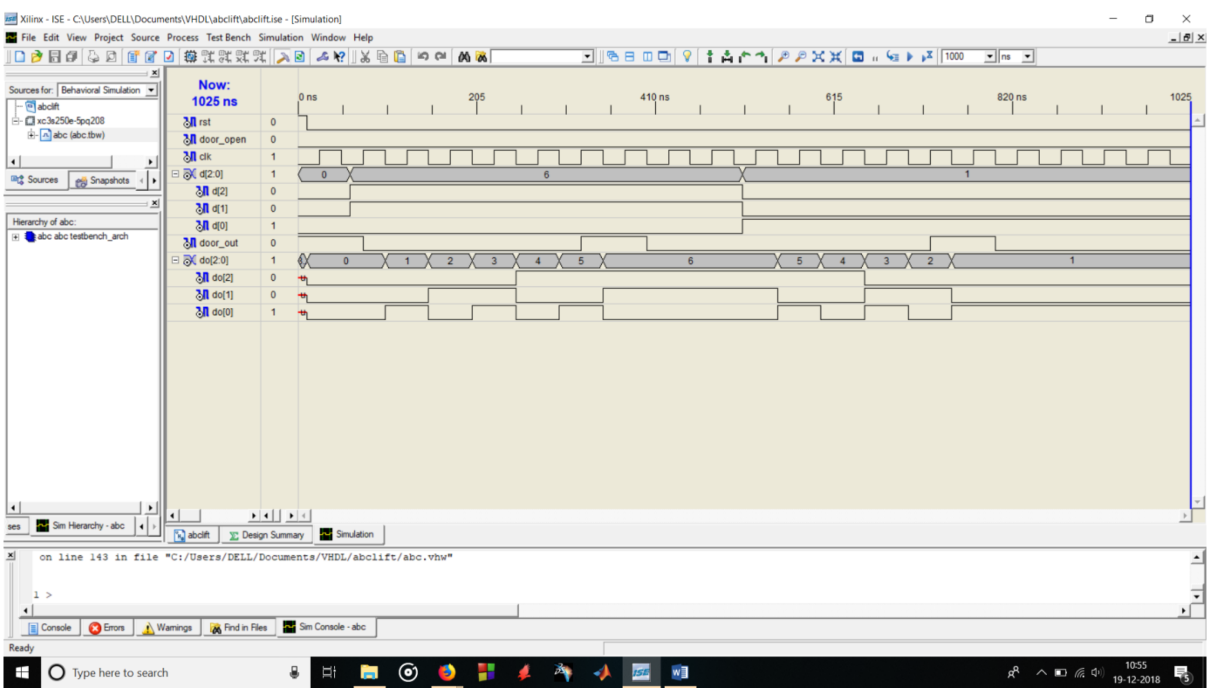
## **Design Summary:**



## TESTBENCH WAVEFORM:-

### Testbench 1:





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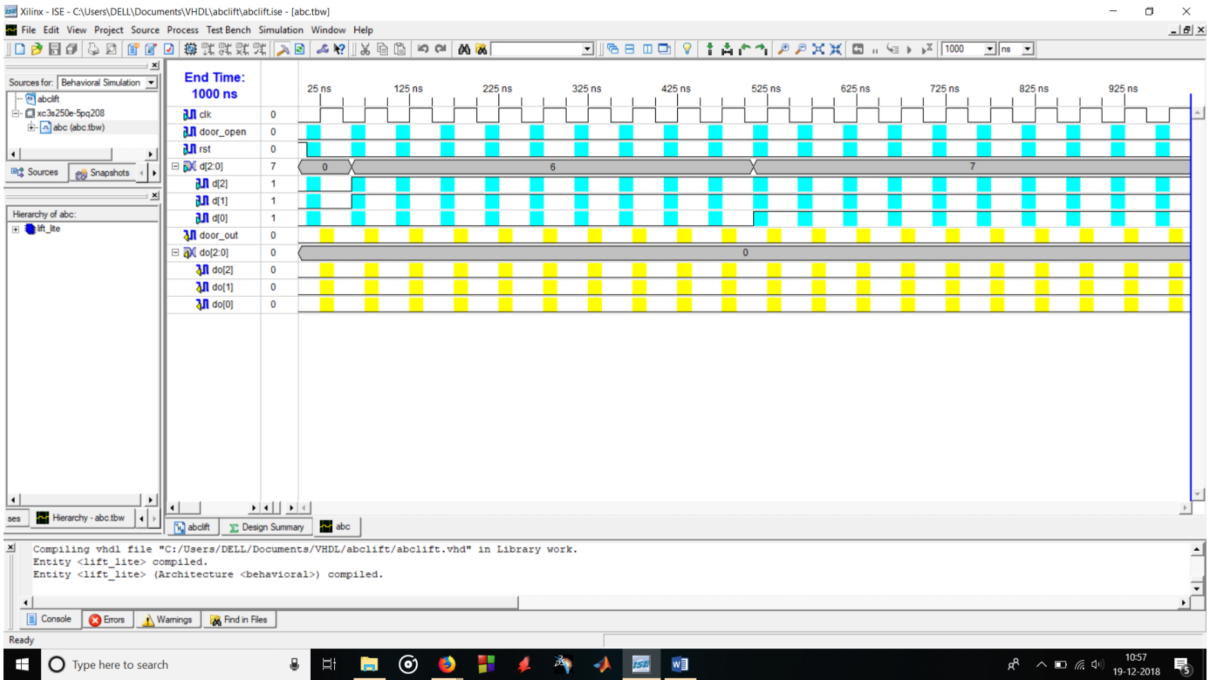

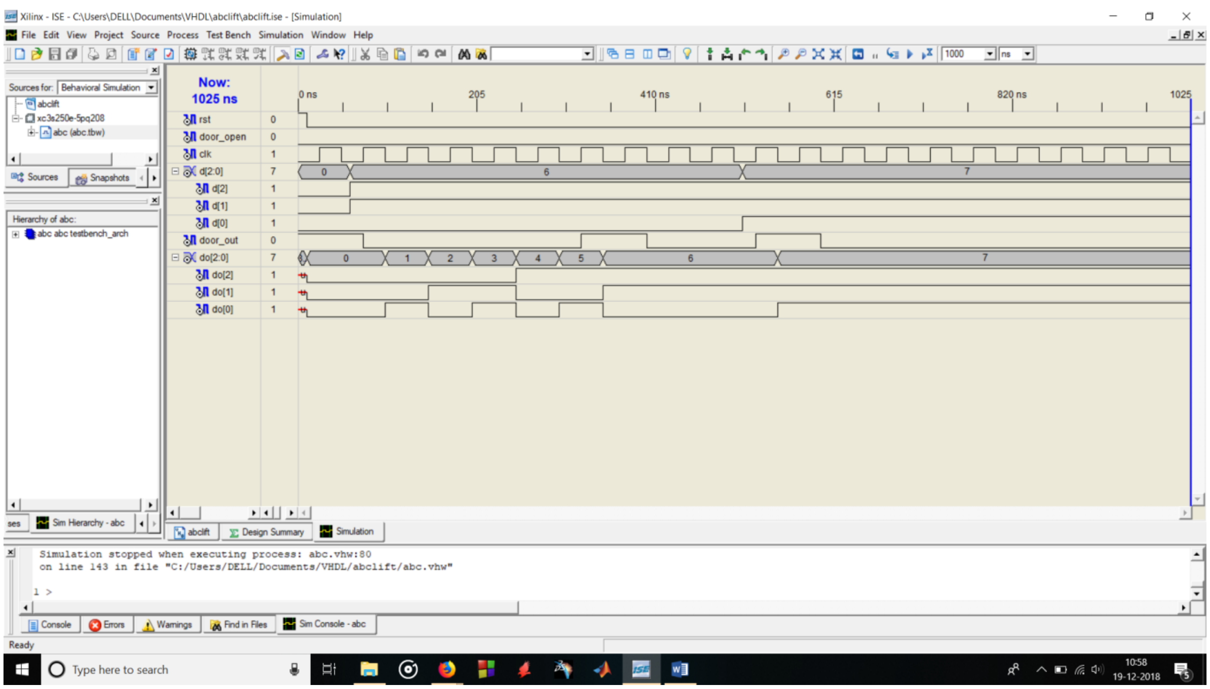

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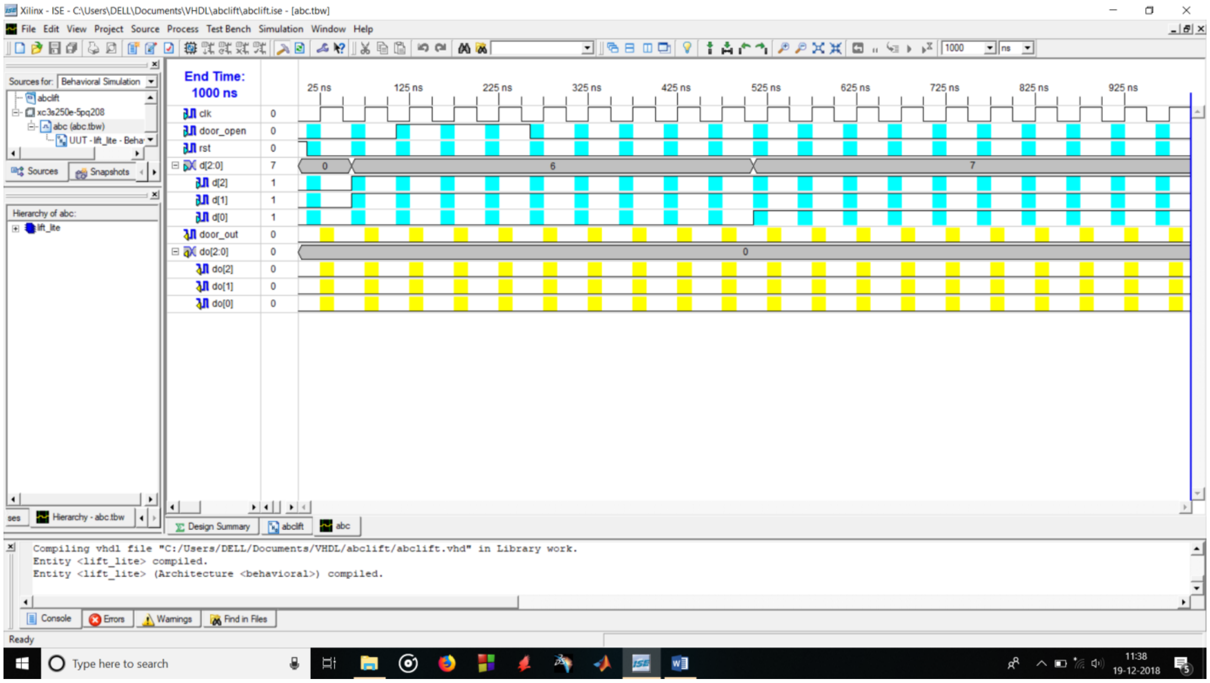

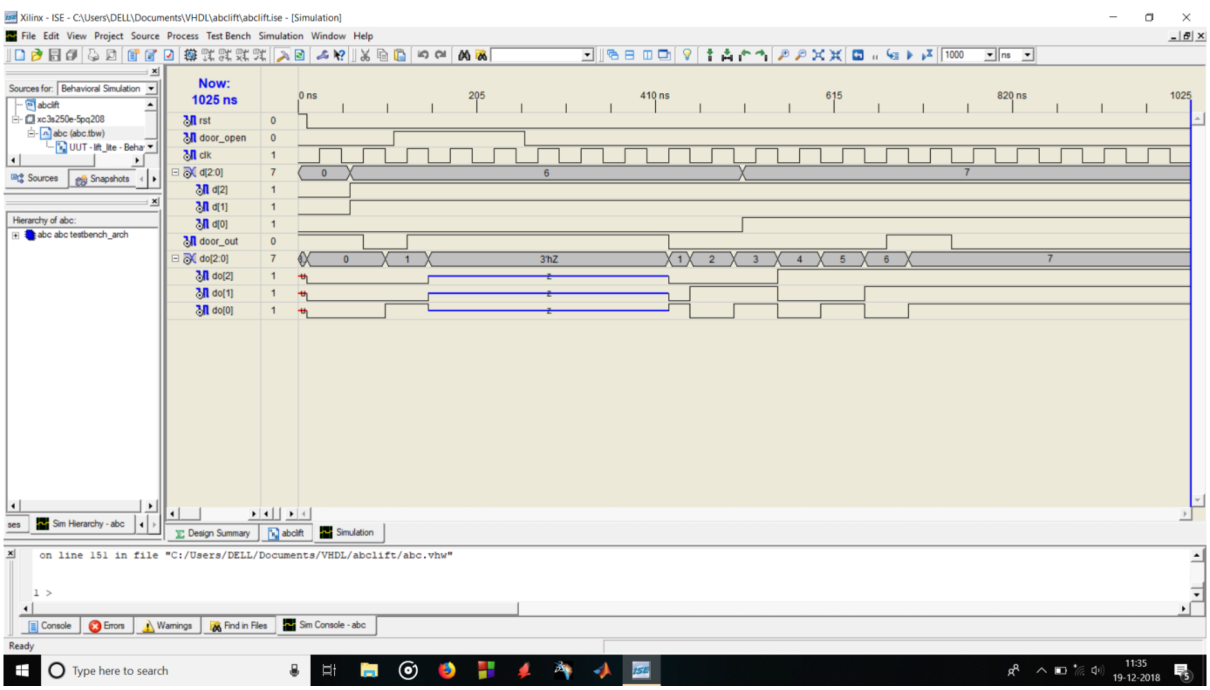

# CHAPTER 5- CONCLUSION

From the above problem statements, we learned about state machine. In this, we have defined various states according to the number of floors. As the desired floor button is pressed, the signal goes on updating the states. This way we have solved our problem statement. This problem statement can be solved by various methods including Moore and Mealy state machines, according to the complexity of the conditions.

## References:-


http://eprints.utem.edu.my/8575/1/Design_And_Implementation_of_Elevator_Controller_On_A_FPGA_-24_Pages.pdf

http://www.elevatorhistory.net/

https://en.wikipedia.org/wiki/Elevator


## Project Scheduled Plan:-

First Our Course Co-Ordinator Mrs. Dipti Sakhare Ma'am gave us a problem statement and that was "LIFT CONTROLLER", then we first analyzed the Problem Statement given to us , and then properly planned the required inputs for it . As we are learning a Course named "Applied Digital Circuits" in which we are learning VHDL (Very Large Scale Integrated Hardware Description Language).

We were four people in a group, we divided the task equally among each other about how to proceed with the problem statement. Then everyone came with some of the inputs and then further implemented to get the desired output.

We can further develop our project by increasing the number of states and increasing processes.