TED UNIVERSITY

EE 207 – ELECTRICAL CIRCUITS AND LOGIC DESIGN

EXPERIMENT 4
LAB REPORT

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OBJECTIVE

The aim of our laboratory was to understand the structure and applications of seven segment displays. To accomplish this objective, we carried out three interconnected experiments using a seven segment display circuit, referred to as "bassy2".Seven segment displays are commonly used in digital devices like calculators, clocks, and measuring instruments, and can be made using LED or LCD technology.

PROCEDURE

As previously stated in the objectives section, this experiment consisted of three distinct parts.

In the first part, we implemented the necessary VHDL code and constraints file for our application, as outlined in the provided manual. We then installed this code on the bassy2 circuit and ran it. The first part of the experiment involved using the switch control to print all the digits on the seven segment display. Through this process, we were able to determine which switches corresponded to which LED on the display. To facilitate this understanding, we created a table detailing the switch configurations required to display each digit (shown below).

	STATE OF SWITCHES							
	sw7	sw6	sw5	sw4	sw3	sw2	sw1	sw0
0	1	0	0	0	0	0	0	1
1	1	1	0	0	1	1	1	1
2	1	0	0	1	0	0	1	0
3	1	0	0	0	0	1	1	0
4	1	1	0	0	1	1	0	0
5	1	0	1	0	0	1	0	0
6	1	0	1	0	0	0	0	0
7	1	0	0	0	1	1	1	1
8	1	0	0	0	0	0	0	0
9	1	0	0	0	0	1	0	0

In this manner, we successfully completed the first experiment, in which we were able to display the digits 0 through 9 on the seven segment display.
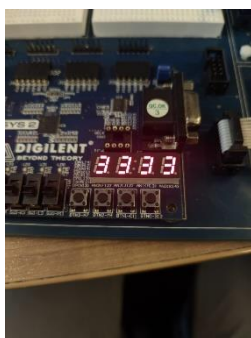

In the second part of our experiment, we aimed to display the digits 1 through 4 on the seven segment display in sequential order. To do so, we implemented the necessary VHDL code and constraints file, as provided in the manual. After transferring this code to the bassy2 circuit, we observed the output on the screen.

```
-- Scrolling text
library IEEE;
use IEEE.STD_LOGIC_1164.ALL;

entity scrolling_text is
   Port ( clk    : in  STD_LOGIC;
        output1 : out  STD_LOGIC_VECTOR (7 downto 0);
        output2 : out  STD_LOGIC_VECTOR (3 downto 0));
end scrolling_text;

architecture Behavioral of scrolling_text is
begin

process(clk)
variable t   :integer:=0; -- timer
variable k   :integer:=1000; -- kilo
variable u_s :integer:=50; -- microsecond
begin

if rising_edge(clk) then
      if t<1*k*k*u_s then -- if t<1second
             output1 <= "11111001"; --1
             output2 <= "0111";
      elsif t<2*k*k*u_s then
             output1 <= "10100100"; --2
             output2 <= "1011";
      elsif t<3*k*k*u_s then
             output1 <= "10110000"; --3
             output2 <= "1101";
      elsif t<4*k*k*u_s then
             output1 <= "10011001"; --4
             output2 <= "1110";
      else
             t:=0;
      end if;
      t:=t+1;
end if;

end process;
end Behavioral;
```

```
# Implementation constraint
NET "clk" LOC = "B8";

NET "output1(0)" LOC = "L14";
NET "output1(1)" LOC = "H12";
NET "output1(2)" LOC = "N14";
NET "output1(3)" LOC = "N11";
NET "output1(4)" LOC = "P12";
NET "output1(5)" LOC = "L13";
NET "output1(6)" LOC = "M12";
NET "output1(7)" LOC = "N13";

NET "output2(3)" LOC = "k14";
NET "output2(2)" LOC = "M13";
NET "output2(1)" LOC = "J12";
NET "output2(0)" LOC = "F12";
```

In the third stage of the experiment, we displayed the year 2023 as scrolling text on the screen. The code and implementation constraints for this task are listed in the left side.

In the fourth stage, we modified the previous step by causing the scrolling text displaying the year 2023 to remain stationary on the screen. The only difference was that we removed one "*k" expression from each of the conditions in the if-elsif structure. These two steps successfully completed the final stages of the experiment."
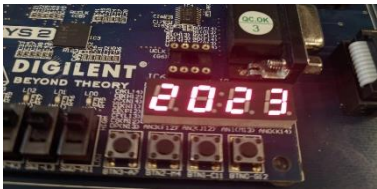
CONCLUSION

Through this laboratory exercise, we gained familiarity with the use of the Bassy2 software, as well as the operation of the seven-segment display and the implementation of switch and VHDL code structures. These skills allowed us to successfully obtain results during the lab.

Dear teacher, I am grateful for your time and consideration.
On behalf of myself and my peers, I would like to express my sincere appreciation for your dedication and guidance.
As the new year approaches, I would like to extend my best wishes for a happy and fulfilling year ahead.

Sincerely,
Melisa SUBAŞI