HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY – VNU HCMC
OFFICE FOR INTERNATIONAL STUDY PROGRAM
FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING

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DIGITAL SYSTEMS (LAB)
EXPERIMENTAL REPORT (Prelab 1)

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I Laboratory 1

Get started with FPGA

1. Get started with FPGA

$$\begin{aligned} \text{LEDR}(9) &<= \text{SW}(9); \\ \text{LEDR}(8) &<= \text{SW}(8); \\ &\dots \\ \text{LEDR}(0) &<= \text{SW}(0); \end{aligned}$$

Code

```
LIBRARY IEEE;
USE IEEE.STD_LOGIC_1164.ALL;

ENTITY Exc1 IS
        PORT (
                SW : IN STD_LOGIC_VECTOR(9 DOWNTO 0);
                LEDR : OUT STD_LOGIC_VECTOR(9 DOWNTO 0)
        );
END ENTITY;

ARCHITECTURE behavior OF Exc1 IS
BEGIN
        LEDR <= SW;
END ARCHITECTURE;
END Logic;
```

2. Know how to program one-bit wide 2-to-1 multiplexer

m <= (NOT (s) AND x) OR (s AND y)

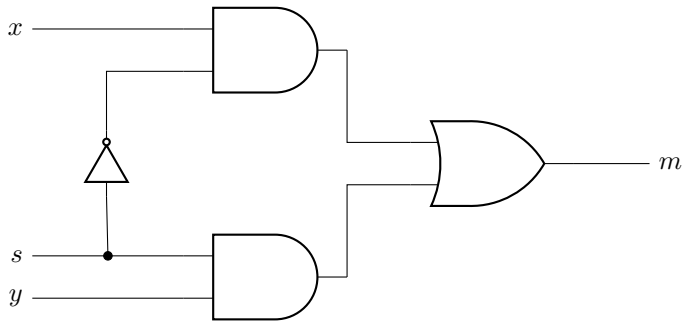


Figure 1.2.a: Circuit diagram

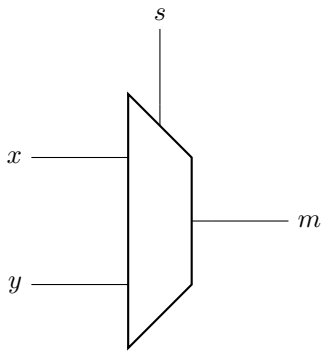


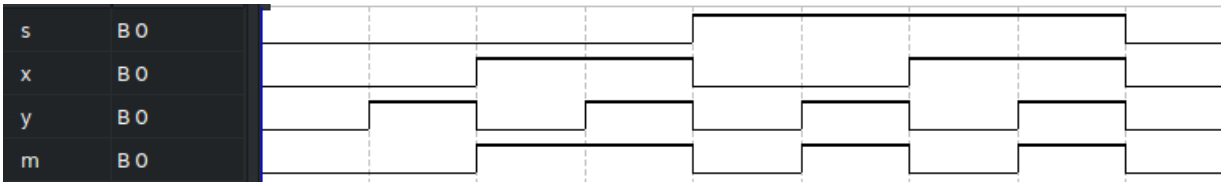
Figure 1.2.b: Circuit diagram

a. Code

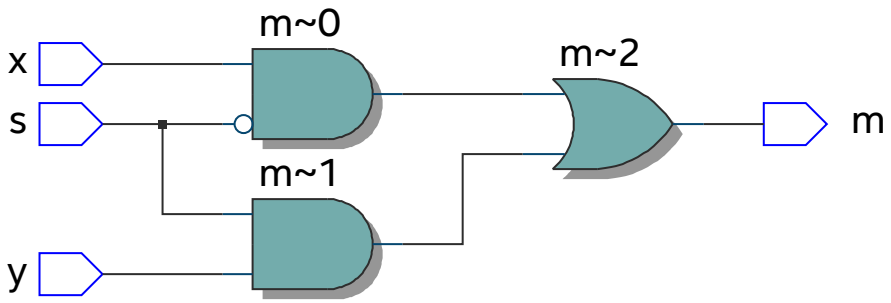
```
LIBRARY ieee;
USE ieee.std_logic_1164.ALL;
ENTITY Exc2 IS
        PORT (
                x : IN std_logic;
                s : IN std_logic;
                y : IN std_logic;
                m : OUT std_logic
        );
END ENTITY;

ARCHITECTURE arch OF Exc2 IS
BEGIN
        m <= (NOT(s) AND x) OR (s AND y);
END arch;
```

b. Waveform



c. Result of RTL viewer



3. Know how to interface with 7-segment LED

c_1	c_0	HEX0	LED
0	0	0 1 1 1 1 0 1	
0	1	1 0 0 1 1 1 1	
1	0	0 1 1 0 0 0 0	
1	1	1 1 1 1 1 1 0	

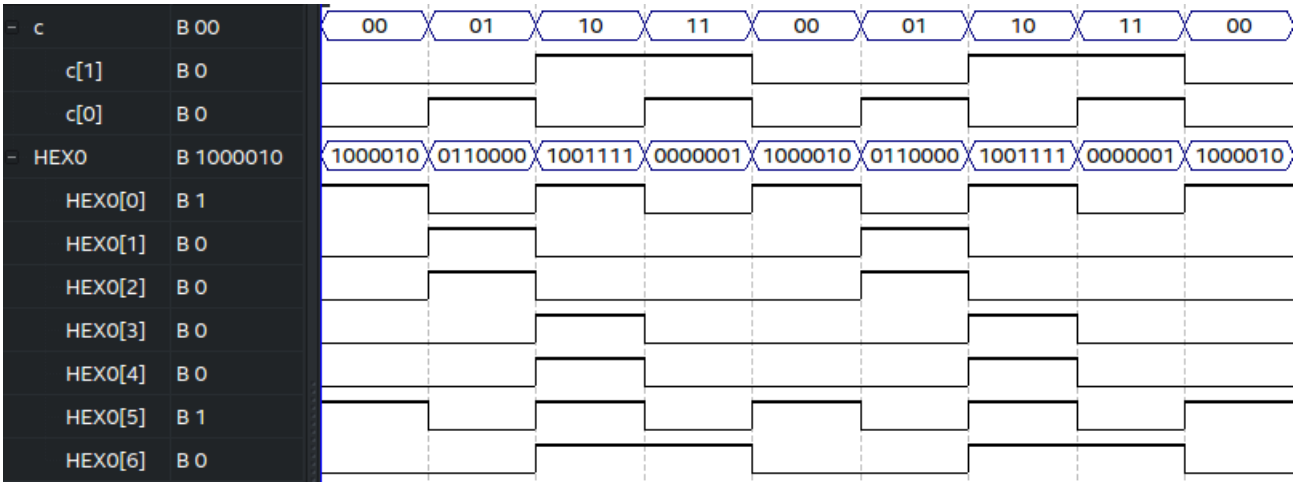
a. Code

```
LIBRARY ieee;
USE ieee.std_logic_1164.ALL;

ENTITY Exc3 IS
        PORT (
                c : IN std_logic_vector(1 DOWNTO 0);
                HEX0 : OUT std_logic_vector(0 TO 6)
        );
END Exc3;

ARCHITECTURE behavior OF Exc3 IS
        SIGNAL HEX : std_logic_vector(0 TO 6);
BEGIN
        HEX0 <= NOT(HEX); -- 7SEGLED is active low.
        WITH c SELECT
        HEX <= "0111101" WHEN "00",
               "1001111" WHEN "01",
               "0110000" WHEN "10",
               "1111110" WHEN "11",
               "0000000" WHEN OTHERS;
END behavior;
```

b. Waveform



c. Result of RTL viewer