CSC258 Lab #2 Pre-Lab

Multiplexers, Design Hierarchy, and HEX Displays

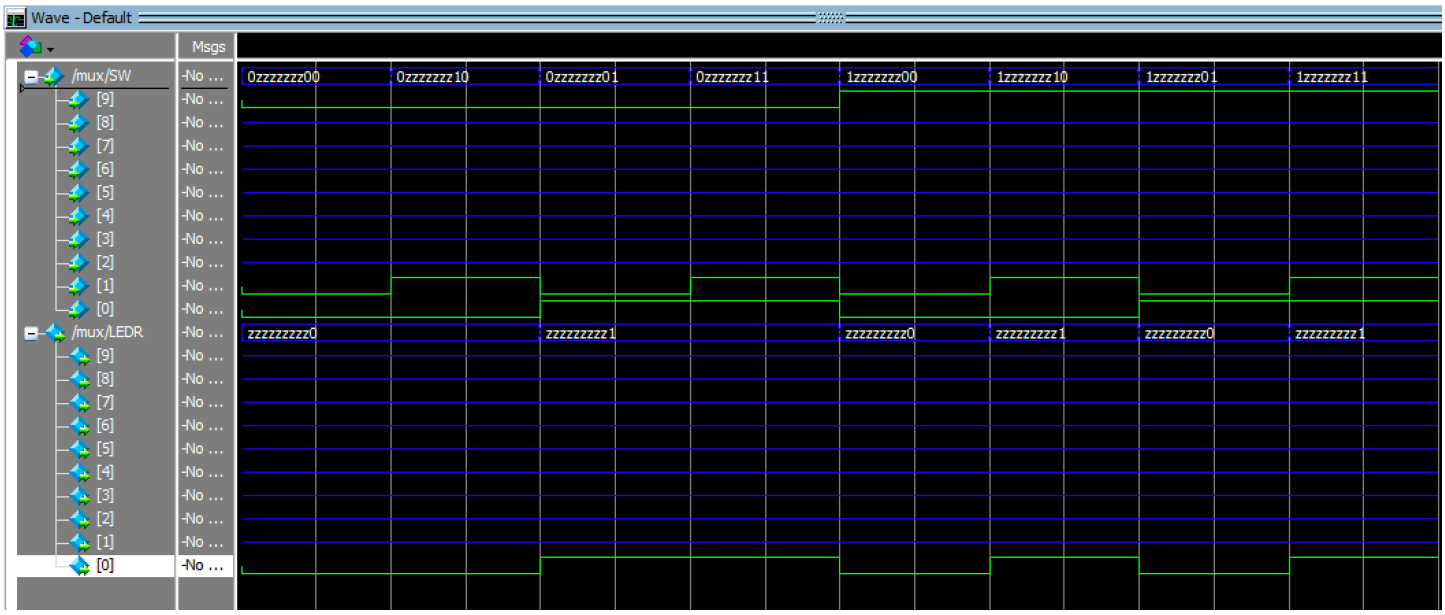
Last name: Fan

First name: Yuchen

Student number: 1003800265

Prat I

1.Look at the generated waveform , which is the simulation output, and verify that the provided test-cases work as expected.

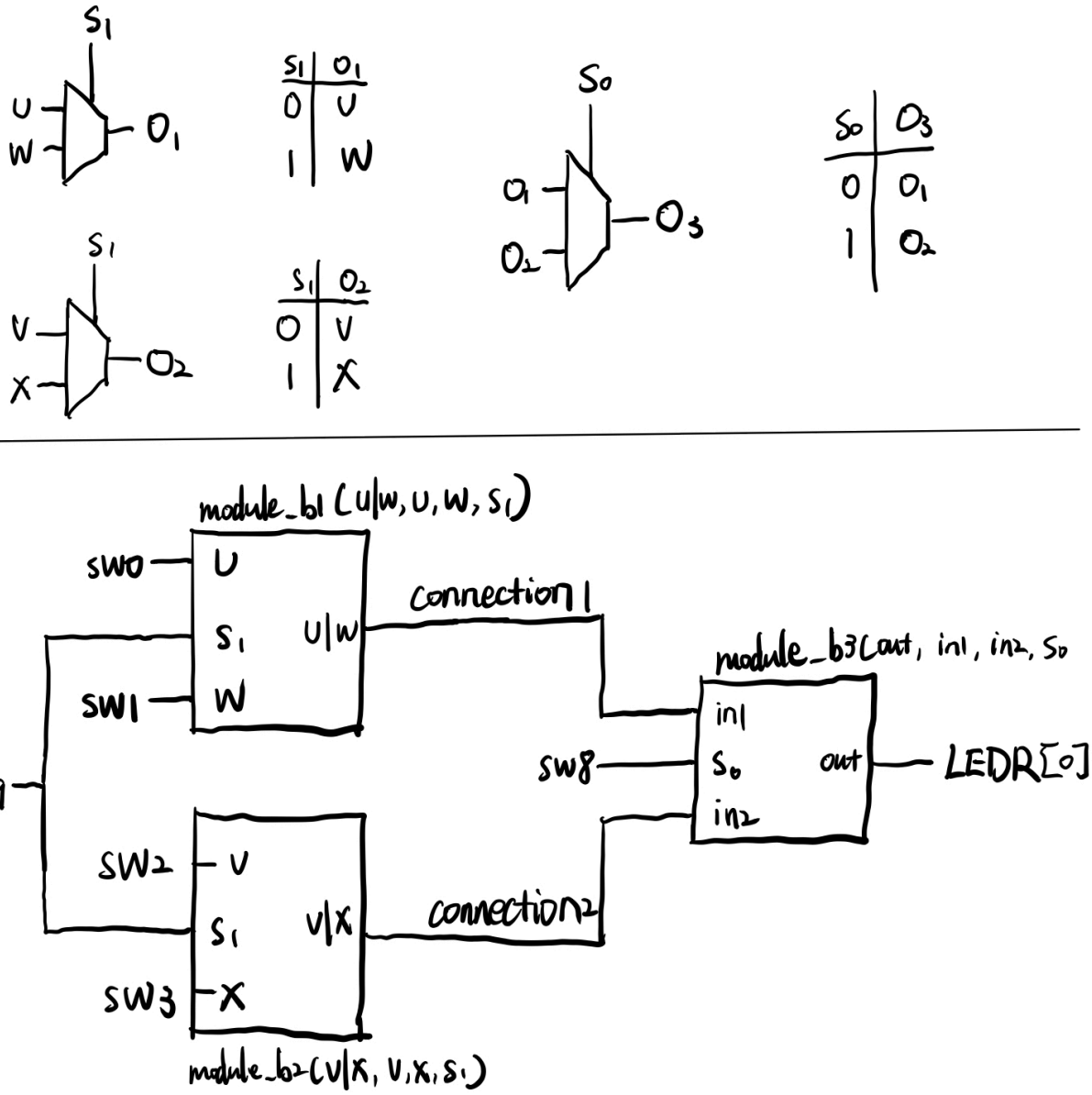


The output is LEDR[0] and the result is as expected. When Sw9 is 0 and Sw0 is 1, what matter Sw1 is, the LEDR[0] is 1. When Sw9 is 1 and Sw0 is 0, if Sw1 is 1, LDER[0] is 1. When three of them are all 1, LEDR[0] is 1.

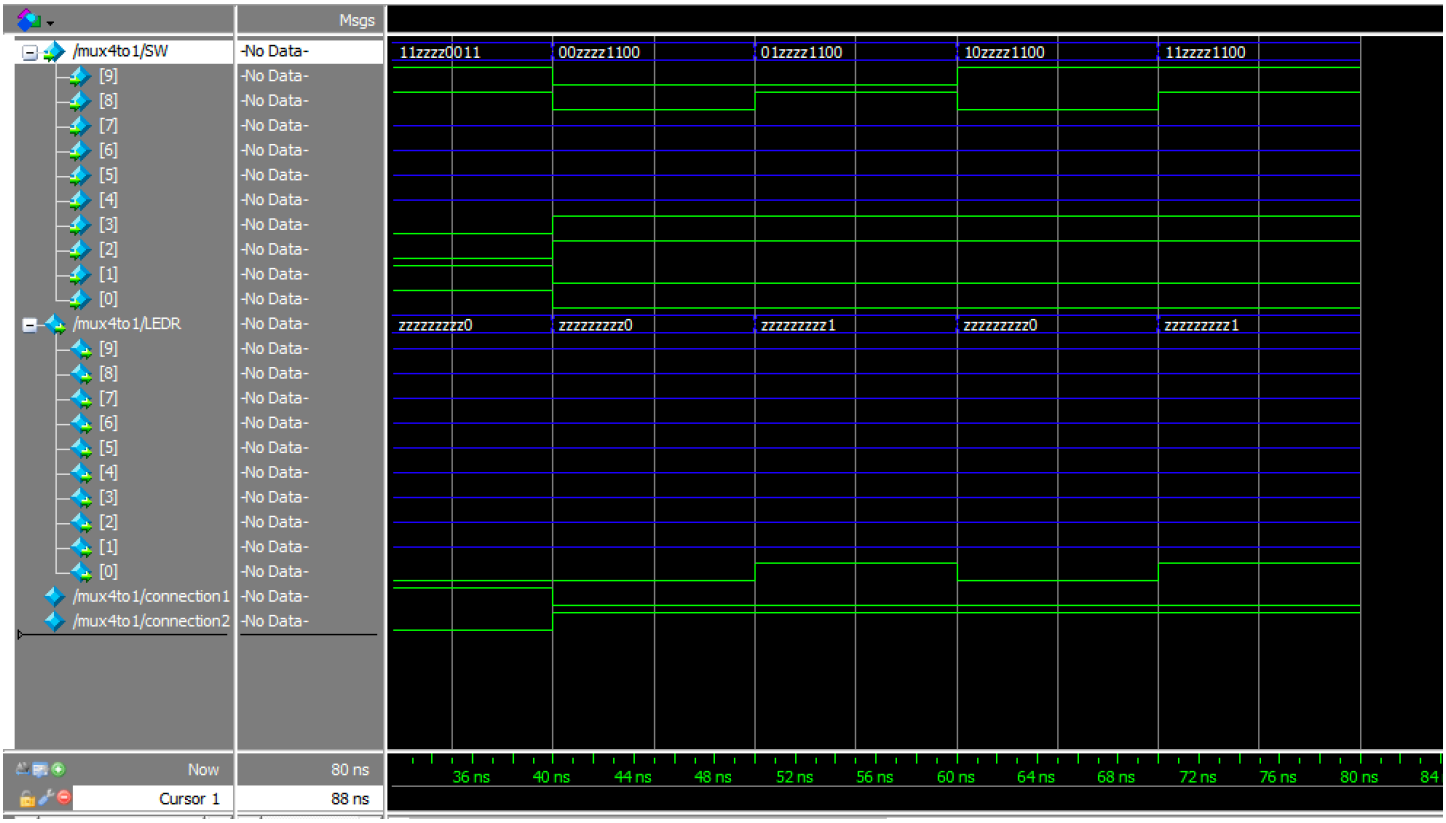
Part II

1. if the truth table in Table 2 was given in full, how many rows would it have?
   there are 6 inputs in the figure3, therefore, it should have 2^6=64 rows.

2. Draw a schematic showing how you will connect the mux2to1 modules to build the 4-to-1 multiplex

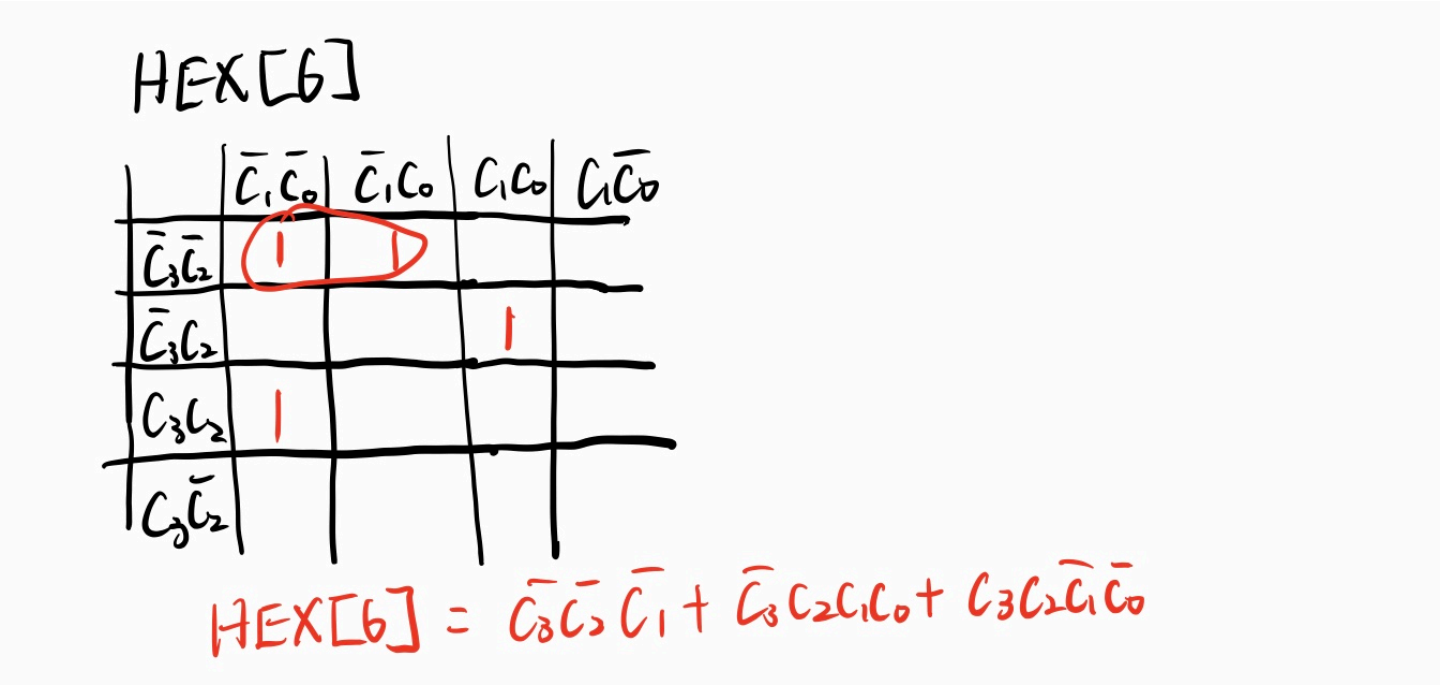


3. Create a new Quartus Prime project for your circuit and write the Verilog code
   the Verilog code is in mux4to1.v
4. Simulate your circuit with ModelSim for different values of s, u, v, w and x
   SW[0] - u SW[1] - w SW[2] - v SW[3] -x SW[9] - s1 SW[8] - s0

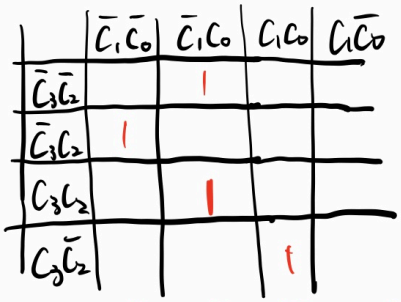


Part III

1. Write the expressions for seven Boolean functions

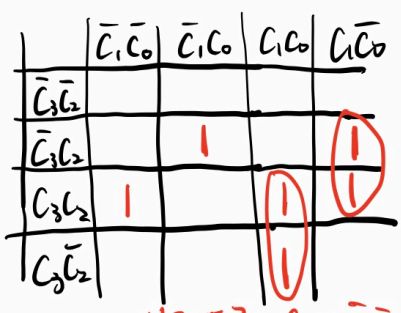


HEX[0]



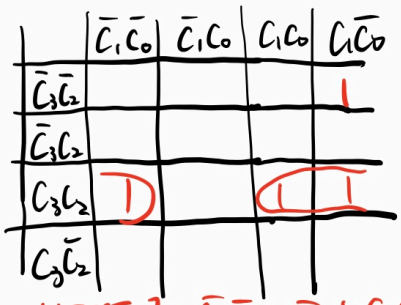
$HEX[0] = \bar{C}_3 C_2 \bar{C}_1 \bar{C}_0 + \bar{C}_3 \bar{C}_2 \bar{C}_1 C_0 + C_3 \bar{C}_2 C_1 C_0 + C_3 C_2 C_1 \bar{C}_0$

HEX[1]



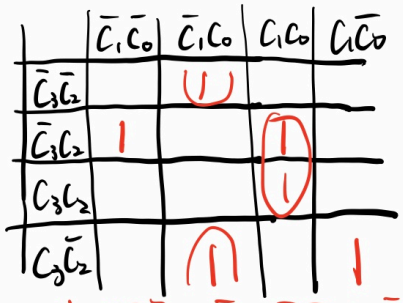
$HEX[1] = C_3 C_2 \bar{C}_1 \bar{C}_0 + \bar{C}_3 C_2 \bar{C}_1 C_0 + C_3 C_1 C_0 + C_2 C_1 \bar{C}_0$

HEX[2]



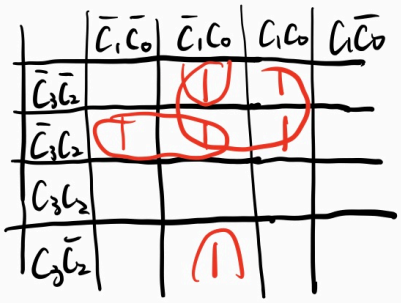
$HEX[2] = \bar{C}_3 \bar{C}_2 C_1 \bar{C}_0 + C_3 C_2 C_1 + C_3 C_2 \bar{C}_1 \bar{C}_0$

HEX[3]



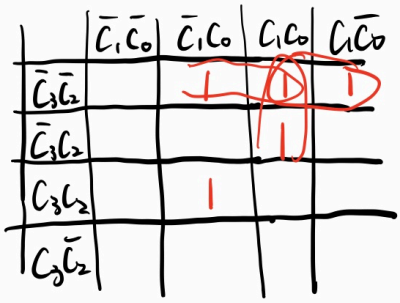
$HEX[3] = \bar{C}_3 C_2 \bar{C}_1 \bar{C}_0 + \bar{C}_2 \bar{C}_1 C_0 + C_2 C_1 C_0 + C_3 \bar{C}_2 C_1 \bar{C}_0$

HEX[4]



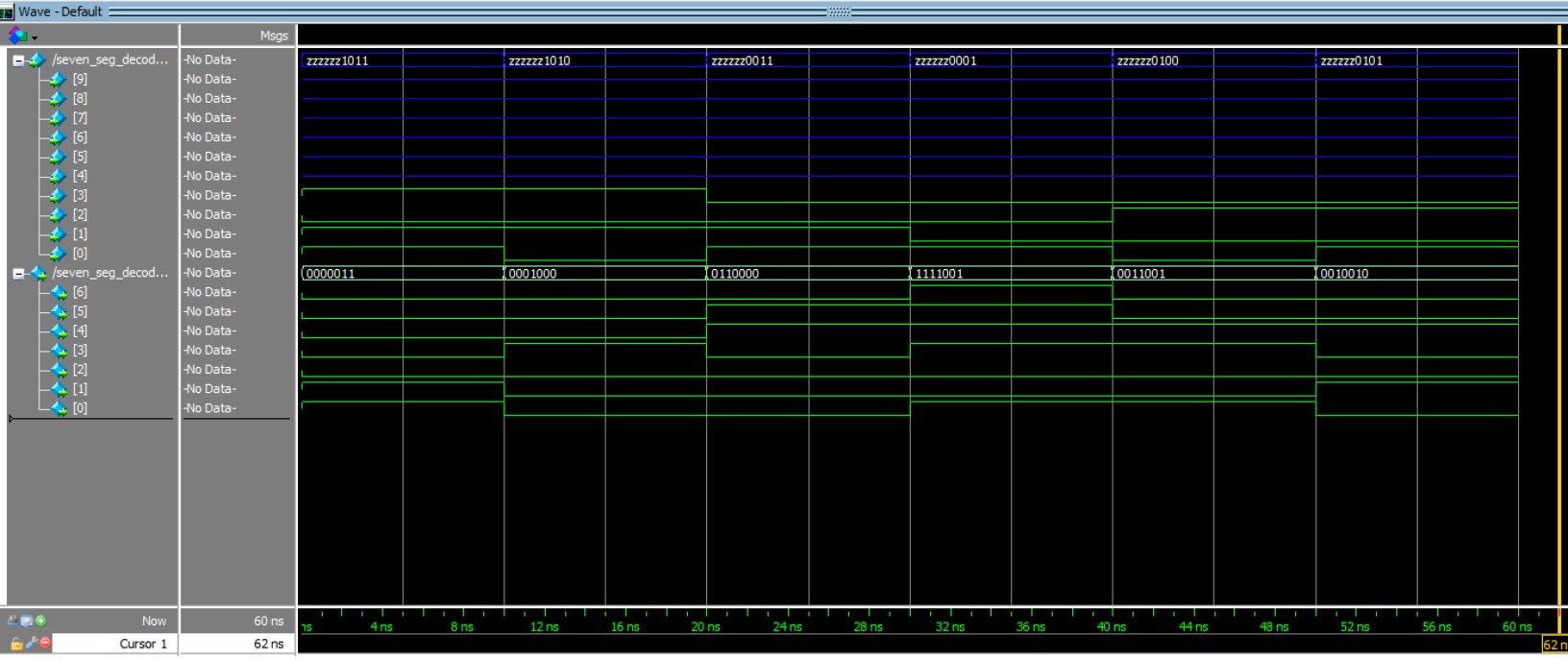
$HEX[4] = C_3 C_2 \bar{C}_1 + \bar{C}_3 C_0 + \bar{C}_2 \bar{C}_1 C_0$

HEX[5]



$HEX[5] = C_3 C_2 \bar{C}_1 C_0 + C_3 \bar{C}_2 C_0 + \bar{C}_3 C_1 C_0 + \bar{C}_3 \bar{C}_2 C_1$

2. Write a Verilog module for the 7-segment decoder
   view the file seven_seg_decoder.v
3. simulate your 7-segment decoder module with ModelSim
   BA3145 for me, see the figure


Wave - Default
Msgs
/seven_seg_decod...
[9]
[8]
[7]
[6]
[5]
[4]
[3]
[2]
[1]
[0]
/seven_seg_decod...
[6]
[5]
[4]
[3]
[2]
[1]
[0]
-No Data-
zzzzzz1011
zzzzzz1010
zzzzzz0011
zzzzzz0001
zzzzzz0100
zzzzzz0101
0000011
0001000
0110000
1111001
0011001
0010010
Now
60 ns
Cursor 1
62 ns
4 ns
8 ns
12 ns
16 ns
20 ns
24 ns
28 ns
32 ns
36 ns
40 ns
44 ns
48 ns
52 ns
56 ns
60 ns