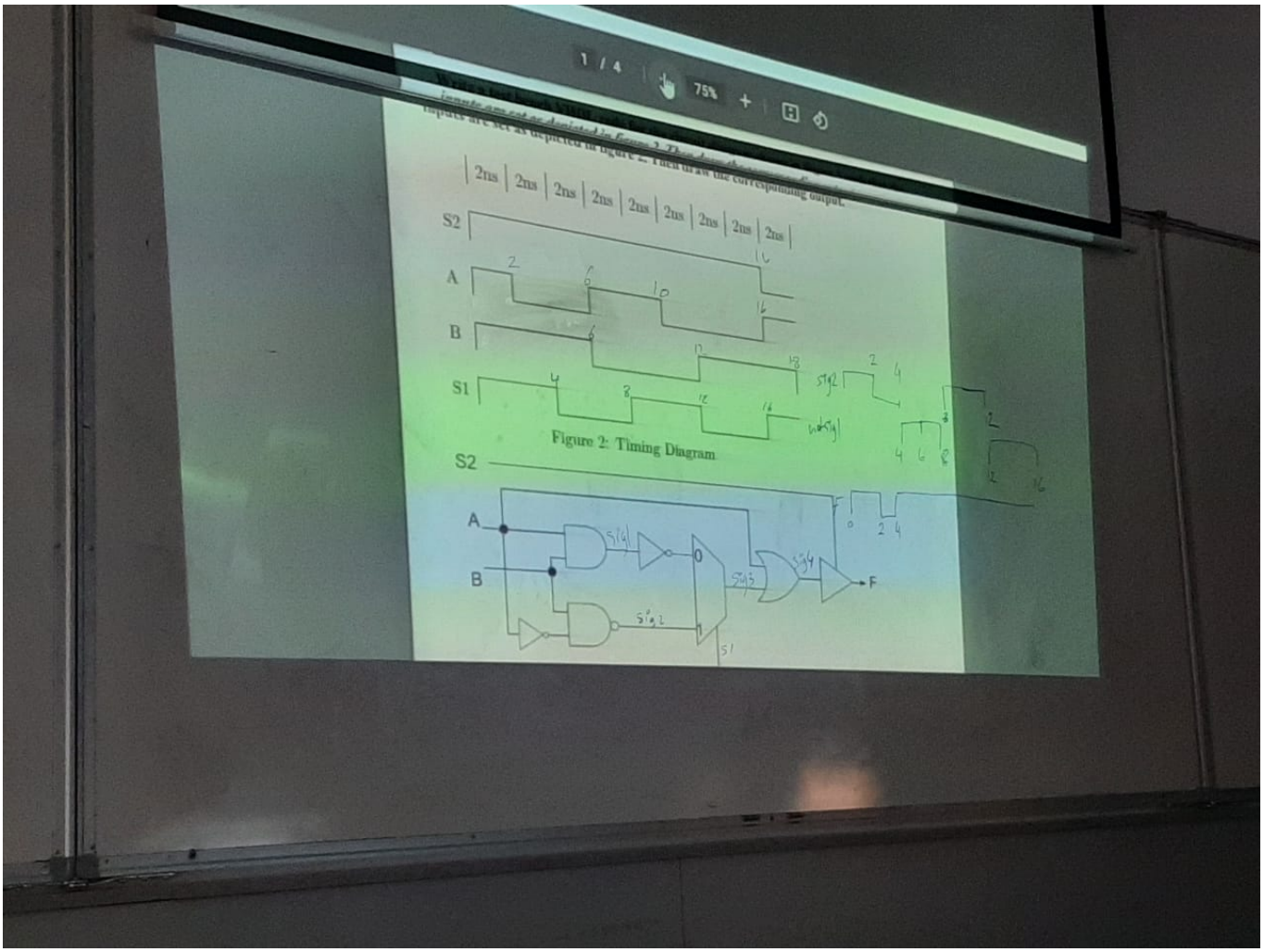
Tutorial 4

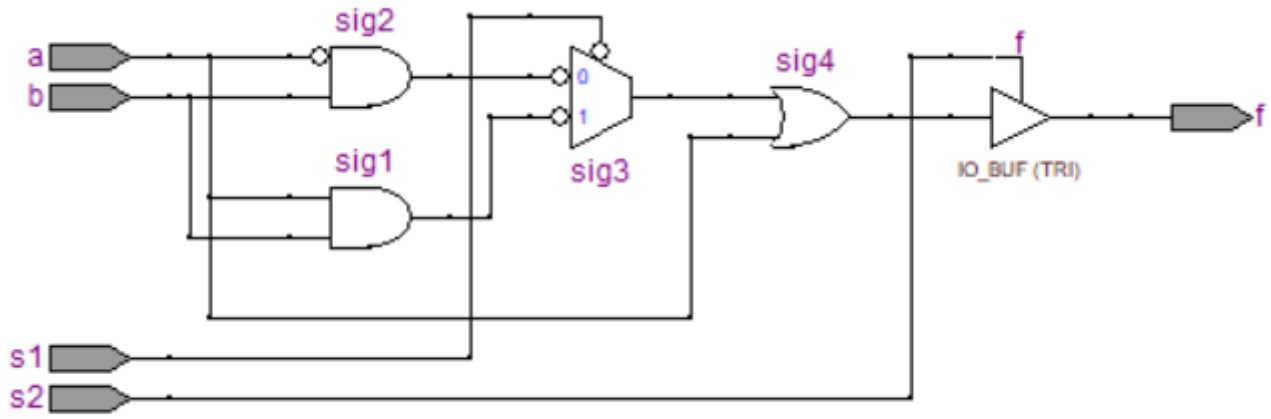
sheet 3

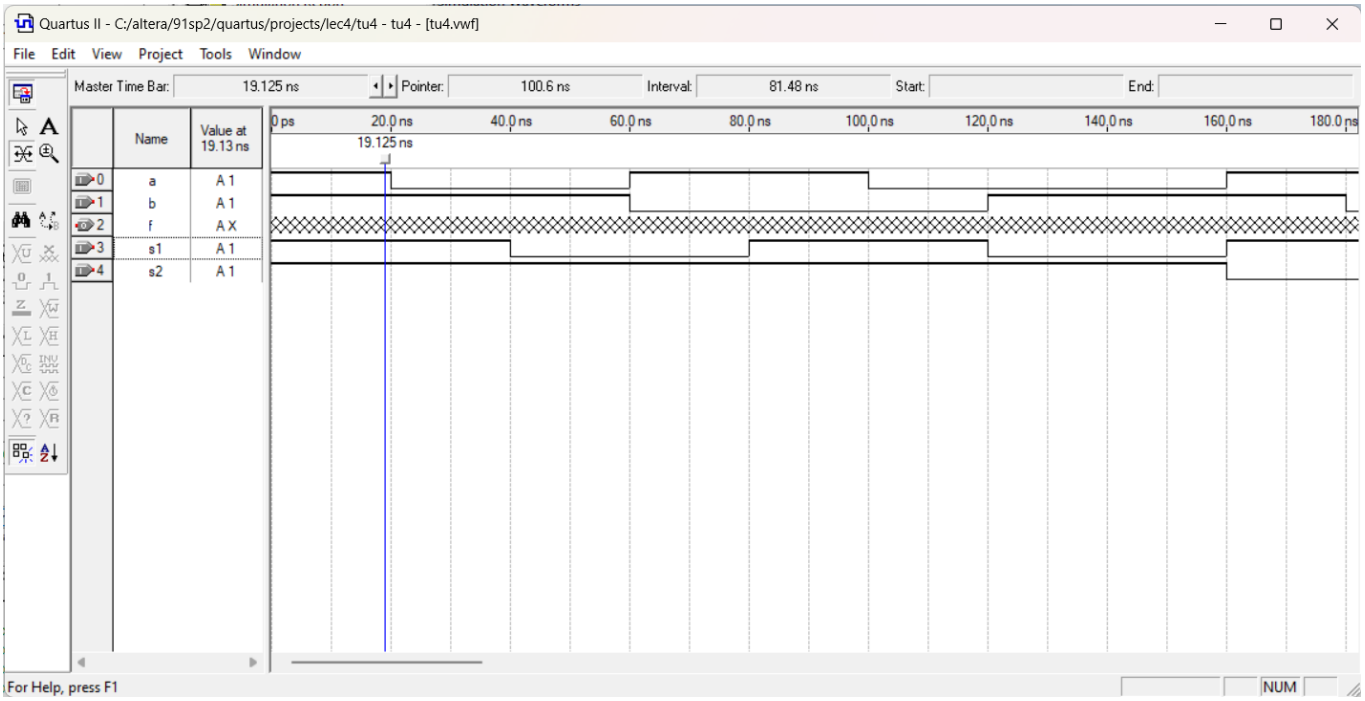
Q1

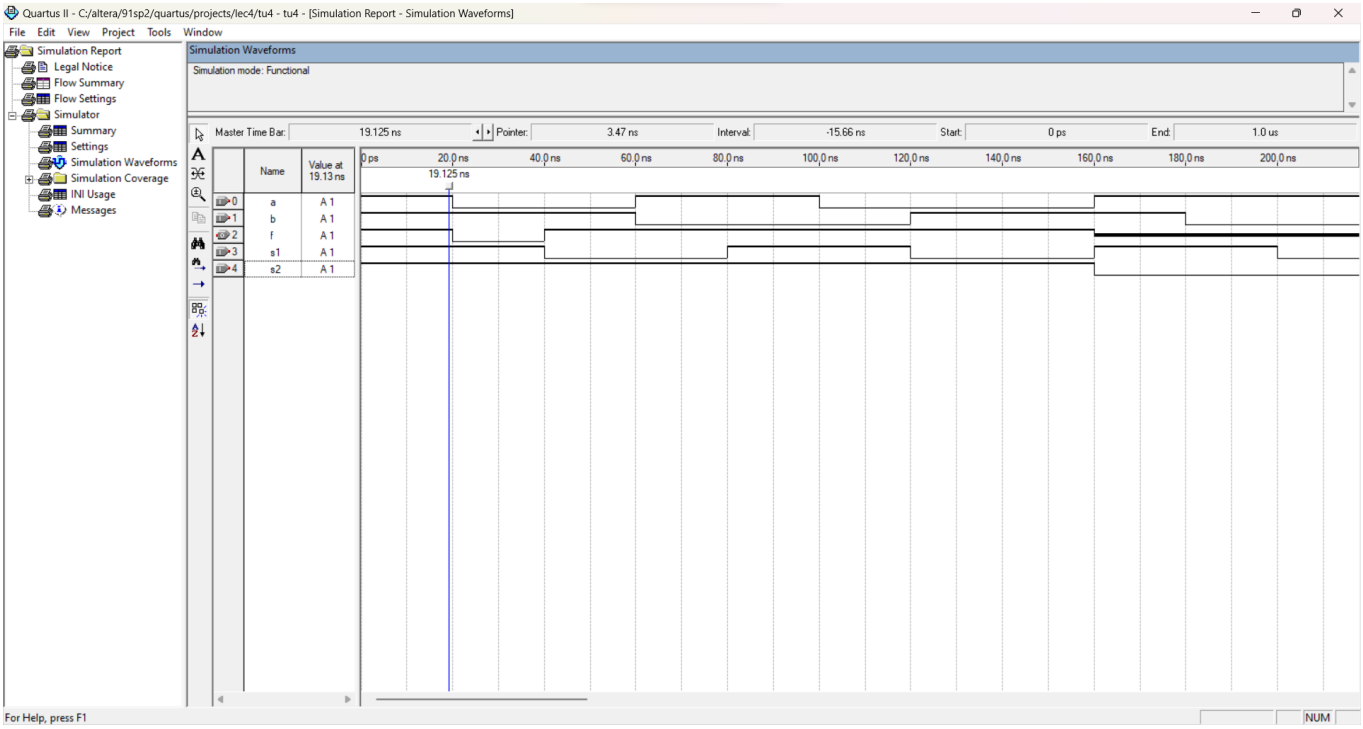



```
library ieee;
use ieee.std_logic_1164.all;

entity tu4 is
port(
          a, b, s1, s2: in std_logic;

          f: out std_logic
          );

end tu4;
```

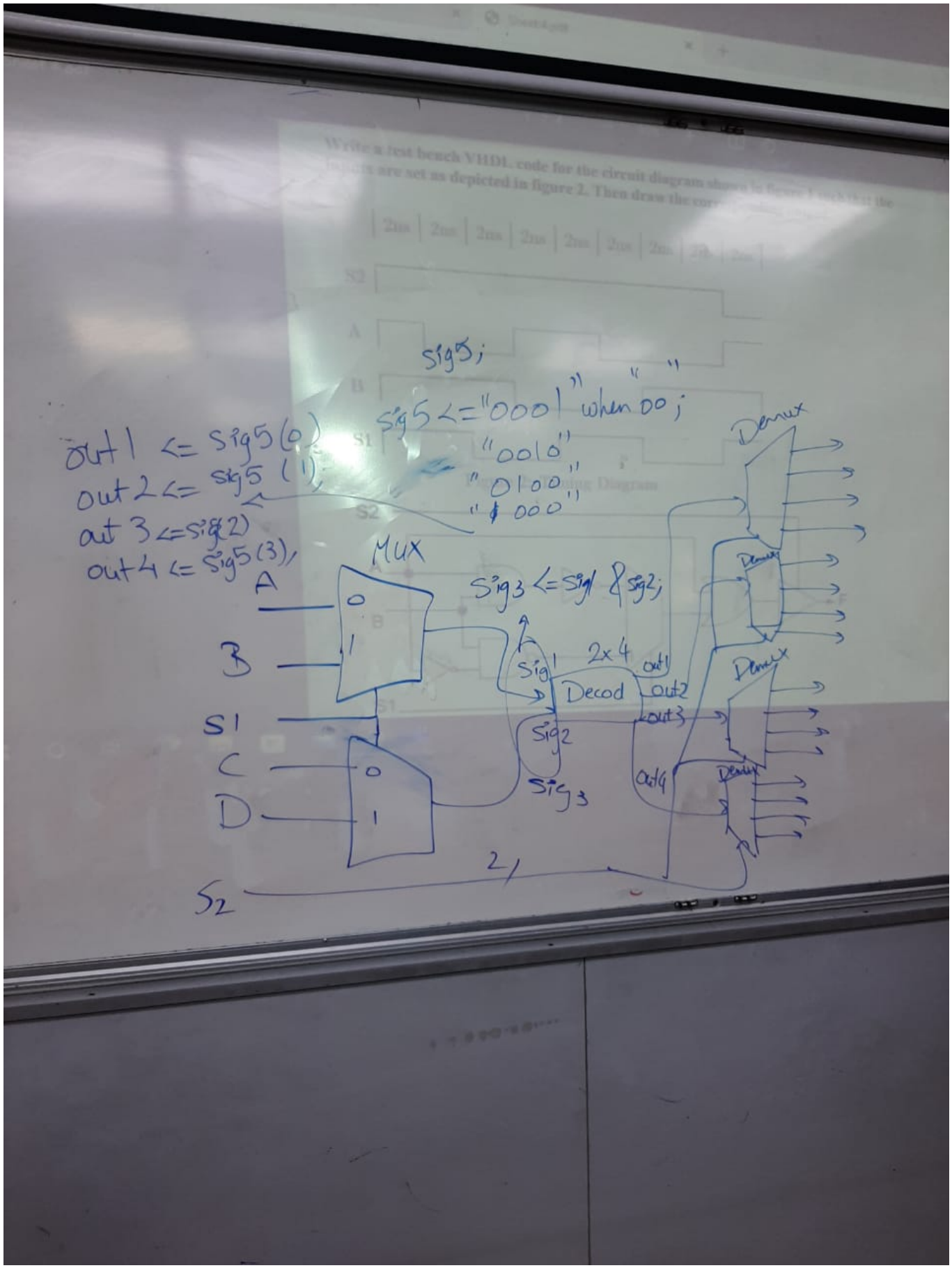
```
architecture behave of tu4 is

signal sig1, sig2, sig3, sig4:  std_logic;


begin
        sig1 <= not( a and b );
        sig2 <= not( not a and b );
        process (s1)
                begin
                        case s1 is
                                when '0' =>
                                        sig3 <= sig1;
                                when '1' =>
                                        sig3 <= sig2;
                end case;
        end process;
        sig4 <= sig3 or a;

        f <= sig4 when(s2='1') else 'Z';
end behave;
```


a
b
sig2
sig1
0
1
sig3
sig4
f
IO_BUF (TRI)
f
s1
s2


Quartus II - C:/altera/91sp2/quartus/projects/lec4/tu4 - tu4 - [tu4.vwf]
File Edit View Project Tools Window
Master Time Bar: 19.125 ns
Pointer: 100.6 ns
Interval: 81.48 ns
Start:
End:
Name
Value at 19.13 ns
0 ps
20.0 ns
40.0 ns
60.0 ns
80.0 ns
100.0 ns
120.0 ns
140.0 ns
160.0 ns
180.0 ns
19.125 ns
0 a A 1
1 b A 1
2 f A X
3 s1 A 1
4 s2 A 1
For Help, press F1
NUM


Quartus II - C:/altera/91sp2/quartus/projects/lec4/tu4 - tu4 - [Simulation Report - Simulation Waveforms]
File Edit View Project Tools Window
Simulation Report
Legal Notice
Flow Summary
Flow Settings
Simulator
Summary
Settings
Simulation Waveforms
Simulation Coverage
INI Usage
Messages
Simulation Waveforms
Simulation mode: Functional
Master Time Bar: 19.125 ns
Pointer: 3.47 ns
Interval: -15.66 ns
Start: 0 ps
End: 1.0 us
Name
Value at 19.13 ns
0 a A 1
1 b A 1
2 f A 1
3 s1 A 1
4 s2 A 1
0 ps
20.0 ns
40.0 ns
60.0 ns
80.0 ns
100.0 ns
120.0 ns
140.0 ns
160.0 ns
180.0 ns
200.0 ns
19.125 ns
For Help, press F1
NUM

Q2


sig5;
sig5 <= "0001" when "00";
"0010"
"0100"
"1000"
out1 <= sig5(0);
out2 <= sig5(1);
out3 <= sig5(2);
out4 <= sig5(3);
Mux
A
B
S1
C
D
S2
sig3 <= sig1 & sig2;
sig1
sig2
sig3
2x4
Decod
out1
out2
out3
out4
Demux