#100daysofrtl

4-BIT COMPARATOR:

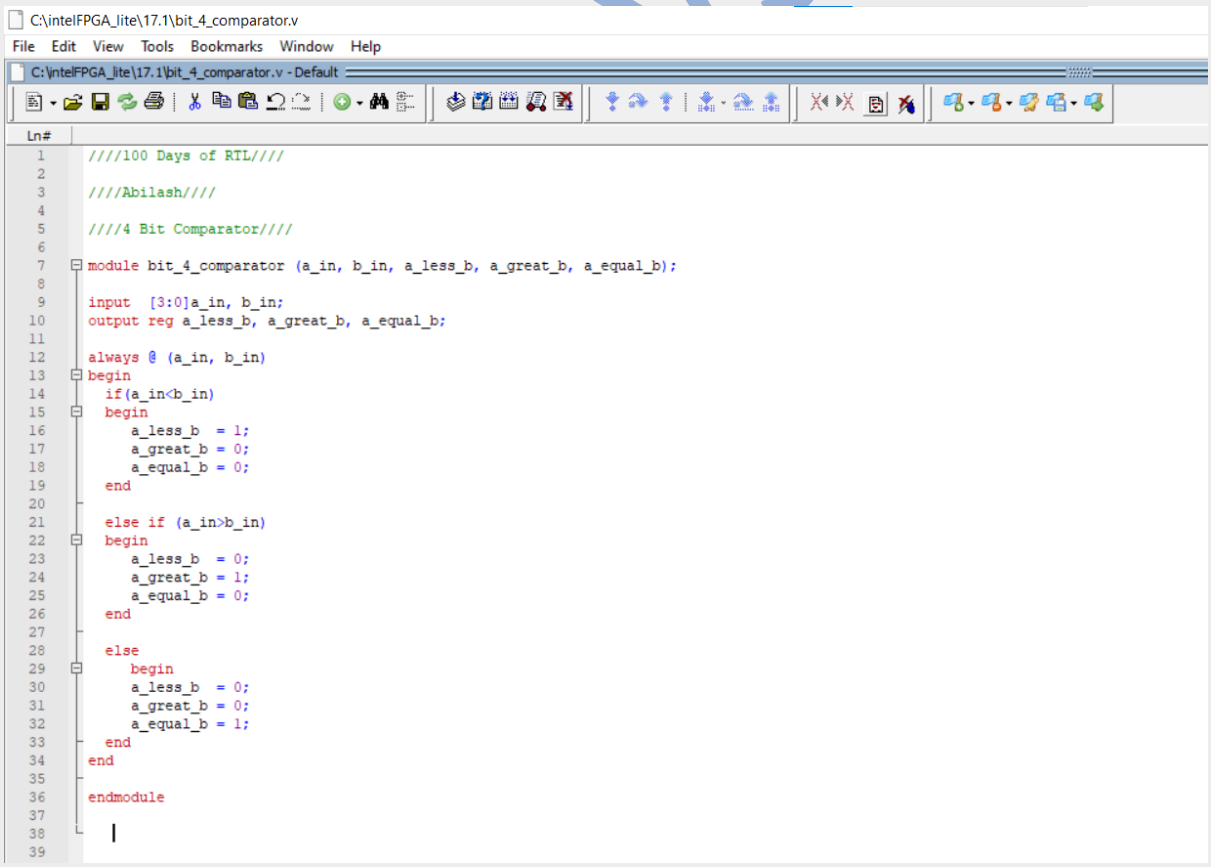
AIM:

To design a four-bit comparator using Modelsim and Verilog HDL

TOOLS:

Modelsim

MAIN CODE:



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TESTBENCH CODE:

C:/intelFPGA_lite/17.1/bit_4_comparator_tb.v

File Edit View Tools Bookmarks Window Help

C:/intelFPGA_lite/17.1/bit_4_comparator_tb.v - Default

```
Ln#
 1  ///100 Days of RTL Challenge///
 2
 3  ///Abilash P///
 4
 5  ///4 bit comparator///
 6
 7  module bit_4_comparator_tb ();
 8
 9  reg  [3:0]a_in,b_in;
10  wire a_less_b, a_great_b, a_equal_b;
11
12  bit_4_comparator DUT (.a_in(a_in), .b_in(b_in), .a_less_b(a_less_b), .a_great_b(a_great_b), .a_equal_b(a_equal_b));
13
14  integer i;
15
16  initial
17  begin
18    a_in = 4'b 0000;
19    b_in = 4'b 0000;
20  end
21
22  initial
23  begin
24    for(i=0; i<256; i=i+1)
25    begin
26      {a_in,b_in} = i;
27      if(b_in == 0)
28        $display("------------------------------------------------");
29      #20;
30    end
31  end
32
33  initial
34   $monitor("Input A = %b, Input B = %b, A<B = %b, A>B = %b, A==b = %b", a_in,b_in,a_less_b,a_great_b, a_equal_b);
35  endmodule
36
37
```

Results:

Transcript

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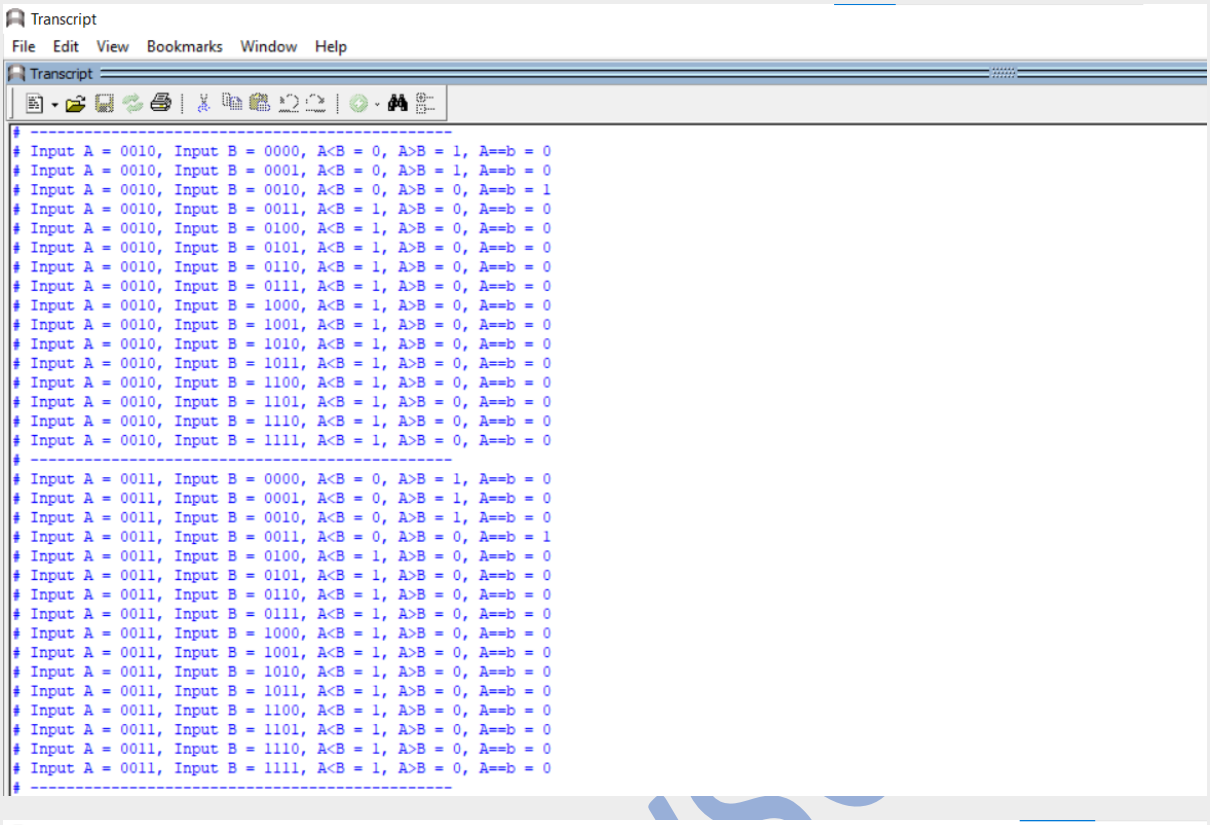
Transcript

```
# Reading C:/intelFPGA_lite/17.1/modelsim_ase/tcl/vsim/pref.tcl
project open C:/intelFPGA_lite/17.1/bit_4_comparator.mpf
# Loading project bit_4_comparator
# Compile of bit_4_comparator.v was successful.
# Compile of bit_4_comparator_tb.v was successful.
# 2 compiles, 0 failed with no errors.
ModelSim> vsim -gui work.bit_4_comparator_tb
# vsim -gui work.bit_4_comparator_tb
# Start time: 16:51:28 on Oct 08,2023
# Loading work.bit_4_comparator_tb
# Loading work.bit_4_comparator
add wave sim:/bit_4_comparator_tb/*
VSIM 4> run -all
# ------------------------------------------------
# Input A = 0000, Input B = 0000, A<B = 0, A>B = 0, A==b = 1
# Input A = 0000, Input B = 0001, A<B = 1, A>B = 0, A==b = 0
# Input A = 0000, Input B = 0010, A<B = 1, A>B = 0, A==b = 0
# Input A = 0000, Input B = 0011, A<B = 1, A>B = 0, A==b = 0
# Input A = 0000, Input B = 0100, A<B = 1, A>B = 0, A==b = 0
# Input A = 0000, Input B = 0101, A<B = 1, A>B = 0, A==b = 0
# Input A = 0000, Input B = 0110, A<B = 1, A>B = 0, A==b = 0
# Input A = 0000, Input B = 0111, A<B = 1, A>B = 0, A==b = 0
# Input A = 0000, Input B = 1000, A<B = 1, A>B = 0, A==b = 0
# Input A = 0000, Input B = 1001, A<B = 1, A>B = 0, A==b = 0
# Input A = 0000, Input B = 1010, A<B = 1, A>B = 0, A==b = 0
# Input A = 0000, Input B = 1011, A<B = 1, A>B = 0, A==b = 0
# Input A = 0000, Input B = 1100, A<B = 1, A>B = 0, A==b = 0
# Input A = 0000, Input B = 1101, A<B = 1, A>B = 0, A==b = 0
# Input A = 0000, Input B = 1110, A<B = 1, A>B = 0, A==b = 0
# Input A = 0000, Input B = 1111, A<B = 1, A>B = 0, A==b = 0
# ------------------------------------------------
# Input A = 0001, Input B = 0000, A<B = 0, A>B = 1, A==b = 0
# Input A = 0001, Input B = 0001, A<B = 0, A>B = 0, A==b = 1
# Input A = 0001, Input B = 0010, A<B = 1, A>B = 0, A==b = 0
# Input A = 0001, Input B = 0011, A<B = 1, A>B = 0, A==b = 0
# Input A = 0001, Input B = 0100, A<B = 1, A>B = 0, A==b = 0
# Input A = 0001, Input B = 0101, A<B = 1, A>B = 0, A==b = 0
# Input A = 0001, Input B = 0110, A<B = 1, A>B = 0, A==b = 0
# Input A = 0001, Input B = 0111, A<B = 1, A>B = 0, A==b = 0
# Input A = 0001, Input B = 1000, A<B = 1, A>B = 0, A==b = 0
# Input A = 0001, Input B = 1001, A<B = 1, A>B = 0, A==b = 0
# Input A = 0001, Input B = 1010, A<B = 1, A>B = 0, A==b = 0
# Input A = 0001, Input B = 1011, A<B = 1, A>B = 0, A==b = 0
# Input A = 0001, Input B = 1100, A<B = 1, A>B = 0, A==b = 0
# Input A = 0001, Input B = 1101, A<B = 1, A>B = 0, A==b = 0
# Input A = 0001, Input B = 1110, A<B = 1, A>B = 0, A==b = 0
# Input A = 0001, Input B = 1111, A<B = 1, A>B = 0, A==b = 0
```

#100daysofrtl



```
Transcript
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Transcript
# ------------------------------------------------
# Input A = 0010, Input B = 0000, A<B = 0, A>B = 1, A==b = 0
# Input A = 0010, Input B = 0001, A<B = 0, A>B = 1, A==b = 0
# Input A = 0010, Input B = 0010, A<B = 0, A>B = 0, A==b = 1
# Input A = 0010, Input B = 0011, A<B = 1, A>B = 0, A==b = 0
# Input A = 0010, Input B = 0100, A<B = 1, A>B = 0, A==b = 0
# Input A = 0010, Input B = 0101, A<B = 1, A>B = 0, A==b = 0
# Input A = 0010, Input B = 0110, A<B = 1, A>B = 0, A==b = 0
# Input A = 0010, Input B = 0111, A<B = 1, A>B = 0, A==b = 0
# Input A = 0010, Input B = 1000, A<B = 1, A>B = 0, A==b = 0
# Input A = 0010, Input B = 1001, A<B = 1, A>B = 0, A==b = 0
# Input A = 0010, Input B = 1010, A<B = 1, A>B = 0, A==b = 0
# Input A = 0010, Input B = 1011, A<B = 1, A>B = 0, A==b = 0
# Input A = 0010, Input B = 1100, A<B = 1, A>B = 0, A==b = 0
# Input A = 0010, Input B = 1101, A<B = 1, A>B = 0, A==b = 0
# Input A = 0010, Input B = 1110, A<B = 1, A>B = 0, A==b = 0
# Input A = 0010, Input B = 1111, A<B = 1, A>B = 0, A==b = 0
# ------------------------------------------------
# Input A = 0011, Input B = 0000, A<B = 0, A>B = 1, A==b = 0
# Input A = 0011, Input B = 0001, A<B = 0, A>B = 1, A==b = 0
# Input A = 0011, Input B = 0010, A<B = 0, A>B = 1, A==b = 0
# Input A = 0011, Input B = 0011, A<B = 0, A>B = 0, A==b = 1
# Input A = 0011, Input B = 0100, A<B = 1, A>B = 0, A==b = 0
# Input A = 0011, Input B = 0101, A<B = 1, A>B = 0, A==b = 0
# Input A = 0011, Input B = 0110, A<B = 1, A>B = 0, A==b = 0
# Input A = 0011, Input B = 0111, A<B = 1, A>B = 0, A==b = 0
# Input A = 0011, Input B = 1000, A<B = 1, A>B = 0, A==b = 0
# Input A = 0011, Input B = 1001, A<B = 1, A>B = 0, A==b = 0
# Input A = 0011, Input B = 1010, A<B = 1, A>B = 0, A==b = 0
# Input A = 0011, Input B = 1011, A<B = 1, A>B = 0, A==b = 0
# Input A = 0011, Input B = 1100, A<B = 1, A>B = 0, A==b = 0
# Input A = 0011, Input B = 1101, A<B = 1, A>B = 0, A==b = 0
# Input A = 0011, Input B = 1110, A<B = 1, A>B = 0, A==b = 0
# Input A = 0011, Input B = 1111, A<B = 1, A>B = 0, A==b = 0
# ------------------------------------------------
```

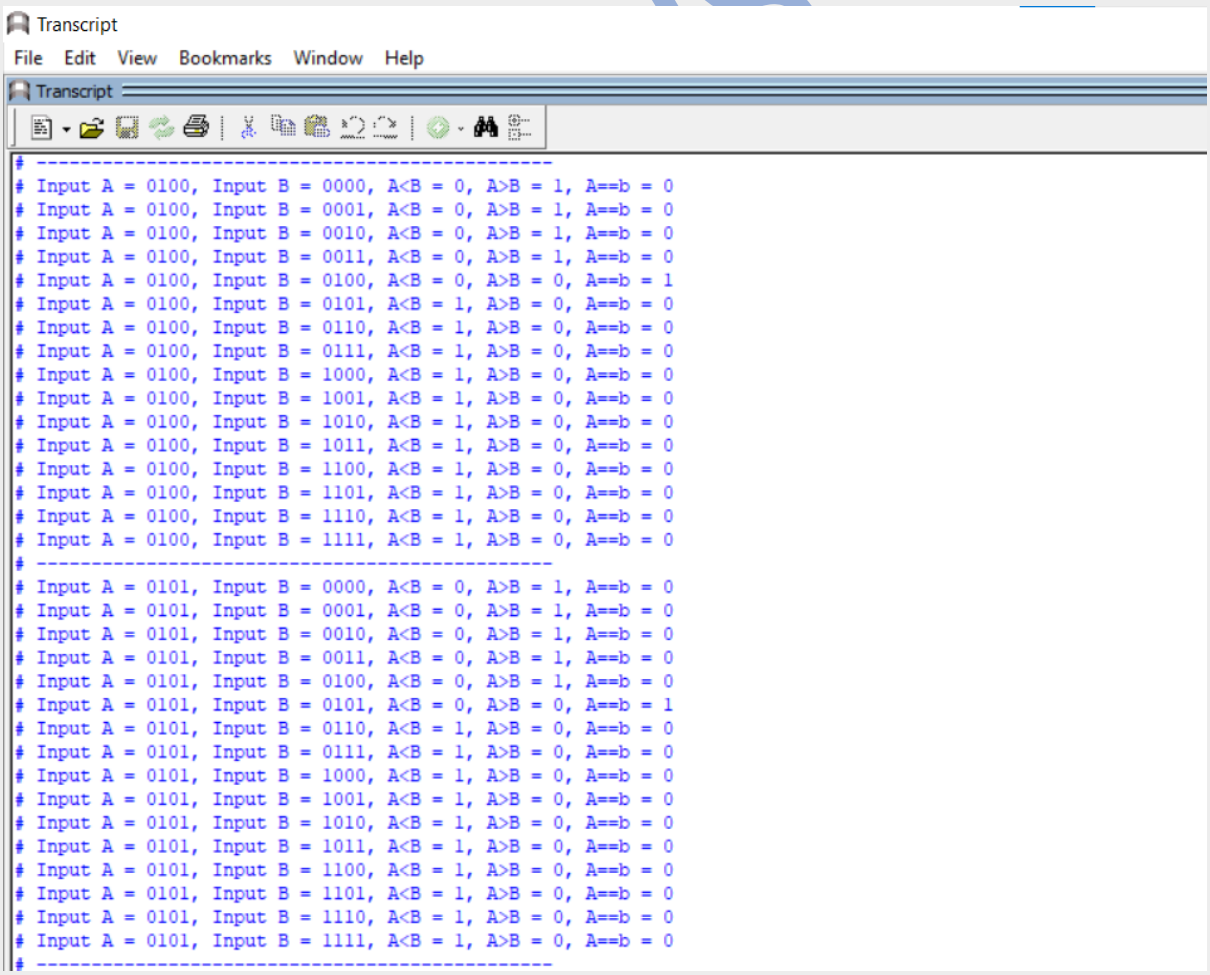

```
Transcript
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Transcript
# ------------------------------------------------
# Input A = 0100, Input B = 0000, A<B = 0, A>B = 1, A==b = 0
# Input A = 0100, Input B = 0001, A<B = 0, A>B = 1, A==b = 0
# Input A = 0100, Input B = 0010, A<B = 0, A>B = 1, A==b = 0
# Input A = 0100, Input B = 0011, A<B = 0, A>B = 1, A==b = 0
# Input A = 0100, Input B = 0100, A<B = 0, A>B = 0, A==b = 1
# Input A = 0100, Input B = 0101, A<B = 1, A>B = 0, A==b = 0
# Input A = 0100, Input B = 0110, A<B = 1, A>B = 0, A==b = 0
# Input A = 0100, Input B = 0111, A<B = 1, A>B = 0, A==b = 0
# Input A = 0100, Input B = 1000, A<B = 1, A>B = 0, A==b = 0
# Input A = 0100, Input B = 1001, A<B = 1, A>B = 0, A==b = 0
# Input A = 0100, Input B = 1010, A<B = 1, A>B = 0, A==b = 0
# Input A = 0100, Input B = 1011, A<B = 1, A>B = 0, A==b = 0
# Input A = 0100, Input B = 1100, A<B = 1, A>B = 0, A==b = 0
# Input A = 0100, Input B = 1101, A<B = 1, A>B = 0, A==b = 0
# Input A = 0100, Input B = 1110, A<B = 1, A>B = 0, A==b = 0
# Input A = 0100, Input B = 1111, A<B = 1, A>B = 0, A==b = 0
# ------------------------------------------------
# Input A = 0101, Input B = 0000, A<B = 0, A>B = 1, A==b = 0
# Input A = 0101, Input B = 0001, A<B = 0, A>B = 1, A==b = 0
# Input A = 0101, Input B = 0010, A<B = 0, A>B = 1, A==b = 0
# Input A = 0101, Input B = 0011, A<B = 0, A>B = 1, A==b = 0
# Input A = 0101, Input B = 0100, A<B = 0, A>B = 1, A==b = 0
# Input A = 0101, Input B = 0101, A<B = 0, A>B = 0, A==b = 1
# Input A = 0101, Input B = 0110, A<B = 1, A>B = 0, A==b = 0
# Input A = 0101, Input B = 0111, A<B = 1, A>B = 0, A==b = 0
# Input A = 0101, Input B = 1000, A<B = 1, A>B = 0, A==b = 0
# Input A = 0101, Input B = 1001, A<B = 1, A>B = 0, A==b = 0
# Input A = 0101, Input B = 1010, A<B = 1, A>B = 0, A==b = 0
# Input A = 0101, Input B = 1011, A<B = 1, A>B = 0, A==b = 0
# Input A = 0101, Input B = 1100, A<B = 1, A>B = 0, A==b = 0
# Input A = 0101, Input B = 1101, A<B = 1, A>B = 0, A==b = 0
# Input A = 0101, Input B = 1110, A<B = 1, A>B = 0, A==b = 0
# Input A = 0101, Input B = 1111, A<B = 1, A>B = 0, A==b = 0
# ------------------------------------------------
```

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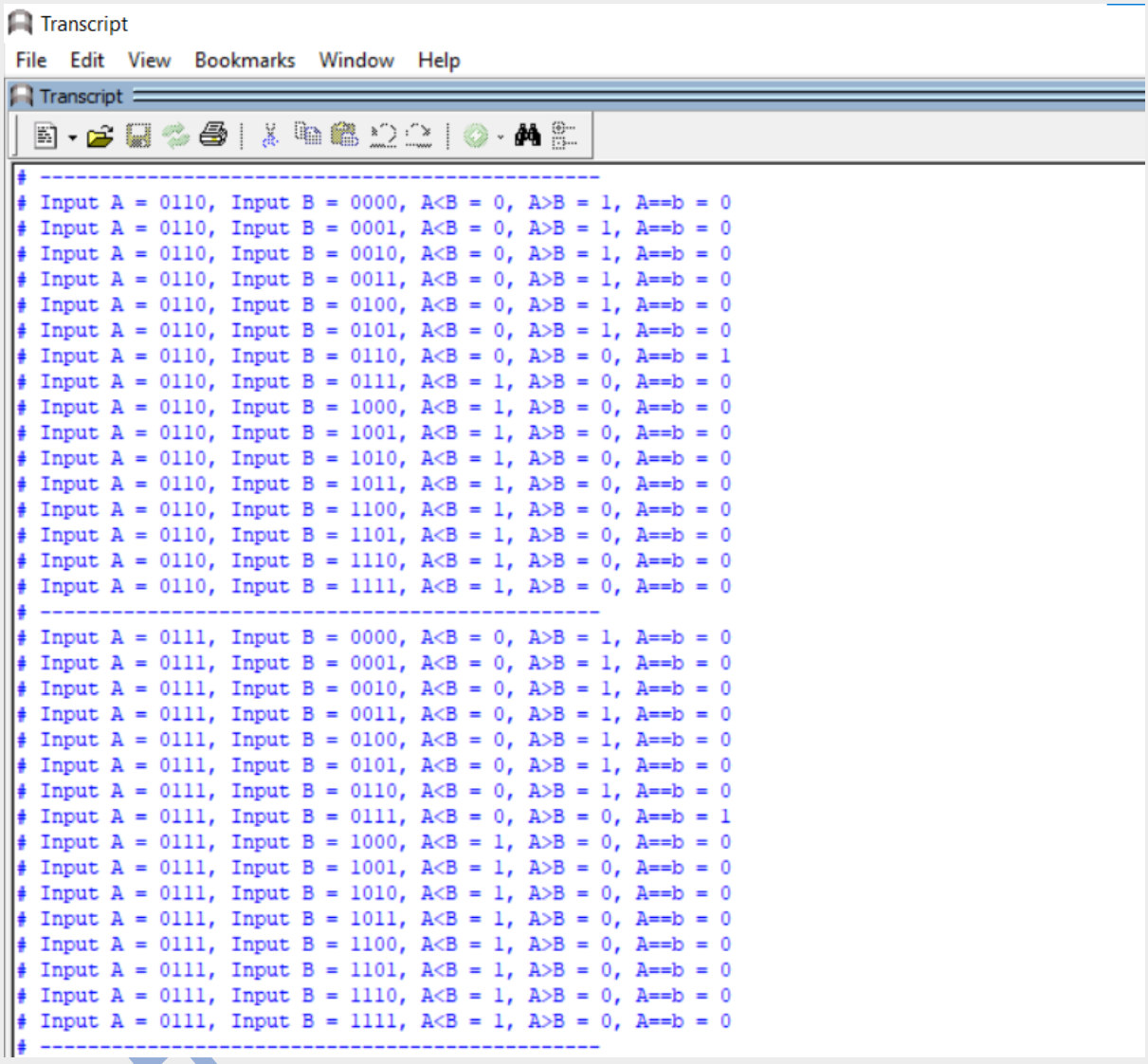
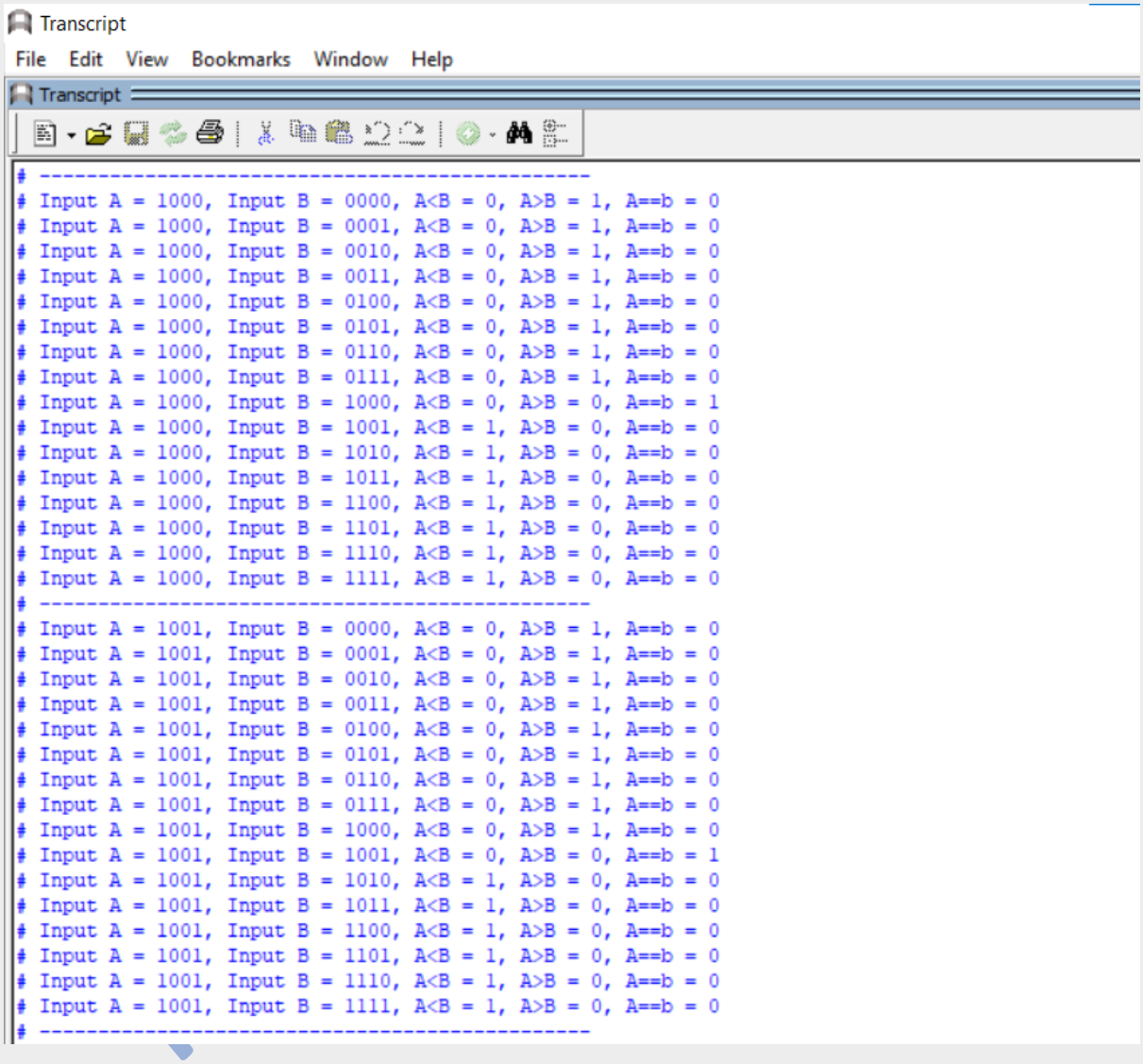


#100daysofrtl



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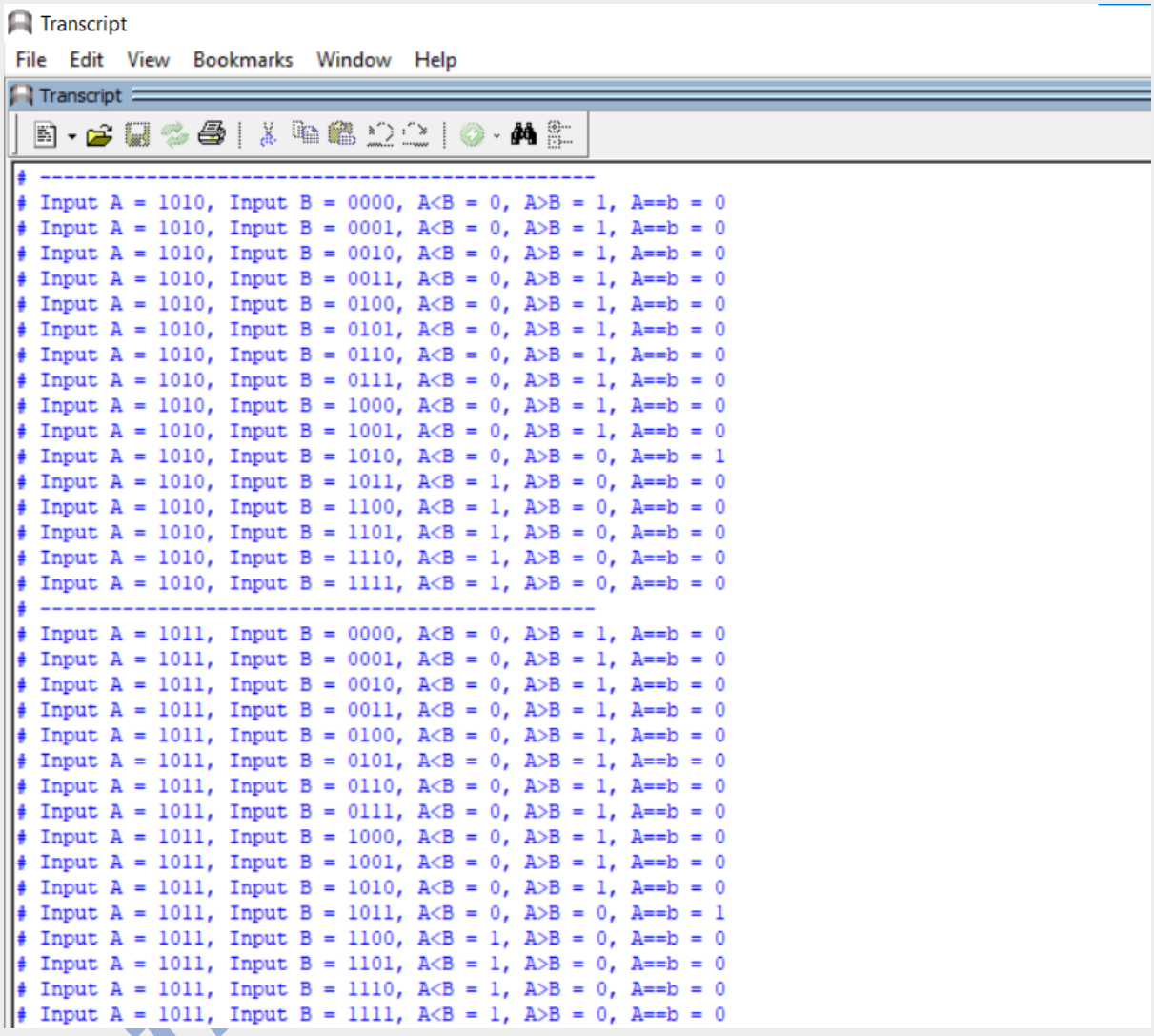
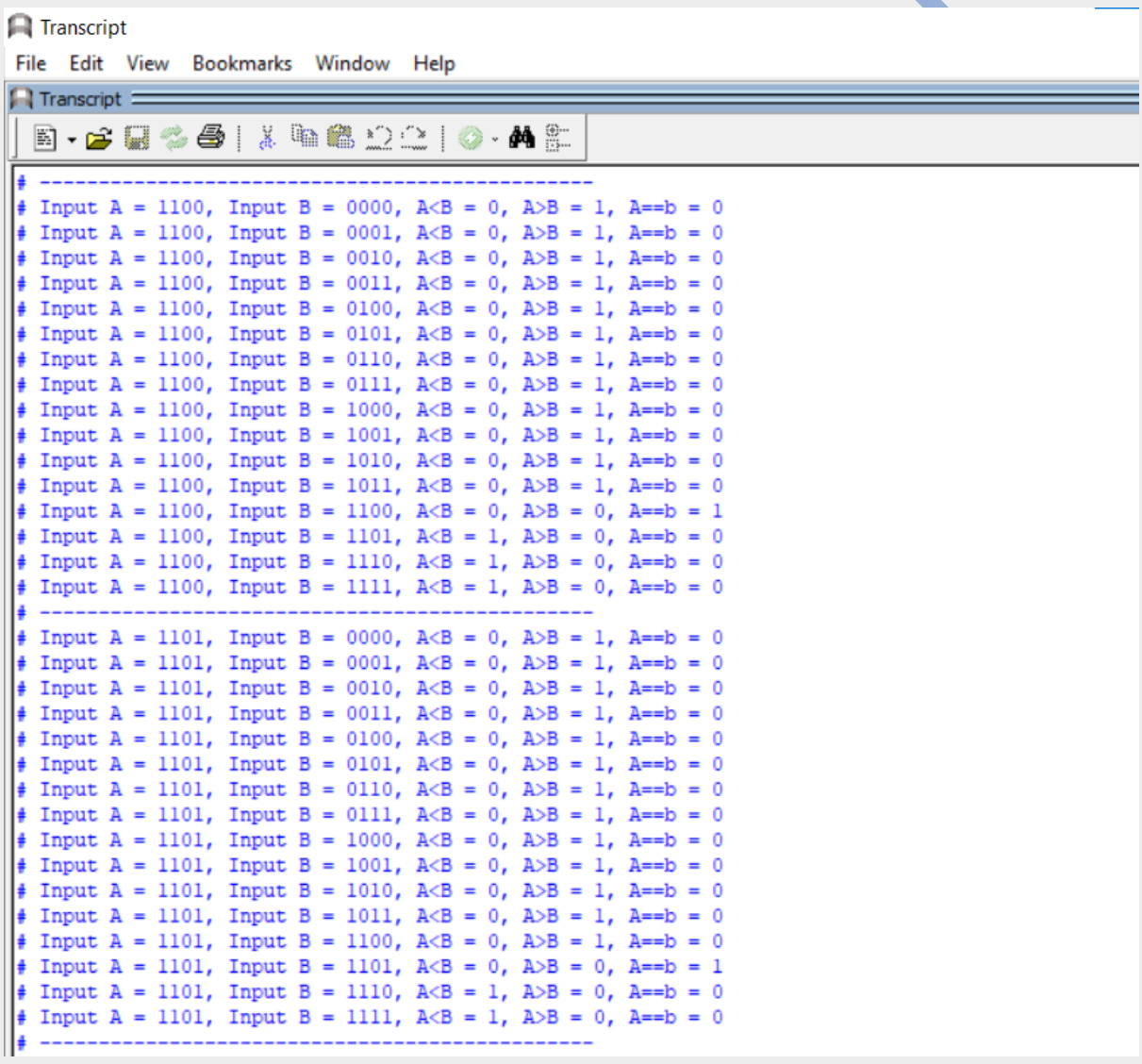


#100daysofrtl



#100daysofrtl

```
# ------------------------------------------------
# Input A = 1110, Input B = 0000, A<B = 0, A>B = 1, A==b = 0
# Input A = 1110, Input B = 0001, A<B = 0, A>B = 1, A==b = 0
# Input A = 1110, Input B = 0010, A<B = 0, A>B = 1, A==b = 0
# Input A = 1110, Input B = 0011, A<B = 0, A>B = 1, A==b = 0
# Input A = 1110, Input B = 0100, A<B = 0, A>B = 1, A==b = 0
# Input A = 1110, Input B = 0101, A<B = 0, A>B = 1, A==b = 0
# Input A = 1110, Input B = 0110, A<B = 0, A>B = 1, A==b = 0
# Input A = 1110, Input B = 0111, A<B = 0, A>B = 1, A==b = 0
# Input A = 1110, Input B = 1000, A<B = 0, A>B = 1, A==b = 0
# Input A = 1110, Input B = 1001, A<B = 0, A>B = 1, A==b = 0
# Input A = 1110, Input B = 1010, A<B = 0, A>B = 1, A==b = 0
# Input A = 1110, Input B = 1011, A<B = 0, A>B = 1, A==b = 0
# Input A = 1110, Input B = 1100, A<B = 0, A>B = 1, A==b = 0
# Input A = 1110, Input B = 1101, A<B = 0, A>B = 1, A==b = 0
# Input A = 1110, Input B = 1110, A<B = 0, A>B = 0, A==b = 1
# Input A = 1110, Input B = 1111, A<B = 1, A>B = 0, A==b = 0
# ------------------------------------------------
# Input A = 1111, Input B = 0000, A<B = 0, A>B = 1, A==b = 0
# Input A = 1111, Input B = 0001, A<B = 0, A>B = 1, A==b = 0
# Input A = 1111, Input B = 0010, A<B = 0, A>B = 1, A==b = 0
# Input A = 1111, Input B = 0011, A<B = 0, A>B = 1, A==b = 0
# Input A = 1111, Input B = 0100, A<B = 0, A>B = 1, A==b = 0
# Input A = 1111, Input B = 0101, A<B = 0, A>B = 1, A==b = 0
# Input A = 1111, Input B = 0110, A<B = 0, A>B = 1, A==b = 0
# Input A = 1111, Input B = 0111, A<B = 0, A>B = 1, A==b = 0
# Input A = 1111, Input B = 1000, A<B = 0, A>B = 1, A==b = 0
# Input A = 1111, Input B = 1001, A<B = 0, A>B = 1, A==b = 0
# Input A = 1111, Input B = 1010, A<B = 0, A>B = 1, A==b = 0
# Input A = 1111, Input B = 1011, A<B = 0, A>B = 1, A==b = 0
# Input A = 1111, Input B = 1100, A<B = 0, A>B = 1, A==b = 0
# Input A = 1111, Input B = 1101, A<B = 0, A>B = 1, A==b = 0
# Input A = 1111, Input B = 1110, A<B = 0, A>B = 1, A==b = 0
# Input A = 1111, Input B = 1111, A<B = 0, A>B = 0, A==b = 1

VSIM 5>
```

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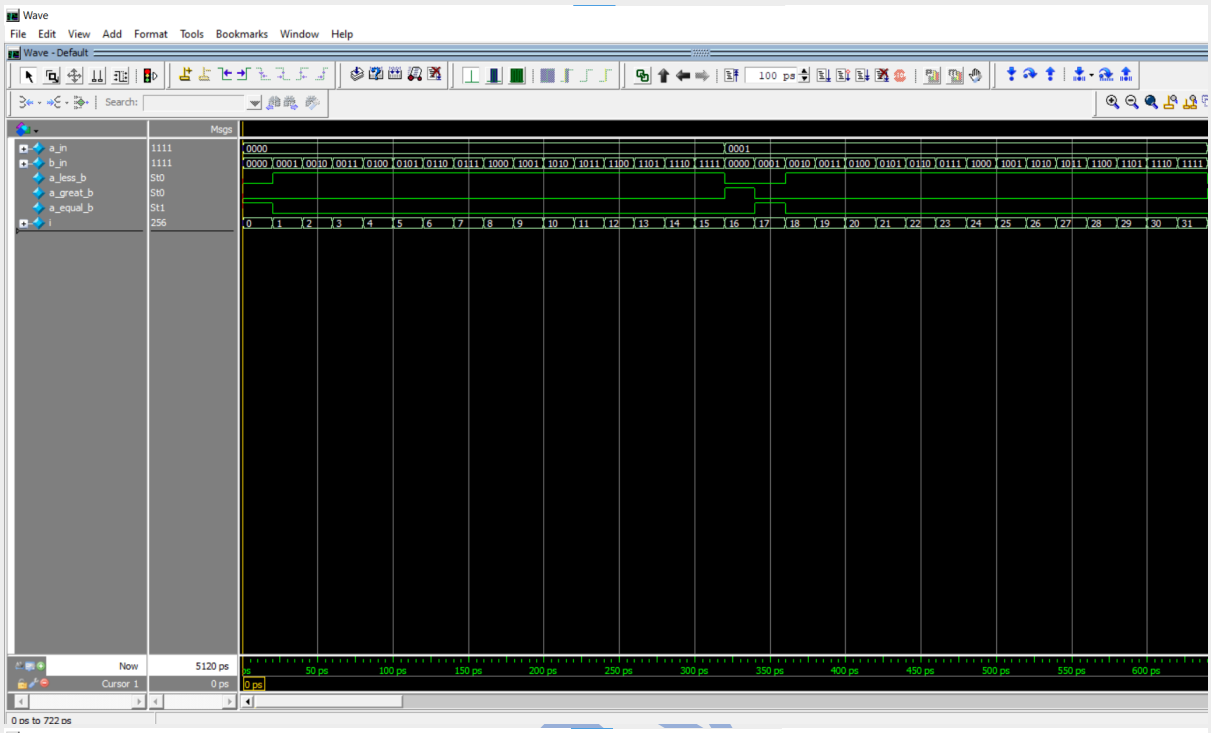
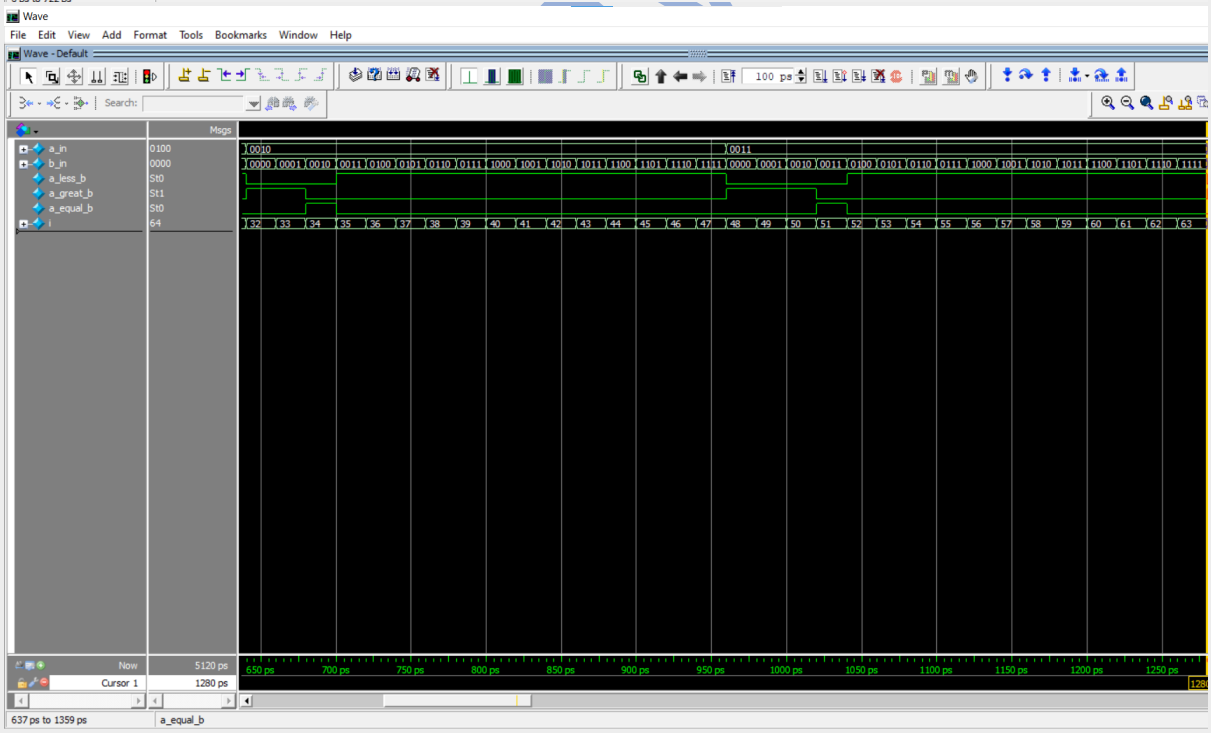
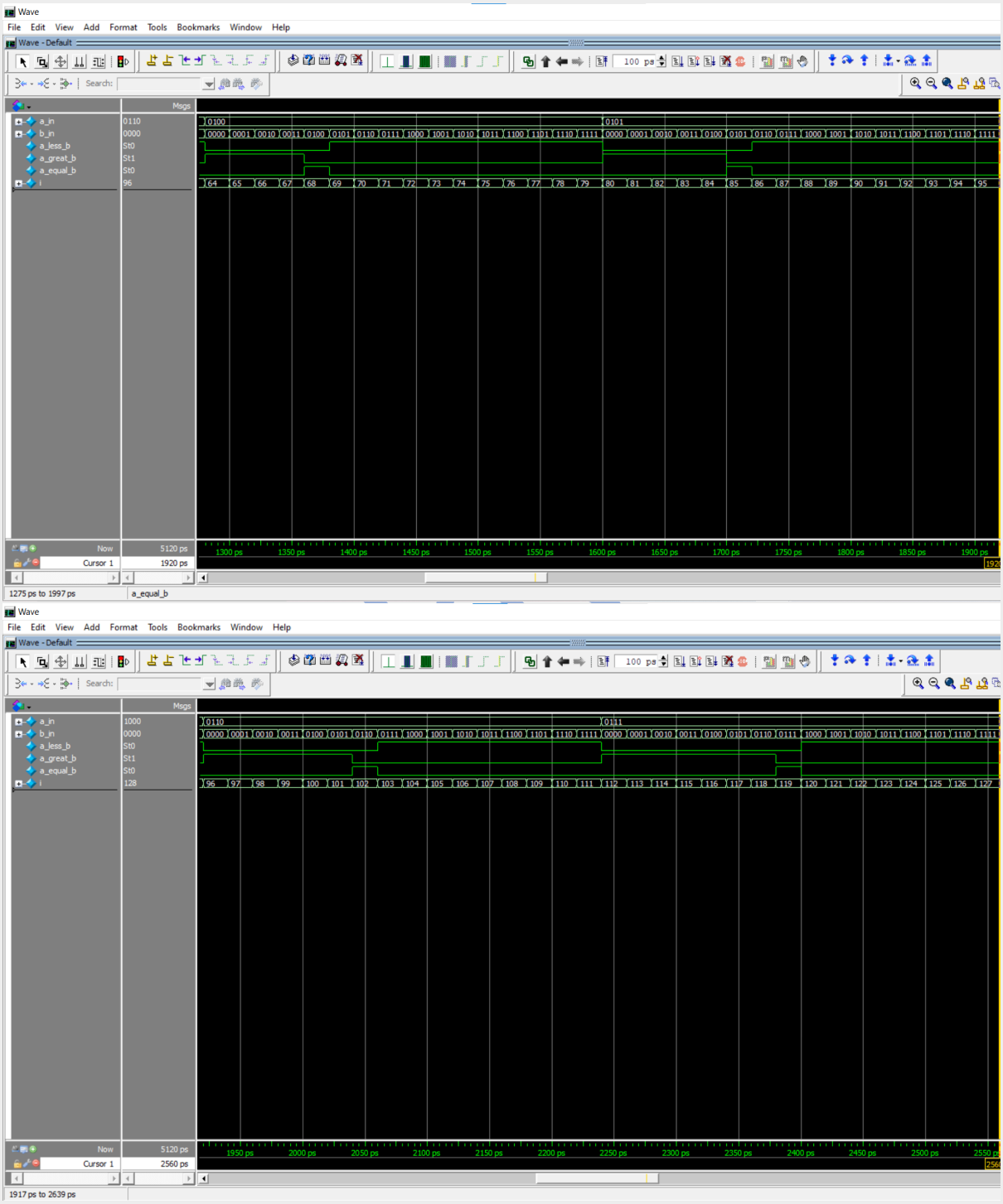
Waves:

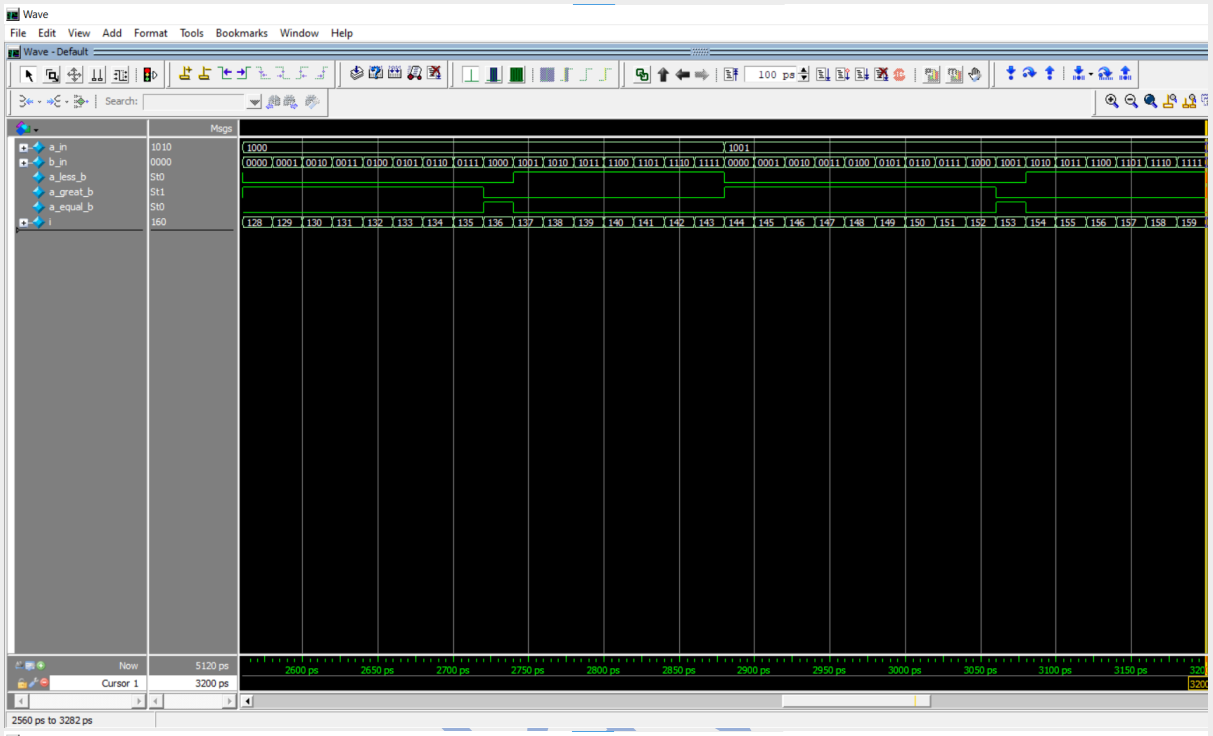


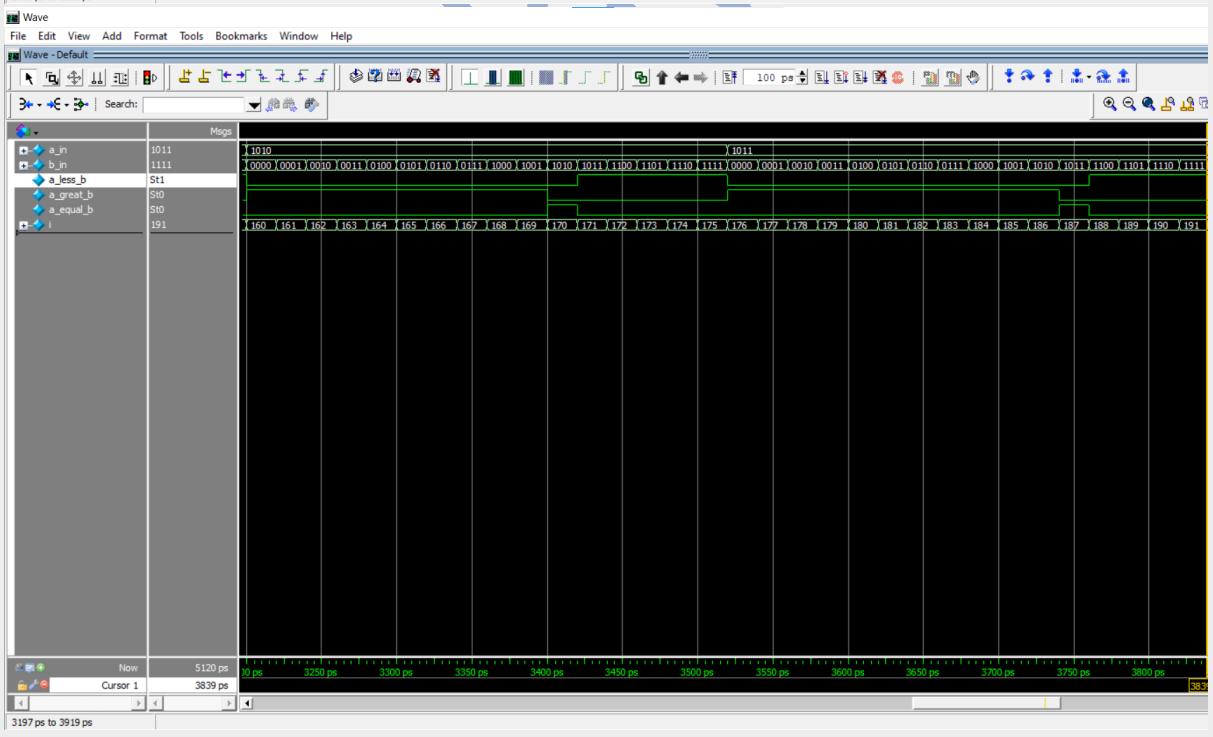


#100daysofrtl

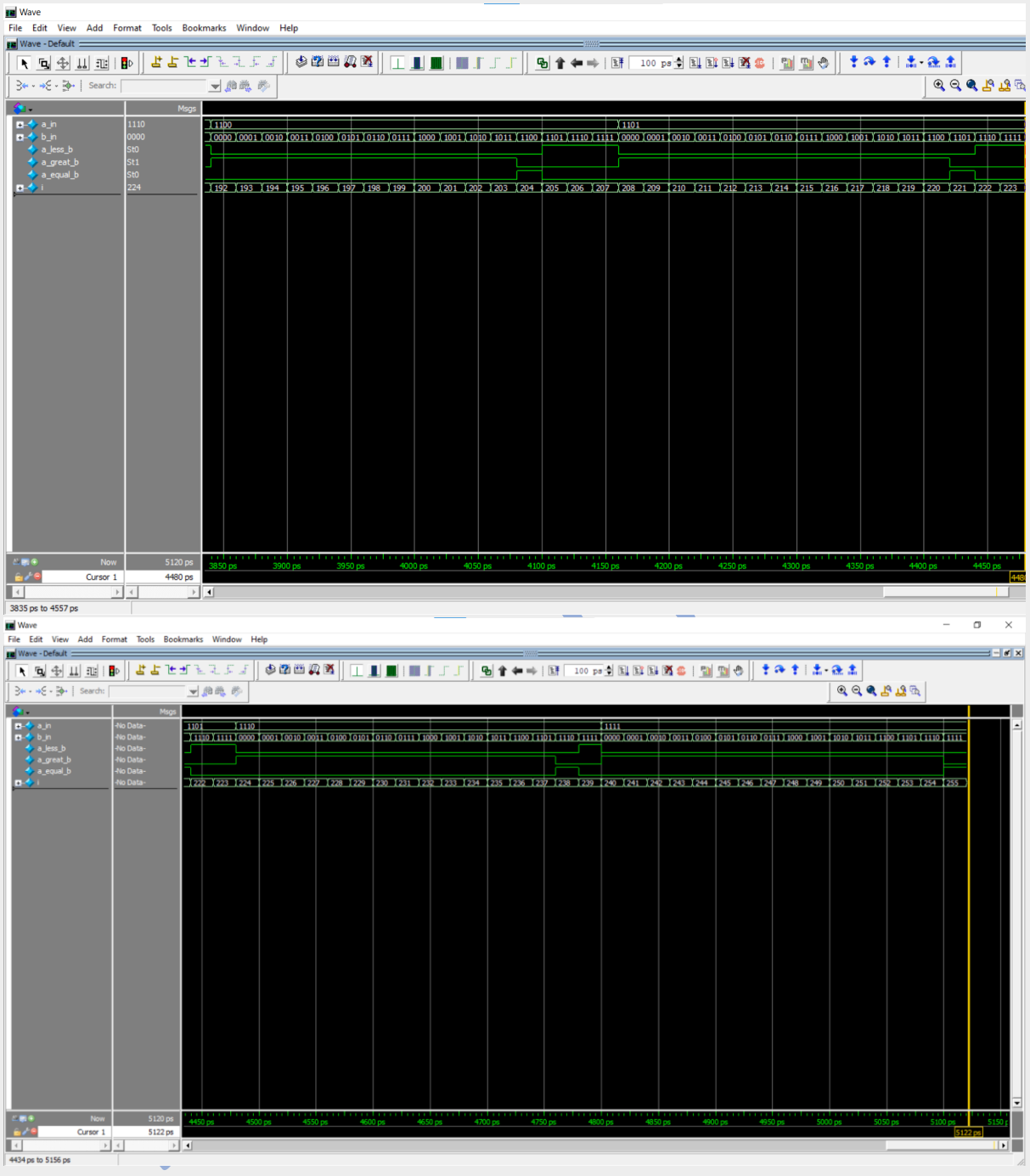


#100daysofrtl





#100daysofrtl



By,

Abilash P