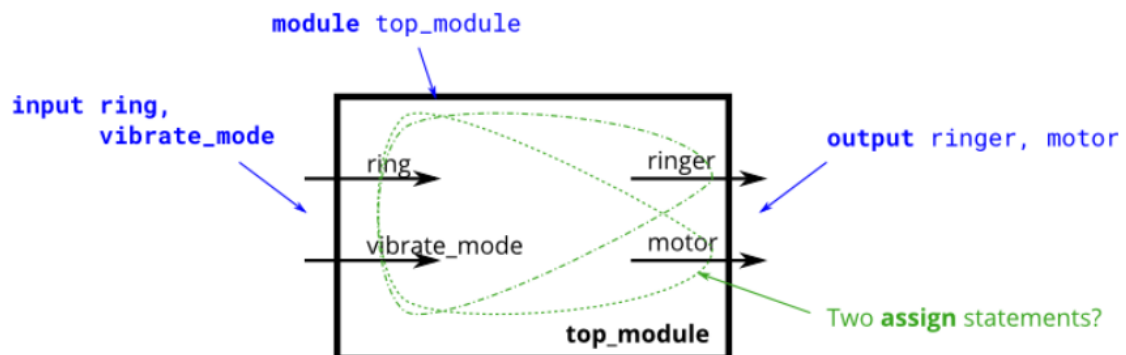


DAY-17

#100DAYSOFRTL

PROBLEM STATEMENT:--

1. Suppose you are designing a circuit to control a cellphone's ringer and vibration motor. Whenever the phone needs to ring from an incoming call (input **ring**), your circuit must either turn on the ringer (output **ringer** = 1) or the motor (output **motor** = 1), but not both. If the phone is in vibrate mode (input **vibrate_mode** = 1), turn on the motor. Otherwise, turn on the ringer.



Write your solution here

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Load

```
1 module top_module (  
2     input ring,  
3     input vibrate_mode,  
4     output ringer,    // Make sound  
5     output motor      // Vibrate  
6 );  
7  
8 assign motor=ring &vibrate_mode;  
9 assign ringer=ring &~(vibrate_mode);  
10  
11  
12 endmodule  
13
```

Submit

Submit (new window)

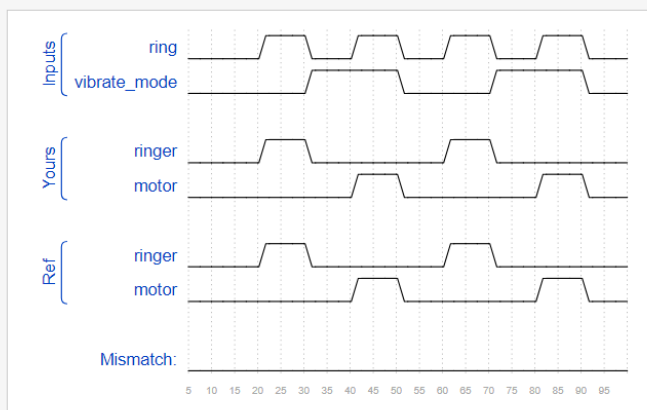
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Timing diagrams for selected test cases

These are timing diagrams from some of the test cases we used. They may help you debug your circuit. The diagrams show inputs to the circuit, outputs from your circuit, and the expected reference outputs. The "Mismatch" trace shows which cycles your outputs don't match the reference outputs (0 = correct, 1 = incorrect).



2.

A heating/cooling thermostat controls both a heater (during winter) and an air conditioner (during summer). Implement a circuit that will turn on and off the heater, air conditioning, and blower fan as appropriate.

The thermostat can be in one of two modes: heating ($\text{mode} = 1$) and cooling ($\text{mode} = 0$). In heating mode, turn the heater on when it is too cold ($\text{too_cold} = 1$) but do not use the air conditioner. In cooling mode, turn the air conditioner on when it is too hot ($\text{too_hot} = 1$), but do not turn on the heater. When the heater or air conditioner are on, also turn on the fan to circulate the air. In addition, the user can also request the fan to turn on ($\text{fan_on} = 1$), even if the heater and air conditioner are off.

Try to use only assign statements, to see whether you can translate a problem description into a collection of logic gates.

Write your solution here

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Load

```
1 module top_module (  
2     input too_cold,  
3     input too_hot,  
4     input mode,  
5     input fan_on,  
6     output heater,  
7     output aircon,  
8     output fan  
9 );  
10  
11  
12     assign heater = (mode & too_cold) | fan_on;  
13     assign aircon = (~mode & too_hot) | fan_on;  
14     assign fan = heater | aircon | fan_on;  
15  
16 endmodule  
17
```

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Running ModelSim simulation. [Show Modelsim messages...](#)

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3. A "population count" circuit counts the number of '1's in an input vector. Build a population count circuit for a 3-bit input vector.

Write your solution here

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```
1 module top_module(  
2     input [2:0] in,  
3     output [1:0] out );  
4  
5     assign out = {in[2] + in[1] + in[0], in[2] + in[1]};  
6  
7 endmodule  
8
```

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