

CMPE212 Lab3 Verifying Full Adder Circuit in Verilog and its Hardware Implementation

Objective

To build and verify full adder circuit in Verilog. To implement the full adder circuit using hardware and observe outputs.

Verilog

1. Connect to the Linux GL server using whichever terminal program you prefer, i.e. putty.exe
Hostname is "gl.umbc.edu" and connection type "SSH"
For mac/linux, open terminal and enter "ssh gl.umbc.edu".
2. Create the half adder module named "Half_Adder.v" if not done in the previous lab-

```
module ha(Sum,Carry,A,B);
    input A,B;
    output Sum,Carry;

    assign Sum=A^B;
    assign Carry=A&B;
endmodule
```

3. Create the full adder module named "Full_Adder.v" –

```
`include "Half_Adder.v"

module fa(Sum,Cout,A,B,Cin);
    input A,B,Cin;
    wire W1,W2,W3;
    output Sum,Cout;

    ha f1(W2,W1,A,B);
    ha f2(Sum,W3,W2,Cin);
    assign Cout=W1|W3;
endmodule
```

5. Create the testbench file named "Full_Adder_tb.v":

```
module fa_tb();

    reg[2:0] in;
    wire Sum,Cout;

    fa function1(Sum,Carry,in[2],in[1],in[0]);
    initial
    begin
        in = 3'b000;
        repeat(7) #50 in=in+1'b1;
    end
    initial
    $monitor(" A=%b B=%b Cin=%b ---> Sum=%b Cout=%b",in[2],in[1],in[0],Sum,Carry);

endmodule
```

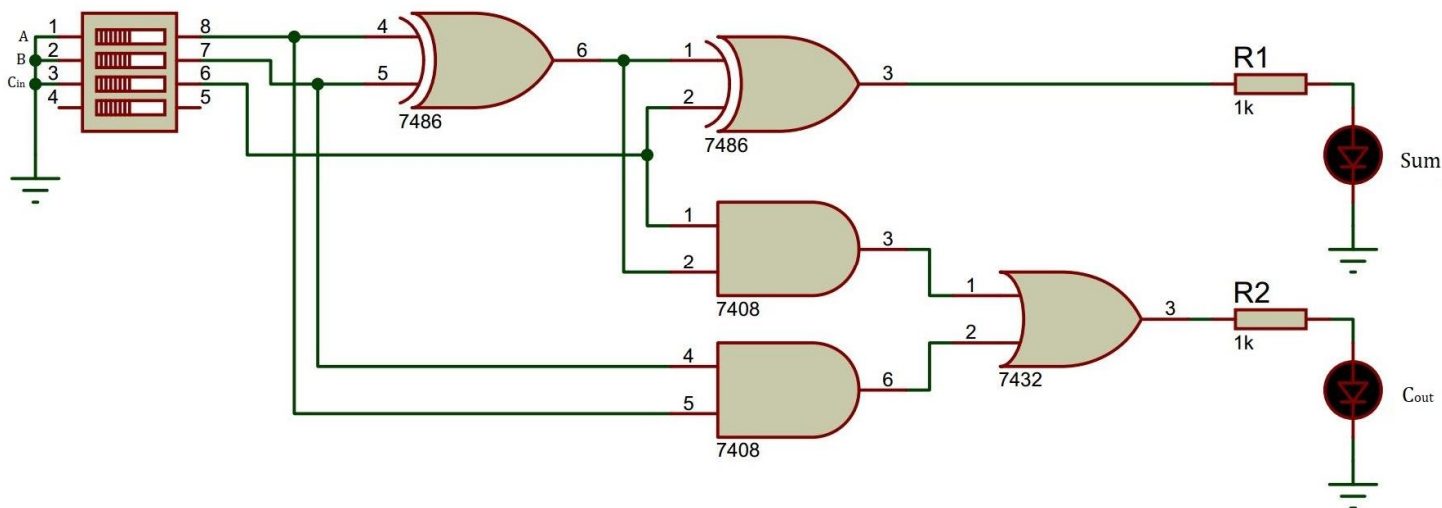
6. Simulate your full adder to get the output with following command-

```
verilog Full_Adder_tb.v Full_Adder.v
```

7. Show your output to the TA.

Hardware

1. Collect the following items from the corner of the last workplace- Breadboard, ic 7408 x 1, ic 7486 x 1, ic 7432 x 1, DIP switch x 1, 1k resistor x 2, LED x 2, connecting wires, multimeter, multimeter probes.
2. Read the "Notes" section below before starting making your circuit.
3. Construct the following circuit on the breadboard-



4. Give the power and ground connection to the ICs (they are not shown in the above schematic)
5. Switch the power module on. Set the voltage to 5V.
6. Connect the power module with breadboard using banana-jack and alligator clips.
7. Vary the switches in the DIP switch to give inputs. Observe the output in the LEDs.
8. Show your outputs to the TA.

Notes:

1. Don't connect the power module to the breadboard before completing the circuit and setting the voltage to 5V.
2. Troubleshoot using the multimeter and oscilloscope.
3. Refer to the Discussion_03 slide for the pin configurations if necessary.
4. Always to refer to Discussion_01 slides while using the instruments and devices.

Remarks

Have fun and ask questions to your TAs.