

Half Adder

Source Code And Output

The image displays two side-by-side screenshots of the ISE Project Navigator (P.20131013) showing the source code for a Half Adder module. The left screenshot shows the module `e21` with the following code:

```
3 // Company:
4 // Engineer:
5 //
6 // Create Date: 09:48:43 08/08/2019
7 // Design Name:
8 // Module Name: e21
9 // Project Name:
10 // Target Devices:
11 // Tool versions:
12 // Description:
13 //
14 // Dependencies:
15 //
16 // Revision:
17 // Revision 0.01 - File Created
18 // Additional Comments:
19 //
20 ///////////////////////////////////////////////////////////////////
21 module e21(
22     input a,
23     input b,
24     output sum,
25     output carry
26 );
27 xor(sum,a,b);
28 and(carry,a,b);
29 endmodule
30
```

The right screenshot shows the module `e21_1` with the following code:

```
3 // Company:
4 // Engineer:
5 //
6 // Create Date: 10:01:36 08/08/2019
7 // Design Name:
8 // Module Name: e21_1
9 // Project Name:
10 // Target Devices:
11 // Tool versions:
12 // Description:
13 //
14 // Dependencies:
15 //
16 // Revision:
17 // Revision 0.01 - File Created
18 // Additional Comments:
19 //
20 ///////////////////////////////////////////////////////////////////
21 module e21_1(
22     input a,
23     input b,
24     output sum,
25     output carry
26 );
27 assign sum= a^b;
28 assign carry= a&b;
29 endmodule
30
```

The image displays two screenshots of the ISE Project Navigator and ISim. The left screenshot shows the source code for the module `e21_2` with the following code:

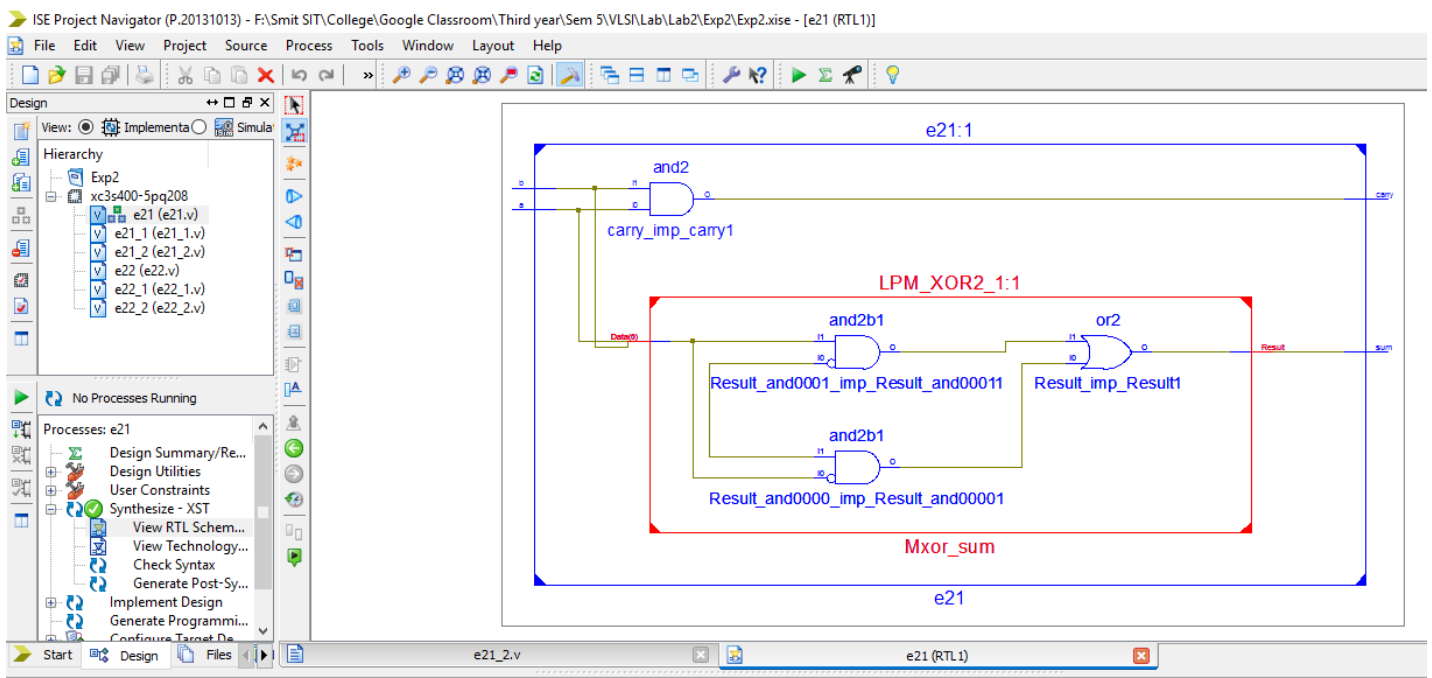
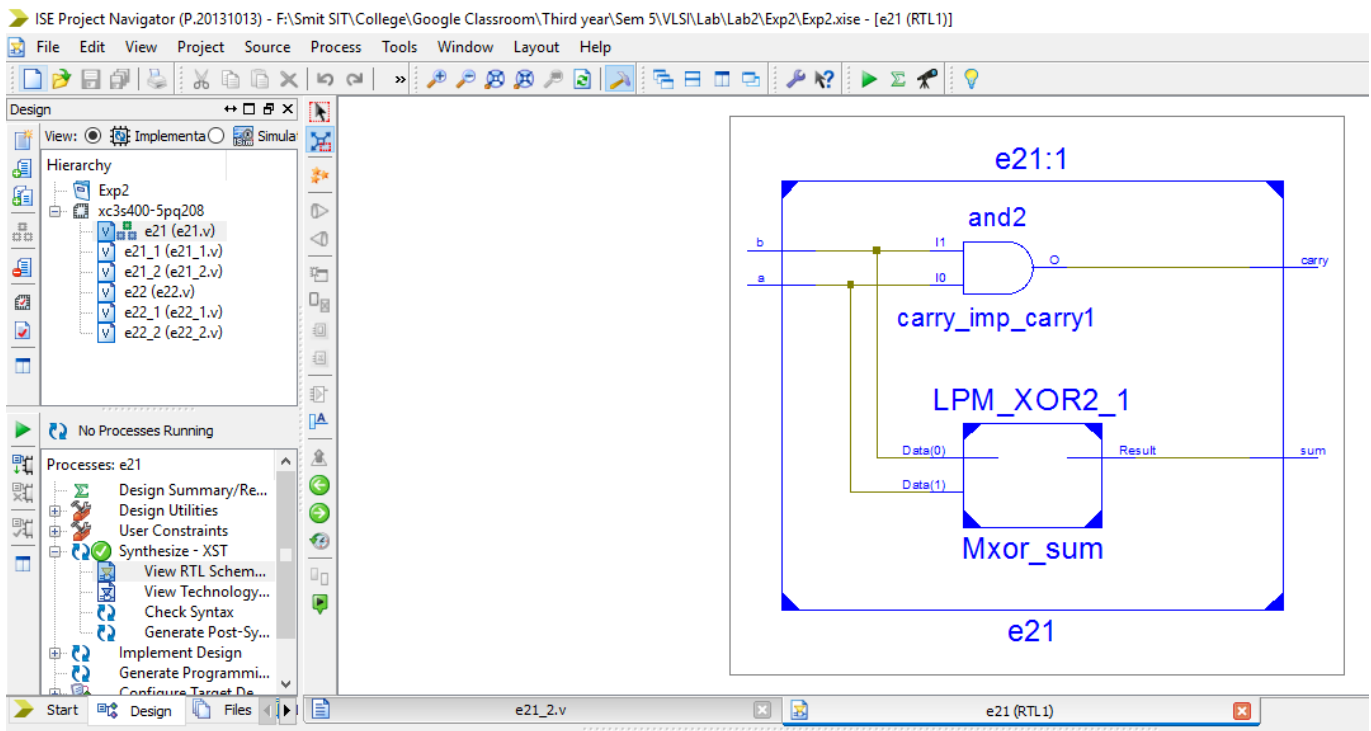
```
3 // Company:
4 // Engineer:
5 //
6 // Create Date: 10:41:17 08/08/2019
7 // Design Name:
8 // Module Name: e21_2
9 // Project Name:
10 // Target Devices:
11 // Tool versions:
12 // Description:
13 //
14 // Dependencies:
15 //
16 // Revision:
17 // Revision 0.01 - File Created
18 // Additional Comments:
19 //
20 ///////////////////////////////////////////////////////////////////
21 module e21_2(
22     input a,
23     input b,
24     output sum,
25     output carry
26 );
27 assign sum= a^b;
28 assign carry= a&b;
29 endmodule
30
```

The right screenshot shows the ISim simulation results for the module `e21_2`. The simulation is completed successfully, and the output signals `sum` and `carry` are shown as waveforms. The console output shows the simulation engine GUI launched successfully and the process "Simulate Behavioral Model" completed successfully.

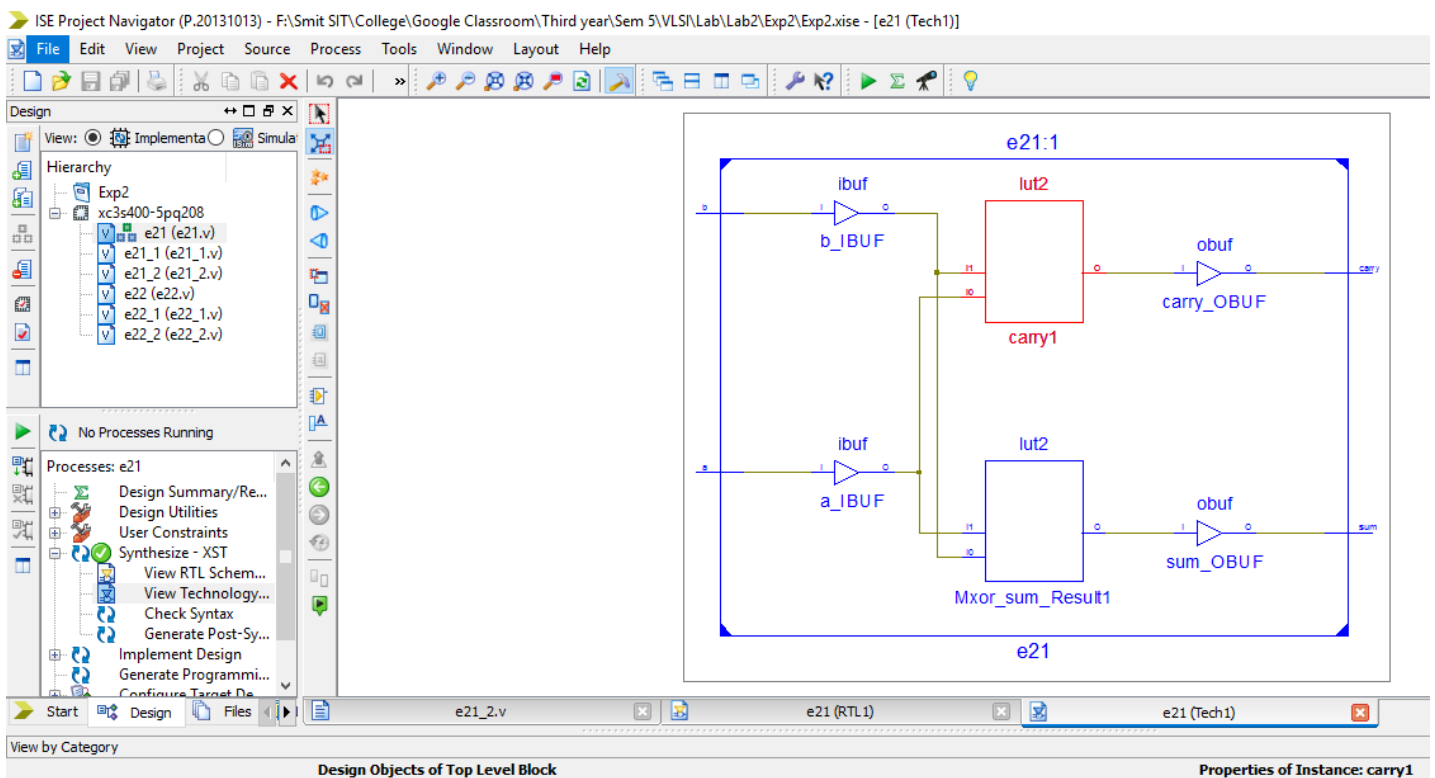
Name	Value
a	0
b	1
sum	1
carry	1

Sim Time: 4,439,646,400 ps

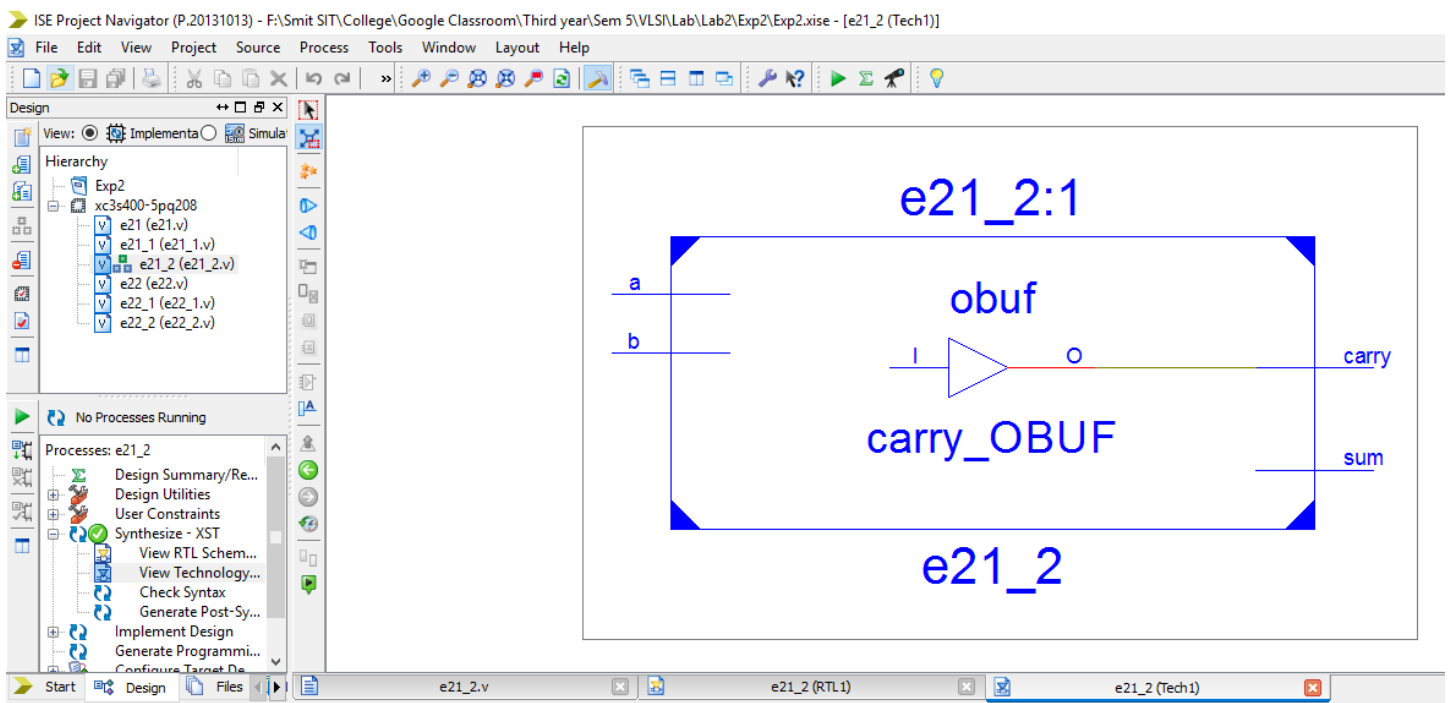
RTL Schematic without Arithmetic Operator



Technology Schematic without Arithmetic Operator



Technology Schematic with Arithmetic Operator



RTL Schematic with Arithmetic Operator

