

Name and Std ID:

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Date:

03/22/22**PRELAB:**

Q1. Before you fill in the answers to this prelab make sure that you understand binary arithmetic, especially signed number representation (2's Complement) and overflow in arithmetic addition and subtraction. Do the following arithmetic operations and write down the expected sum, carry and overflow:

In case of subtraction, since we are doing a 2's Complement addition Cout is the carryout of the adder.

Binary numbers to add/subtract	Sum	Cout	Overflow
1011 - 0110	0101	1	1
1001 - 0010	0111	1	1
0001 + 0111	1000	1	1
1100 + 0110	0010	0	0
0011 - 1101	0110	0	0
0101 + 1011	0000	0	0

$$\begin{array}{r}
 \boxed{10}10^x \\
 1011 \\
 + 1010 \\
 \hline
 0101
 \end{array}
 \quad
 \begin{array}{r}
 \boxed{10}00^x \\
 1001 \\
 + 1110 \\
 \hline
 0111
 \end{array}
 \quad
 \begin{array}{r}
 \boxed{10}11^x \\
 0001 \\
 + 0111 \\
 \hline
 1000
 \end{array}
 \quad
 \begin{array}{r}
 \boxed{11}00^x \\
 1100 \\
 + 0110 \\
 \hline
 0010
 \end{array}$$

$$\begin{array}{r}
 \boxed{11}01^x \\
 0101 \\
 + 1011 \\
 \hline
 0000
 \end{array}
 \quad
 \begin{array}{r}
 \boxed{10}01^x \\
 0011 \\
 + 0011 \\
 \hline
 1010
 \end{array}$$

Lab 7 Answer Sheet

Q2. Complete the truth table for a full adder:

X	Y	Cin	Cout	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

Q3. Complete the assignment expressions for S and Cout below:

```

module FA (Cin, X, Y, S, Cout);
input Cin, X, Y;
output Cout, S;
assign S = (expression for S);
assign Cout = (expression for Cout);

```

Expression for S: $(\bar{x} \cdot \bar{y} \cdot C_{in}) + (\bar{x} \cdot y \cdot \bar{C}_{in}) + (x \cdot \bar{y} \cdot \bar{C}_{in}) + (x \cdot y \cdot C_{in})$

Expression for Cout: $(\bar{x} \cdot y \cdot C_{in}) + (x \cdot \bar{y} \cdot C_{in}) + (x \cdot y \cdot \bar{C}_{in}) + (x \cdot y \cdot C_{in})$

TA Initials: _____

LAB:

ModelSim demonstrates a good circuit. TA Initials: _____