Computer Assignment #2
Due Su. 11/01

Full-Adder Implementation

Total Points: 25

1 Introduction

In this lab you will design and implement a Full Adder (FA) in order to add binary digits. The lab is divided into four parts: design, schematic entry, simulation, and implementation. Be sure to see the "What to Turn In" section at the end of the lab before you begin.

2 Design

Build a full-adder that has inputs A, B and C_{in} and outputs S and C_{out}. Note: this is already done in HW 7.4.

3 Schematic Entry

Start Quartus and create a new project named "cpe100_comp2_xx" (where xx are your initials) and create your FSM schematic. You should first create a single FA and test its operation. Once you have confirmed proper operation, replicate the gates and wire appropriately in order to build a 4-bit adder.

4 Simulation

With your design completed, you are now able to use ModelSim to verify its operation. You will want to perform enough input variation to demonstrate that the FSM performs all functions correctly. At minimum you must show the the result of addition of:

Table 1: Required FA Input Combinations

A	B
0111	0111
0011	0101
1000	0001
1111	0001
1111	1111
1000	1000

For more information, see the ModelSim Tutorial online. This highlights lots of advanced features that may make simulation easier. Start reading from Section 3. In particular, look at how to create a clock signal (search: `VSIM> force -deposit /clk 1 0, 0 10 ns -repeat 20`) and 3.3.1 Input generation (search: `VSIM> force -deposit /keys_in 10#4, 10#1 20, 10#6 40, 10#9 60, 10#0 80`).

5   What to Turn In

1. (25 points) Full-Adder Implementation

   (a) (0 points) How many hours did you spend on the lab?

   (b) (10 points) A printout of the Quartus II schematic.

   (c) (10 points) A print out of the ModelSim simulation of the circuit. Make sure you test the circuit completely and show the results at minimally for those inputs in Table 1.

   (d) (5 points) A brief paragraph (2-4 sentences) highlighting what you learned on this lab assignment. List any difficulties you encountered.