Computer Organization and Assembly Language Programming (CMSC 313)
Fall 2005

Homework #4

Homework assigned Tues 6 Dec to be collected on Tues 13 Dec

Objective

In this assignment, you are to design a counter with an arbitrary count. You are to verify the counter by setting it up and running it in an appropriate simulation in B2Logic. An example of such a counter and the method for designing it is shown in both the class-notes and the course textbook ("arbitrary count sequence counter" pp338-339).

Problem Description

This synchronous counter is to be designed to follow one of two repeating sequences, the sequence being selected by an input called C. When C = 0, the steady-state sequence is '00', '01', '11'. When C = 1 the steady-state sequence is '00', '11', '01'. You must include the condition where the count happens to come up as '10' by chance during power-up in your state transition diagram.

Submission Requirements for each design -- numbered items in [] brackets

DESIGN PHASE

Draw up your design as follows: [1] Indicate the number of FF's required to store the state bits. [2] Draw the state transition diagram and [3] a state transition table. [4] Draw K-Maps for the D-type FF next state combinational logic. [5] Produce a schematic in B2Logic using positive edge-triggered D-type FF's, along with 2- or 3-input AND and OR gates and inverters as provided in B2Logic. [6] Explain in writing what you would need to do in order to redesign the FSM using negative edge-triggered SR FF's. Submit parts [1] through [6] inclusive in hardcopy format.

SIMULATION PHASE

Build and debug your circuit using B2Logic. Draw the schematic of your FSM in a flat hierarchical style so that all FF's and combinational logic are visible. Operate with a 1 MHz, 50% duty cycle clock. Note that gate delays are to be set to nominal for the simulation.

Save your circuit as [7] a *.CKT file and the simulation command file as [8] a *.TXT file using a filename derived according to the following format:

FILENAME: First two characters of the filename - Initial of your first name followed by 4 letters of your last name e.g. for Des Smithers in section 0201 this would be compacted to DSMIT

The compacted name would have an appended numerical sequence indicating your section number, either 0101 or 0201

So for our student Des Smithers, I would expect to collect two files, one called DSMIT0201.CKT and DSMIT0201.TXT These are to be applied to the Digital Dropbox in Blackboard before 23:59 hrs on Tues 13 Dec.

Notes: (1) Approved textbook: "Logic and Computer Design Fundamentals" Mano and Kime