University of British Columbia
Electrical and Computer Engineering
Digital Design and Microcomputers
CPEN312

Lab 3 - Counters

For this lab you will design and test a 12 hour clock using both Multisim and Quartus Prime.

Tools and Equipment Needed

1. Multisim V14 or newer.
2. Altera DE0-CV board.
3. Quartus Prime version 15 or newer.

Activities

1) Design and simulate a clock using Multisim. The clock must display hours, minutes, and seconds with 7-segment displays using a 12H format. The hours, minutes, and seconds must be settable using any method of your choice. There is no need to have an AM/PM indicator. On power on, the clock must display a valid time, for example 12:00:00 or 01:00:00. The STEP_VOLTAGE source can be used to reset your clock for this purpose. You can use any of the logic components available in Multisim, including (but not limited to) logic gates, flip-flops and counters. In order to simplify your design a little bit, you may use also the 'DCD_HEX' display available in the Multisim libraries which converts a 4-bit input to its 7-segment representation.

2) Design, code, and test a clock that displays hours, minutes, and seconds using the 7-segment displays available in the Altera DE0-CV board. The clock should use the 12H format. The hours, minutes, and seconds must be settable, using any method of your choice. There is no need to have an AM/PM indicator. You can use any of the components available in the schematic editor of Quartus Prime or create your own components using VHDL. If you prefer, you can code your clock completely in VHDL. On power on, the clock must display a valid time, for example 12:00:00 or 01:00:00.