ECGR2252 "Electrical Engineering Design I"
Department of Electrical & Computer Engineering
UNC Charlotte, Spring 2010

Mini-Project 1 (10 pt.)

Individual Assignment Due 11:00am on Feb. 11, 2010

Design of Timing Circuits using CAD Tools (ABET PO.a, PO.k):

Design a spreadsheet to automatically calculate the resistance and capacitance values (in kΩ and nF) for i) a one-shot (aka monostable) circuit whenever a new value for a desired pulse-width (in μs) is entered into the spreadsheet, and ii) an astable circuit whenever new values for frequency (in kHz) and active-low duty cycle (d.c.) are entered into the spreadsheet. Also, use a CAD tool (e.g., OrCAD Capture) to simulate both circuits and compare the results with your spreadsheet calculations.

Please turn in on Feb. 11 (under the same numbering system as shown below):

a. One-shot circuit sample design calculations for a pulse-width of 1000μs, and the one-shot circuit schematic with the parameter values of the sample calculations and Vcc of 5V. (2 pts.)

b. Astable circuit sample design calculations for f=20kHz and d.c.= 0.33, and the astable circuit schematic with the parameter values of the sample calculations and Vcc of 5V. (2.5 pts.)

c. OrCAD plots of the one-shot's output and trigger voltages on the same axes for parameter values in (a) above. Use a proper Vpulse signal from OrCAD library to trigger your one-shot. Label the output plot with x-y coordinates such that one can calculate the pulse-width from the labeled values on the plot. (1.5 pts.)

d. OrCAD plot of the astable's output for parameter values in (b) above. Label the output plot with x-y coordinates such that one can calculate the steady state frequency and duty cycle from the labeled values on the plot. (1.5 pts)

e. Your spreadsheet with **embedded** design equations for both one-shot and astable circuits. Populate your spreadsheet with one-shot design calculations for pulse-widths of 10, 100, 1,000, 10,000, 100,000, and 1,000,000 μs. Also, populate your spreadsheet with astable design calculations for d.c.=0.33 and frequencies of 0.1, 1, 10, 20, 100 and 1,000kHz. Capacitor values are to be chosen to result in resistor values that are in kΩ. Add the simulated values for pulse-width in (c), and for f and d.c. in (d) above to your spreadsheet for comparison with designed values. Your spreadsheet must have appropriate column headings to make it easy to use. (2.5 pts.)

Submission:

Your report must be typed using a word processing software. It must have a title similar to

ECGR2252 "Electrical Engineering Design I" – Spring 2010
Mini-project 1 - Design of Timing Circuits using CAD Tools

Your Name Your Major (BSEE, BSCpE, or both)

Turn in hardcopies of your report and spreadsheet in class on Feb. 11. Also, upload the electronic copies of your report and spreadsheet into the assignment dropbox in Blackboard by 11:00am on Feb. 11.

Submission Policy

Late submissions will be accepted up to 5 business days but 10% will be deducted for each day that a submission is late. Lateness policy applies to electronic submissions as well. All electronic submissions with a time-stamp that is later than 11:00am of the due date will be considered late. 50% will be deducted for any submission that is not organized according to the numbering (a) through (e) above.