Homework #2 – Hybrid Embedded Systems

- Due September 17, 2010.

Problem 1: Expand the SDRAM test program to evaluate the entire chip. Currently, it only goes up to 128 words. Use the LEDs and LCD display from lab 2 to show the count and number of errors. (15 points)

Problem 2: There are many types of memory test programs accepted in industry. Find examples of three of them and write your own more advanced memory test program for SRAM. Most memory test programs use several algorithms to check for different types of faults. Execute the test code from SDRAM. (30 points)

Problem 3: Write a retro version of the 1970’s classic kill the bit computer game for the DE2 board. The goal in kill the bit game is to turn off all of the four LEDs using the four pushbuttons. The game starts with an initial non-zero pattern displayed in the LEDs. The pattern constantly does a circular shift moving through the LEDs in a loop with a time delay to slow down the shifts. If you hit one of the four pushbuttons exactly when the same number LED is turned on, it will turn off one LED in the pattern. If you hit a pushbutton and its LED is off another LED turns on.

Here is how the program works. Each time just before the pattern shifts, the pattern is bit-wise exclusive or’ed with one input sample from the pushbuttons to generate a new pattern. When both the pushbutton is pushed and the corresponding bit in the pattern are High, one less bit will be High in the new pattern after the exclusive or (i.e. 1 xor 1 is 0). After the shift, one less LED will be turned on since there is one less “1” in the new pattern. If your timing is off and the LED is not turned on when you hit the pushbutton, a new high bit will be generated in the pattern (i.e. 1 xor 0 is 1). When this happens, the new “1” bit in the pattern lights another LED. Note that you need a “1” when a pushbutton is pressed and a “1” to turn on an LED for the xor function to work.

Display the elapsed time in the LCD display and stop the time display when a player wins the game (turns out all the LEDs). Adjust the shift time delay for reasonable game play. Blink all of the LEDs when a player wins. (55 points)