

## Assignment 1

Due Monday, February 20. Submit your assignment using the appropriate dropbox on the course web site. Assignments submitted after the solutions are made available will be given a mark of zero.

Answer the following exercises from Chapter 4 of Harris & Harris:

4.3 and 4.4 I've supplied a .zip file with the Verilog code given in the book (in `asg1-testbench3.sv`) and the first few lines of test vectors (`asg1-example.tv`). Modify the code and test vectors to meet the requirements of the question. Use a packed array for the input.

Your answer should include the modified testbench, test vectors and transcript from running the simulation with Modelsim.

*Hints: you will need to change several (7?) lines in the testbench code to accommodate the different-width input. You can use the %p format specifier to print a packed array.*

4.22 Exercise 2.38 reads (in part):

*Exercise 2.38 An M-bit thermometer code for the number k consists of k 1's in the least significant bit positions and M - k 0's in all the more significant bit positions. A binary-to-thermometer code converter has N inputs and  $2^N - 1$  outputs. It produces a  $2^N - 1$  bit thermometer code for the number specified by the input. For example, if the input is 110, the output should be 0111111. Design a 3:7 binary-to-thermometer code converter.*

...

Use Verilog. Try to use a loop rather than listing all the possible outputs.

4.48 and 4.49

4.27 Simulate your solution to show it works properly.

You can use the following testbench if you want:

```
module jkff_tb ( );  
  
    logic j, k, clk, q;  
  
    jkff j0 (.*) ;  
  
    initial begin  
        for ( logic [3:0] i=4'b0100 ; i<4'b1101 ; i++ )  
            #1us {j,k,clk} = i[2:0] ;  
            $stop ;  
        end  
  
endmodule
```