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// EE 271
// Lab 5

// userInput module takes clk, reset, and button as 1-Bit inputs and returns 1-Bit out
// This module instatiates the buttons for user input.

module userInput(out, clk, reset, button);
   output logic out;
   input logic clk, reset, button;

   enum {on, off} ps, ns;

   always_comb begin
      case(ps)
         on:   if(button) ns = on;
               else ns = off;

         off:  if(button) ns = on;
               else ns = off;

      endcase
   end

   // same as Lab 6 behavior
   assign out = (ps == on & ns == off);

   always_ff @(posedge clk) begin
      if(reset)
         ps <= off;
      else
         ps <= ns;
   end
endmodule

// userInput_testbench tests all expected, unexpected, and edgecase behaviors

module userInput_testbench();
   logic clk, reset;
   logic button;
   logic out;

   userInput dut (.out, .clk, .reset, .button);

   parameter CLOCK_PERIOD = 100;
   initial begin
      clk <= 0;
      forever #(CLOCK_PERIOD / 2)
      clk <= ~clk;
   end

   initial begin
      reset <= 1;                @(posedge clk);
                                 @(posedge clk);
      reset <= 0;                @(posedge clk);
                                 @(posedge clk);
      button <= 1;               @(posedge clk);
                                 @(posedge clk);
                                 @(posedge clk);
      button <= 0;               @(posedge clk);
                                 @(posedge clk);
                                 @(posedge clk);
      button <= 1;               @(posedge clk);
                                 @(posedge clk);
                                 @(posedge clk);
      button <= 0;               @(posedge clk);
                                 @(posedge clk);
                                 @(posedge clk);
      button <= 1;               @(posedge clk);
                                 @(posedge clk);
                                 @(posedge clk);
      button <= 0;               @(posedge clk);
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                                 @(posedge clk);
                                 @(posedge clk);
      button <= 1;               @(posedge clk);
                                 @(posedge clk);
      $stop;
   end
endmodule
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