ECE 152A: Lab n

Erk Sampat

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Part A

Step A.1

a)

TwoByTwo_tb.v

```
// functions
typedef enum logic [1:0] {
  NA   = 2'b00,
  LOAD  = 2'b01,
  LEFT  = 2'b10,
  RIGHT = 2'b11
} funct_t;

module shift_register #(parameter WIDTH = 4) (
  input logic        clk,
  input logic        rst,
  input funct_t        funct_i,
  input logic [WIDTH-1:0] word_i,   // for LOAD
  input logic        serial_i, // for LEFT/RIGHT
  output logic [WIDTH-1:0]  out_o
);

  logic [WIDTH-1:0] out_d, out_q;
  assign out_o = out_q;

  always_comb begin
    out_d = out_q; // default value
    case (funct_i)
      NA:   out_d = out_q;
      LOAD:   out_d = word_i;
      LEFT:   out_d = {out_q[WIDTH-2:0], serial_i};
      RIGHT:  out_d = {serial_i, out_q[WIDTH-1:1]};
    endcase
  end

  always_ff @(posedge clk or posedge rst) begin
    if (rst) begin
      out_q <= '0;
    end else begin
      out_q <= out_d;
    end
  end

endmodule
```

Part B