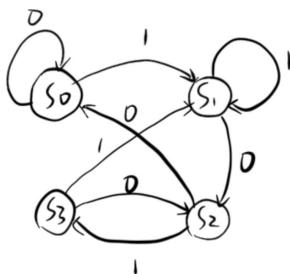


习题 5

(1) 状态分配

状态	Q_1	Q_0	含义
S_0	0	0	未检测
S_1	0	1	已检测
S_2	1	0	已检测 0
S_3	1	1	已检测 0 1



激励函数: $Q^{n+1} = D$

D 触发器

状态表

现状	输入 X	次态	输出 Z
00	0	00	0
00	1	01	0
01	0	10	0
01	1	01	0
10	0	00	0
10	1	11	1
11	0	10	0
11	1	01	0

$D_1:$

Q, Q_0	X	0	1
00		00	01
01		10	01
11		10	01
10		00	01

$$D_1 = Q_0 \bar{X} + Q_1 \bar{Q}_0 X$$

$D_0:$

Q, Q_0	X	0	1
00		00	01
01		10	01
11		10	01
10		00	10

$$D_0 = X$$

$$\text{输出 } Z = Q_1 \bar{Q}_0 X$$

```

module seq_101_detector(
    input wire clk,
    input wire rst_n,
    input wire x,
    output reg y
);
    localparam S0 = 2'b00;
    localparam S1 = 2'b01;
    localparam S2 = 2'b10;
    reg [1:0] state, next_state;

```

```

always @(posedge clk or negedge rst_n) begin
    if (!rst_n)
        state <= S0;
    else
        state <= next_state;
end

always @(*) begin
    y = 0;
    case (state)
        S0: begin
            if (x) next_state = S1;
            else next_state = S0;
        end
        S1: begin
            if (x) next_state = S1;
            else next_state = S2;
        end
        S2: begin
            if (x) begin
                next_state = S1;
                y = 1;
            end
            else next_state = S0;
        end
        default: next_state = S0;
    endcase
end

endmodule

```

