多路选择器实验

设计代码

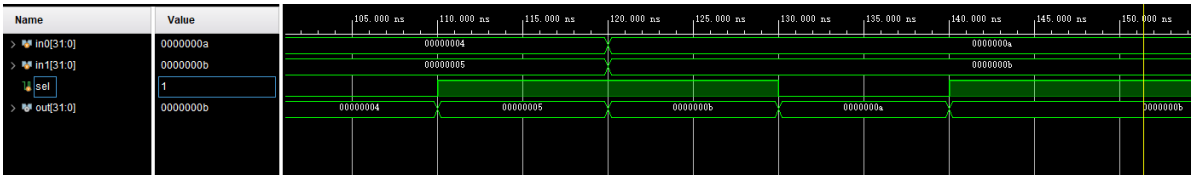
```
`timescale 1ns / 1ps
//////////////////////////////////////////////////////////////////////////////////
// Company:
// Engineer:
//
// Create Date: 2024/10/14 19:30:20
// Design Name:
// Module Name: mux_4to1
// Project Name:
// Target Devices:
// Tool Versions:
// Description:
//
// Dependencies:
//
// Revision:
// Revision 0.01 - File Created
// Additional Comments:
//
//////////////////////////////////////////////////////////////////////////////////

module mux2to1_32bit (
    input [31:0] in0,  // 输入0
    input [31:0] in1,  // 输入1
    input sel,         // 选择信号
    output reg [31:0] out  // 输出
);

    always @(*) begin
        case (sel)
            1'b0: out = in0;  // sel = 0时，选择 in0
            1'b1: out = in1;  // sel = 1时，选择 in1
            default: out = 32'b0;  // 默认输出 0
        endcase
    end
endmodule
```

仿真代码

```
`timescale 1ns / 1ps

module mux2to1_32bit_tb;

    // Inputs
    reg [31:0] in0;
    reg [31:0] in1;
    reg sel;

    // Outputs
    wire [31:0] out;

    // 实例化待测试模块
    mux2to1_32bit uut (
        .in0(in0),
        .in1(in1),
        .sel(sel),
        .out(out)
    );

    initial begin
        // 初始化输入信号
        in0 = 32'h00000004; // 十六进制表示4
        in1 = 32'h00000005; // 十六进制表示5
        sel = 0;

        // 等待100纳秒，观察初始状态
        #100;

        // 测试1：选择 in0
        sel = 0;
        #10;
        $display("Time: %t | sel: %b | out: %h", $time, sel, out);

        // 测试2：选择 in1
        sel = 1;
        #10;
        $display("Time: %t | sel: %b | out: %h", $time, sel, out);

        // 改变输入信号
        in0 = 32'h0000000A; // 十六进制表示10
        in1 = 32'h0000000B; // 十六进制表示11
        #10;

        // 测试3：选择 in0
        sel = 0;
        #10;
        $display("Time: %t | sel: %b | out: %h", $time, sel, out);

        // 测试4：选择 in1
        sel = 1;
        #10;
        $display("Time: %t | sel: %b | out: %h", $time, sel, out);
```

```
        // 测试完成
        $display("All tests completed.");
        $finish;
    end
endmodule
```

仿真结果



控制台输出

```
Vivado Simulator 2019.2
Time resolution is 1 ps
Time:               110000 | sel: 0 | out: 00000004
Time:               120000 | sel: 1 | out: 00000005
Time:               140000 | sel: 0 | out: 0000000a
Time:               150000 | sel: 1 | out: 0000000b
All tests completed.
```