// Combined Module

module sensors\_detectors\_automation(

input wire clk, // System clock

input wire reset, // System reset

input wire smoke\_sensor, // Smoke detector input

input wire gas\_sensor, // Gas leak detector input

input wire motion\_sensor, // Motion sensor input

input wire [7:0] temp\_sensor, // Temperature sensor input (8-bit temperature)

output reg smoke\_alert, // Smoke alert output

output reg gas\_alert, // Gas alert output

output reg motion\_alert, // Motion alert output

output reg temp\_alert // Temperature alert output

);

// Parameters

parameter TEMP\_THRESHOLD = 8'd30; // Temperature threshold (e.g., 30 degrees)

// Sequential block to monitor and update alerts based on sensor inputs

always @(posedge clk or posedge reset) begin

if (reset) begin

smoke\_alert <= 1'b0;

gas\_alert <= 1'b0;

motion\_alert <= 1'b0;

temp\_alert <= 1'b0;

end else begin

// Smoke Alert: Trigger when smoke sensor is activated

smoke\_alert <= smoke\_sensor;

// Gas Alert: Trigger when gas sensor is activated

gas\_alert <= gas\_sensor;

// Motion Alert: Trigger when motion is detected

motion\_alert <= motion\_sensor;

// Temperature Alert: Trigger if temperature exceeds threshold

temp\_alert <= (temp\_sensor > TEMP\_THRESHOLD) ? 1'b1 : 1'b0;

end

end

endmodule

// Test Bench

module tb\_sensors\_detectors\_automation();

// Testbench signals

reg clk;

reg reset;

reg smoke\_sensor;

reg gas\_sensor;

reg motion\_sensor;

reg [7:0] temp\_sensor;

wire smoke\_alert;

wire gas\_alert;

wire motion\_alert;

wire temp\_alert;

// Instantiate the module under test

sensors\_detectors\_automation uut (

.clk(clk),

.reset(reset),

.smoke\_sensor(smoke\_sensor),

.gas\_sensor(gas\_sensor),

.motion\_sensor(motion\_sensor),

.temp\_sensor(temp\_sensor),

.smoke\_alert(smoke\_alert),

.gas\_alert(gas\_alert),

.motion\_alert(motion\_alert),

.temp\_alert(temp\_alert)

);

// Clock generation

always #5 clk = ~clk;

// Test sequence

initial begin

// Initialize inputs

clk = 0;

reset = 1;

smoke\_sensor = 0;

gas\_sensor = 0;

motion\_sensor = 0;

temp\_sensor = 8'd0;

// Release reset

#10 reset = 0;

// Test smoke sensor

#10 smoke\_sensor = 1; #10 smoke\_sensor = 0;

// Test gas sensor

#10 gas\_sensor = 1; #10 gas\_sensor = 0;

// Test motion sensor

#10 motion\_sensor = 1; #10 motion\_sensor = 0;

// Test temperature sensor

#10 temp\_sensor = 8'd31; #10 temp\_sensor = 8'd25;

// Reset system

#10 reset = 1; #10 reset = 0;

// Finish simulation

#50 $stop;

end

endmodule