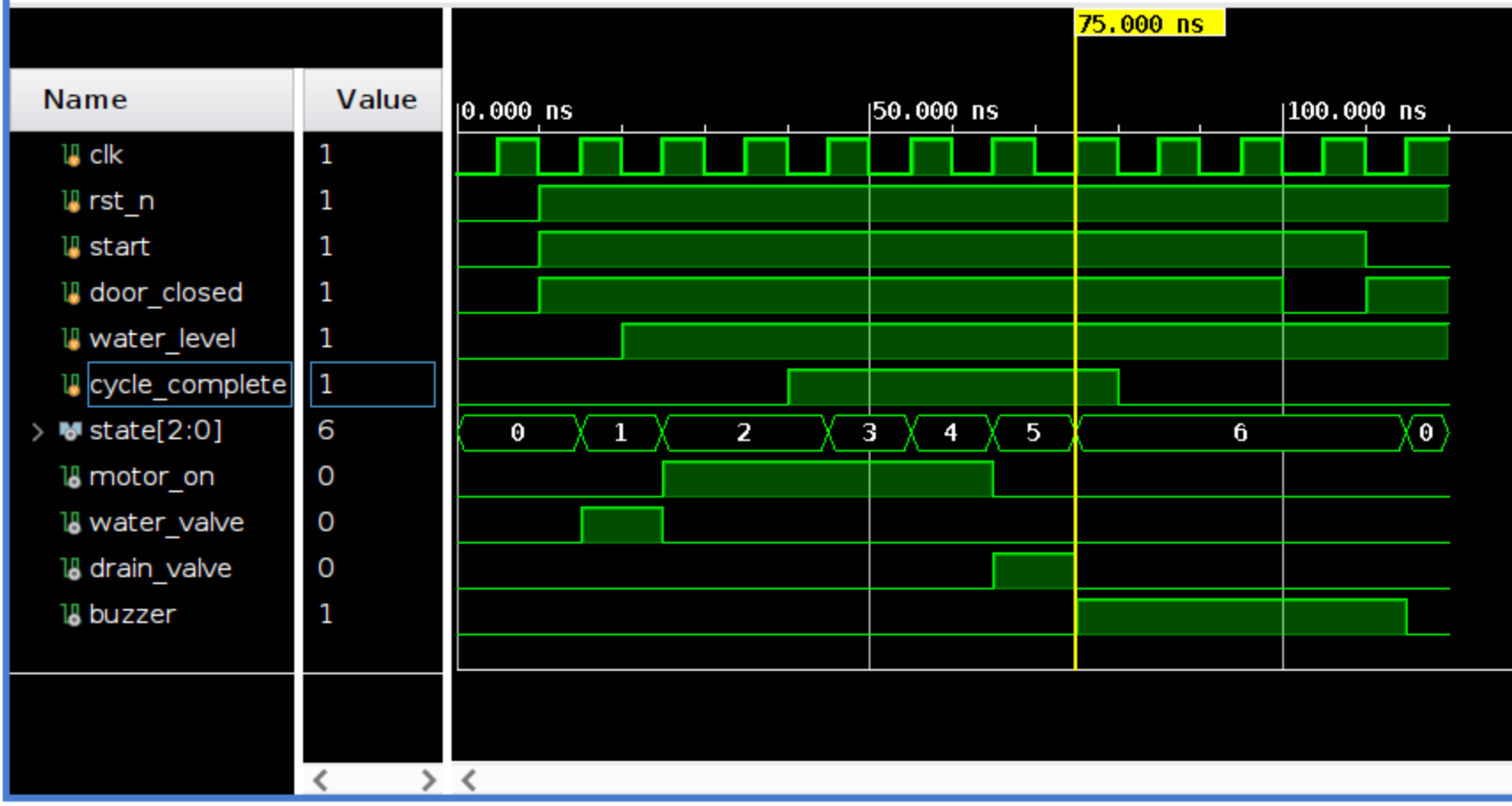
project_1 - [/home/itzzinfinity/Cozy Drive/100daysofRTL/day_092/project_1/projec

Window Layout View Run Help Quick Access

10 s

IMULATION - Behavioral Simulation - Functional - sim_1 - washing_machine_fsm_tb

Untitled 3 × washing_machine_fsm.v × washing_machine_fsm_tb.v ×



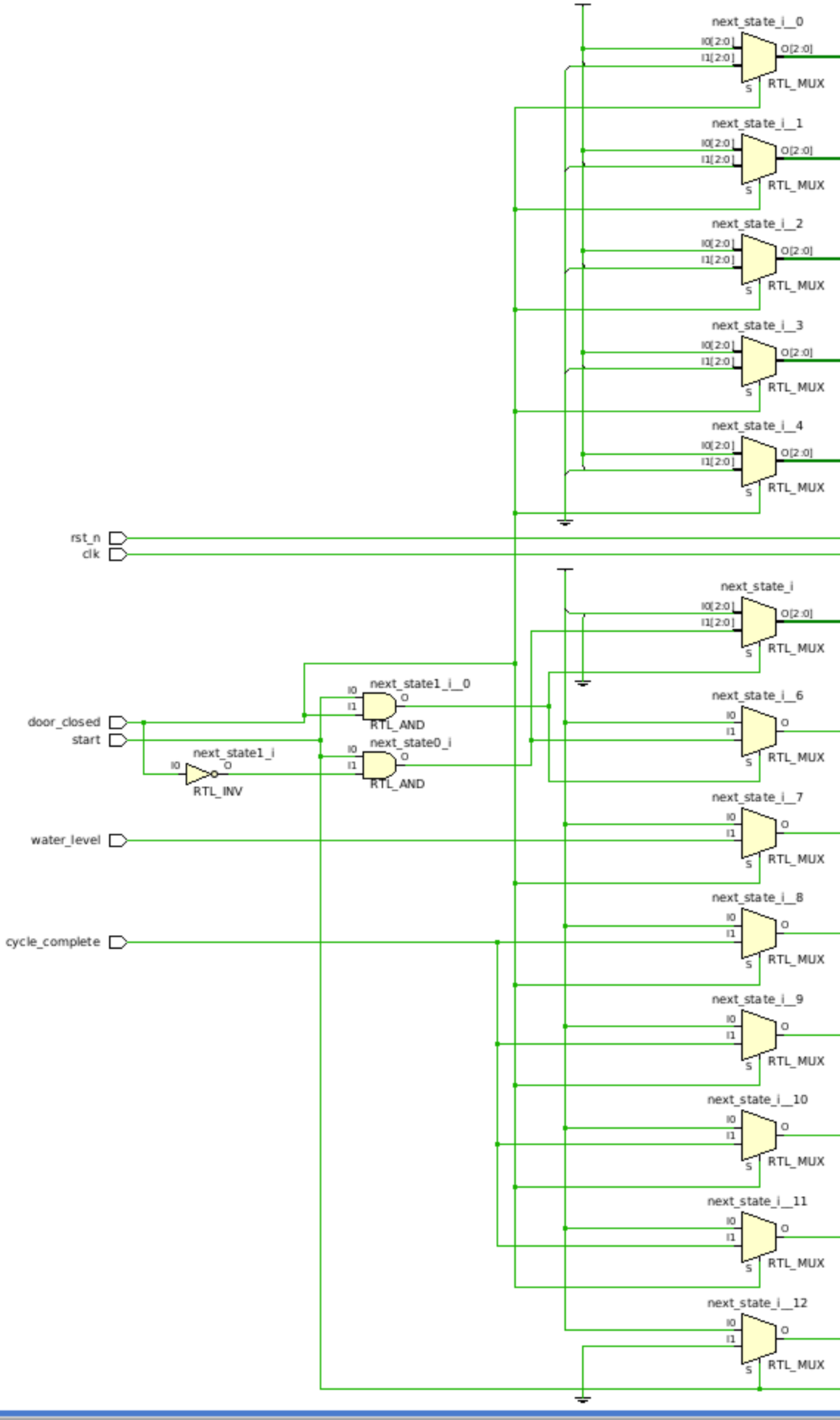
Tcl Console × Messages Log

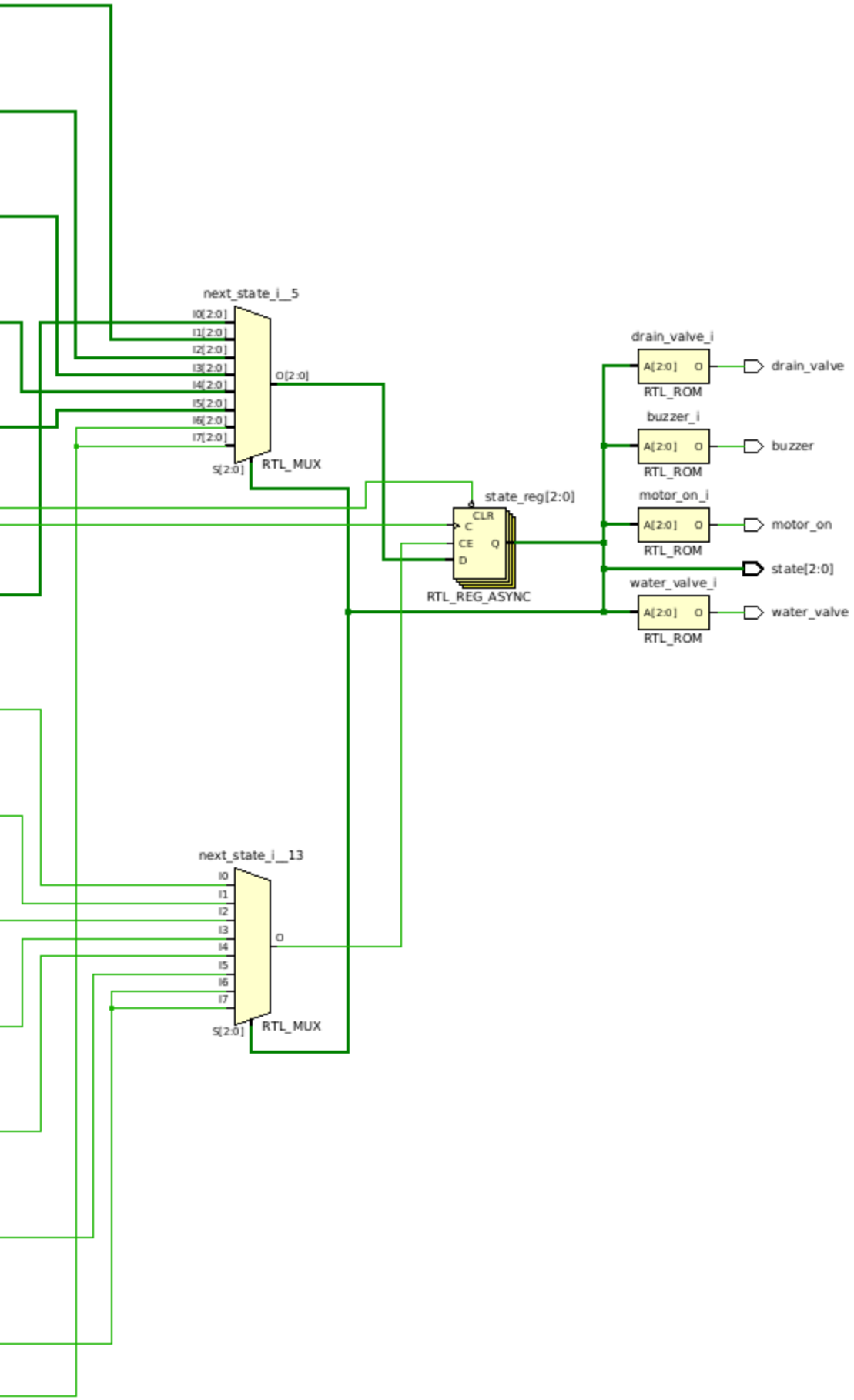
```
# run 1000ns
Time=0, State=000, Motor=0, WaterValve=0, DrainValve=0, Buzzer=0
Time=15, State=001, Motor=0, WaterValve=1, DrainValve=0, Buzzer=0
Time=25, State=010, Motor=1, WaterValve=0, DrainValve=0, Buzzer=0
Time=45, State=011, Motor=1, WaterValve=0, DrainValve=0, Buzzer=0
Time=55, State=100, Motor=1, WaterValve=0, DrainValve=0, Buzzer=0
Time=65, State=101, Motor=0, WaterValve=0, DrainValve=1, Buzzer=0
Time=75, State=110, Motor=0, WaterValve=0, DrainValve=0, Buzzer=1
Time=115, State=000, Motor=0, WaterValve=0, DrainValve=0, Buzzer=0
$finish called at time : 120 ns : File "/home/itzzinfinity/Cozy Drive/100daysofRTL/day_092/
INFO: [USF-XSim-96] XSim completed. Design snapshot 'washing_machine_fsm_tb_behav' loaded.
```

Type a Tcl command here

(2)

25 Cells 13 I/O Ports 47 Nets




next_state_i__5
I0[2:0]
I1[2:0]
I2[2:0]
I3[2:0]
I4[2:0]
I5[2:0]
I6[2:0]
I7[2:0]
O[2:0]
S[2:0]
RTL_MUX
state_reg[2:0]
CLR
C
CE
D
Q
RTL_REG_ASYNC
drain_valve_i
A[2:0]
O
RTL_ROM
drain_valve
buzzer_i
buzzer
motor_on_i
motor_on
state[2:0]
water_valve_i
water_valve
next_state_i__13
I0
I1
I2
I3
I4
I5
I6
I7
O
S[2:0]
RTL_MUX

washing_machine_fsm.v

/home/itzzinfinity/Cozy Drive/100daysofRTL/day_092/project_1/project_1.srcs/sources_1/new/washing_machine_fsm

```
1   `timescale 1ns / 1ps
2   //////////////////////////////////////////////////////////////////////////////////
3   // Engineer: ANjan Prasad
4   // Create Date: 12/22/2024 04:56:57 AM
5   // Module Name: washing_machine_fsm
6   //////////////////////////////////////////////////////////////////////////////////
7
8   module washing_machine_fsm (
9       input clk,
10      input rst_n,        // Active low reset
11      input start,
12      input door_closed,
13      input water_level,cycle_complete,
14      output reg [2:0] state,
15      output reg motor_on,
16      output reg water_valve,
17      output reg drain_valve,
18      output reg buzzer
19  );
20
21      localparam IDLE        = 3'b000;
22      localparam FILL_WATER  = 3'b001;
23      localparam WASH        = 3'b010;
24      localparam RINSE       = 3'b011;
25      localparam SPIN        = 3'b100;
26      localparam DRAIN_WATER = 3'b101;
27      localparam END         = 3'b110;
28      localparam ERROR       = 3'b111;
29
30      reg [2:0] next_state;
31
32      // State transition logic
33      always @(posedge clk or negedge rst_n) begin
34          if (!rst_n)
35              state <= IDLE;
36          else
37              state <= next_state;
38      end
39
40      // Next state logic
41      always @(*) begin
42          next_state = state;
43          case (state)
44              IDLE: begin
45                  if (start && door_closed)
46                      next_state = FILL_WATER;
47                  else if (start && !door_closed)
48                      next_state = ERROR;
49              end
50
```

washing_machine_fsm.v

/home/itzzinfinity/Cozy Drive/100daysofRTL/day_092/project_1/project_1.srcs/sources_1/new/washing_machine_fsm

```
50
51              FILL_WATER: begin
52                  if (!door_closed)
53                      next_state = ERROR;
54                  else if (water_level)
55                      next_state = WASH;
56              end
57
58              WASH: begin
59                  if (!door_closed)
60                      next_state = ERROR;
61                  else if (cycle_complete)
62                      next_state = RINSE;
63              end
64
65              RINSE: begin
66                  if (!door_closed)
67                      next_state = ERROR;
68                  else if (cycle_complete)
69                      next_state = SPIN;
70              end
71
72              SPIN: begin
73                  if (!door_closed)
74                      next_state = ERROR;
75                  else if (cycle_complete)
76                      next_state = DRAIN_WATER;
77              end
78
79              DRAIN_WATER: begin
80                  if (!door_closed)
81                      next_state = ERROR;
82                  else if (cycle_complete)
83                      next_state = END;
84              end
85
86              END: begin
87                  if (!start)
88                      next_state = IDLE;
89              end
90
91              ERROR: begin
92                  if (!start)
93                      next_state = IDLE;
94              end
95
96              default: next_state = IDLE;
97          endcase
98      end
99
```

washing_machine_fsm.v

/home/itzzinfinity/Cozy Drive/100daysofRTL/day_092/project_1/project_1.srcs/sources_1/new/washing_machine_fsm

```
100         // Output logic
101         always @(*) begin
102             // Default values
103             motor_on = 0;
104             water_valve = 0;
105             drain_valve = 0;
106             buzzer = 0;
107
108             case (state)
109                 FILL_WATER: water_valve = 1;
110                 WASH: motor_on = 1;
111                 RINSE: motor_on = 1;
112                 SPIN: motor_on = 1;
113                 DRAIN_WATER: drain_valve = 1;
114                 END: buzzer = 1;
115                 ERROR: buzzer = 1;
116             endcase
117         end
118     endmodule
119
120
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122
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124
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126
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128
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```

washing_machine_fsm_tb.v

/home/itzzinfinity/Cozy Drive/100daysofRTL/day_092/project_1/project_1.srcs/sim_1/new/washing_machine_fsm_tb.

```
1   `timescale 1ns / 1ps
2   //////////////////////////////////////////////////////////////////////////////////
3   // Engineer: Anjan Prasad
4   // Create Date: 12/22/2024 04:58:11 AM
5   // Module Name: washing_machine_fsm_tb
6   //////////////////////////////////////////////////////////////////////////////////
7
8   module washing_machine_fsm_tb;
9
10      reg clk;
11      reg rst_n;
12      reg start;
13      reg door_closed;
14      reg water_level;
15      reg cycle_complete;
16      wire [2:0] state;
17      wire motor_on;
18      wire water_valve;
19      wire drain_valve;
20      wire buzzer;
21
22      washing_machine_fsm DUT (
23          .clk(clk),
24          .rst_n(rst_n),
25          .start(start),
26          .door_closed(door_closed),
27          .water_level(water_level),
28          .cycle_complete(cycle_complete),
29          .state(state),
30          .motor_on(motor_on),
31          .water_valve(water_valve),
32          .drain_valve(drain_valve),
33          .buzzer(buzzer)
34      );
35
36      initial clk = 0;
37      always #5 clk = ~clk;
38
39      initial begin
40          $monitor("Time=%0d, State=%b, Motor=%b, WaterValve=%b, DrainValve=%b, Buzzer=
41                   $time, state, motor_on, water_valve, drain_valve, buzzer);
42
43          rst_n = 0; start = 0; door_closed = 0; water_level = 0; cycle_complete = 0;
44          #10 rst_n = 1;
45
46          // Start the machine with door closed
47          start = 1; door_closed = 1; #10;
48
49          // Simulate water filling
50          water_level = 1; #20;
```

washing_machine_fsm_tb.v

/home/itzzinfinity/Cozy Drive/100daysofRTL/day_092/project_1/project_1.srcs/sim_1/new/washing_machine_fsm_tb.

```
49          // Simulate water filling
50          water_level = 1; #20;
51
52          // Simulate wash cycle completion
53          cycle_complete = 1; #10 cycle_complete = 0;
54
55          // Simulate rinse cycle completion
56          cycle_complete = 1; #10 cycle_complete = 0;
57
58          // Simulate spin cycle completion
59          cycle_complete = 1; #10 cycle_complete = 0;
60
61          // Simulate draining water
62          cycle_complete = 1; #10 cycle_complete = 0;
63
64          // Machine reaches end state
65          #20;
66
67          // Trigger error: Open door during operation
68          door_closed = 0; #10;
69          door_closed = 1; start = 0; #10;
70
71          $finish;
72      end
73  endmodule
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
```