NMJ31804 – Principles of Computer Architecture

SEMESTER 2, 2021/22

LAB 2a) FSM for Washing Machine

Name: TAN YI JIE

Matric Number: 191020976

Program code: RK20 - Computer Engineering

Process flow

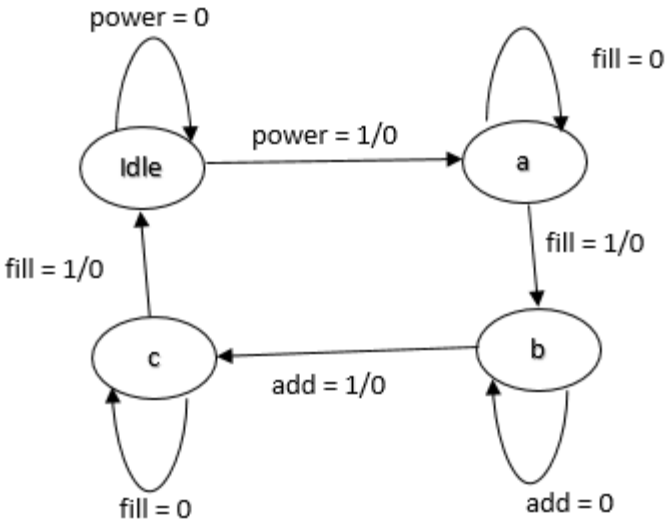
1. Idle state: It is the state when the washing machine is in initial mode. If power button is “on”, the state transition takes place from state “idle” to state “a” and the output, z is low. If power button is “off”, then the state remains in “idle”.

2. “a” state: In state “a”, if fill is 1 (the washing machine filled with water) then the state moves to state “b”, otherwise it remain in state “a”.

3. “b” state: In state “b”, it is the washing state of the machine, if add is 1 (the detergent been added into the washing machine) then the state moves to state “c”, otherwise it remain in state “b”.

4. “b” state: It is the rinse state of the machine, if fill is 1 (the process been completed), then the state returns back to state “idle” and the output, z is 1.

State diagram



State table

State	Function
Idle	Initial mode
a	Filled with water
b	Washing mode
c	Rinsing mode

Coding

```
module lab2a(clk, rst, power, fill, add, z);
input clk, rst, power, fill, add;
output z;
reg z;

reg [3:0] count = 0;
reg [1:0] state;
parameter idle = 0, a = 1, b = 2, c = 3;

always @(posedge clk)
        begin
        if (rst == 1) //reset state
        begin
        state <= idle;
        z <= 0;
        end
        else
        case (state)
                idle: if (power == 1) //initial
                                begin
                                state = a;
                                z = 0;
                                end
                                else
                                begin
                                state <= idle;
                                z <= 0;
                                end

                a:              if (fill == 1) //fill in water
                                begin
                                state <= b;
                                z <= 0;
                                end
                                else
                                begin
                                state <= a;
                                z <= 0;
                                end

                b:          if (add == 1) //add detergent
                                begin
                                state <= c;
```

```
                z <= 0;
            end
                else
                begin
                state <= b;
                z <= 0;
                end

        c:      if (fill == 1)
                begin
                state <= idle;
                z <= 1;
                end
                else
                begin
                state <= c;
                z <= 0;
                end
    endcase
    end
endmodule
```

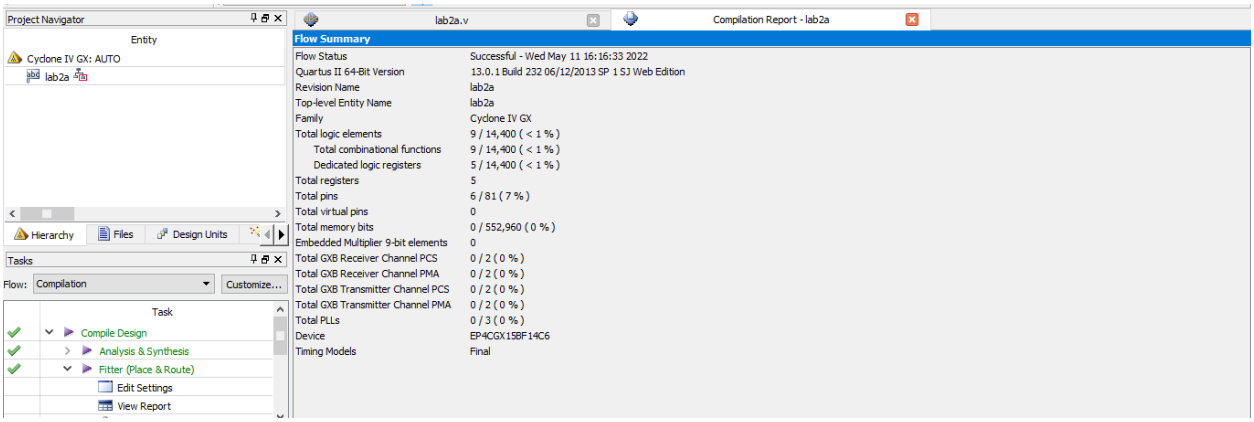


Figure. 1

Figure. 1 shows that the compilation of coding is successful, no errors.

Result

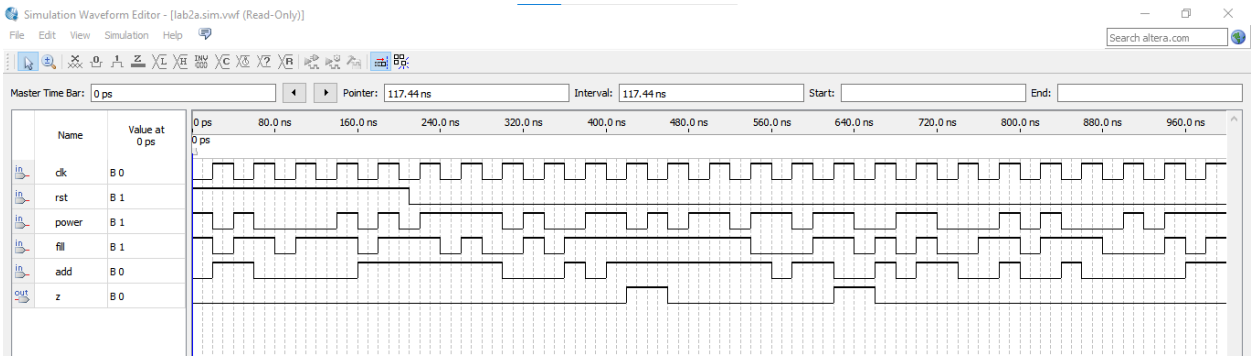


Figure. 2

Figure. 2 shows that the result is matched with the planned process flow of the washing machine system.