Course: CSC258F

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Lab6

Pre-Lab Report

Part1:

1. Answer following questions:

--- Given the starter circuit, is the Reset signal a synchronous or asynchronous reset?

***It is an asynchronous reset in stater circuit.***

--- Is it active high, or active low signal?

***It is active high.***

--- How should the Reset signal feature in the tests that you run on your FSM?

***In the test, if I activate reset (to 1) and then the FSM should go back to state A.***

2. Assign flip-flop values to each of the states create a state table that illustrates the state transitions in response to the input signal w.

***Since there are 7 states totally which are A, B, C, D, E, F and G, then we only need celling(log27) = 3 flip flops to cover all states.***

Table

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4. Implement the output value circuit for z in part1\_FSM.

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5. Outline the test plan for your circuit in your prelab report and why these test cases verify the correctness of your circuit.

***We have to understand how FSM and state table work, I list a way to get output 1, it starts from State A when w = 1 then goes to State B, then when w = 1 goes to State C, when w = 1 goes to State D, then when w = 1 goes to state F and get 1 here. Actually, there are more than one way to get output of 1, but I just provided one way to test the correctness of the circuit. I also showed some screenshots of both FSM and state table.***

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Part2:

1. I fully understand the circuit already.

2. Determine a sequence of steps similar to the datapath example shown in lecture to control the datapath to perform the required computation. You should draw a table that shows the contents of the registers and the control signal values for each cycle of your computation. Include this table in your prelab.

***To do the calculation of AX2 + BX + C, we need 9 steps in total. The first 4 circles are loading RA, RB,RC and RX prospectively. Then we calculate X multiple B from register B and register X then store the result into register B. Next, we calculate BX add C from register B and register C then store the result into the register A. We next calculate X multiple x from register x and register X then store the result into register B. After that, we calculate C multiple X2 from register C and register B then store the result into register B. Last, we calculate CX2 addBX + A from register B and register A then store into the result into register R and so far, we finish the whole calculation of AX2 + BX + C.***

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Cycle*** | ***Id \_c*** | ***Id\_x*** | ***Id \_a*** | ***Id\_b*** | ***Id\_r*** | ***Id\_alu\_out*** | ***alu\_select\_a*** | ***alu\_select\_b*** | ***alu\_op*** | ***State*** |
| ***1*** | ***0*** | ***0*** | ***1*** | ***0*** | ***0*** |  |  |  |  | ***0000*** |
| ***2*** | ***0*** | ***0*** | ***0*** | ***1*** | ***0*** |  |  |  |  | ***0001*** |
| ***3*** | ***1*** | ***0*** | ***0*** | ***0*** | ***0*** |  |  |  |  | ***0010*** |
| ***4*** | ***0*** | ***1*** | ***0*** | ***0*** | ***0*** |  |  |  |  | ***0011*** |
| ***5*** | ***0*** | ***0*** | ***0*** | ***1*** | ***0*** | ***1*** | ***01*** | ***11*** | ***1*** | ***0100*** |
| ***6*** | ***0*** | ***0*** | ***1*** | ***0*** | ***0*** | ***1*** | ***00*** | ***01*** | ***0*** | ***0101*** |
| ***7*** | ***0*** | ***0*** | ***0*** | ***1*** | ***0*** | ***1*** | ***11*** | ***11*** | ***1*** | ***0110*** |
| ***8*** | ***0*** | ***0*** | ***0*** | ***1*** | ***0*** | ***1*** | ***10*** | ***01*** | ***1*** | ***0111*** |
| ***9*** | ***0*** | ***0*** | ***0*** | ***0*** | ***1*** | ***0*** | ***01*** | ***00*** | ***0*** | ***1000*** |

3. Draw a state diagram to correspond the FSM and the table shows.

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5. Test the circuit with poke to verify the correctness.

When can have a follow processes to verify the correctness. (There is more than one way to do.)

***1. Load A to 5***

***2. Load B to 3***

***3. Load C to 4***

***4. Load X to 2***

***5. calculate BX, then will get 6 for R\_B val***

***6. calculate BX + A, then will get 11 for R\_Aval***

***7. calculate X2, then will get 4 for R\_B val***

***8. calculate CX2, then will get 16 for R\_B val***

***9. calculate CX2 + BX + A, then will get 27 for data register***

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