**Hardware**

**Pattern Detection**

This pattern detection block consist of one FSM (Finite State Machine) and four I/O ports. List any assumptions made in answering the following questions.



**DIN:** 1-bit data input. Data input can only change at rising edge of CLK.

**RST:** Asynchronous reset input.

**CLK:** 100 MHz reference clock input.

**DETECT:** 1-bit output indicator. A value of 1’b1 for one CLK cycle indicates a 1011 pattern in the data input stream is detected. 1 is the 1st bit and 0 is the 2nd bit in the 1011 pattern.

**Questions:**

**Architect**

Draw a state transition diagram of the FSM for the pattern detection block. Optimize and simplify design when possible.

**Design**

Create a synthesizable Verilog module for the pattern detection block. Include assertions for error conditions and comments describing the code.

**Verification**

Create a self-checking Verilog test bench for the pattern detection block. Include a data input pattern generator that covers all state transitions.

**Validation**

Describe the flow to bring-up and prototype this pattern detection block on FPGA. Provide a validation plan.

Software - Python Question

Please make use of any resources available to you to answer the question. Answer the questions using Python 2 or Python 3.

1. Given an input json file containing one json object, how would you parse in Python? What native Python data structure would be most appropriate to represent a json file and provide an explanation of how you transfer the json file to this data structure?
2. Assume the following directory structure where each json file contains the result of the same test conducted on different devices:

Tests/

                |-> testA.json

|-> testB.json

…

|-> testZ.json

                Each json is structured as follows:

                                {

                                                “info”: {

                                                                “test type”: “A”,

                                                                “user”: ”Alan”,

                                                                “device”: “A” *Note: Device letter changes with json file, “A” is only provided as an example for testA.json*

                                                },

                                                “data”:{

                                                                “freq”: [1E+6, 1E+7, 1E+8, 1E+9, 2E+9, 5E+9, 10E+9, 75E+8, 6E+9], *Note: there will always be 9 data points with a corresponding freq-error pair in each test json file.*

                                                                “errors”: [0 , 0, 0, 0, 0, 0, 10, 5, 0]

                                                }

                                }

 Write a sample Python script that parses each json file and creates a single graphical summary of the entire test suite. You can assume that you have a string variable that contains the path to the Tests/ directory. Please describe any non-native libraries used.