

**Name & Std No.: Riley Lawson 116555487 Lab Section: 6**

**Date: 11/5/2020**

### **Submission Instructions:**

#### **Prelab:**

- 1. Complete the prelab**
- 2. Submit this report with the prelab completed to Canvas before your lab starts**

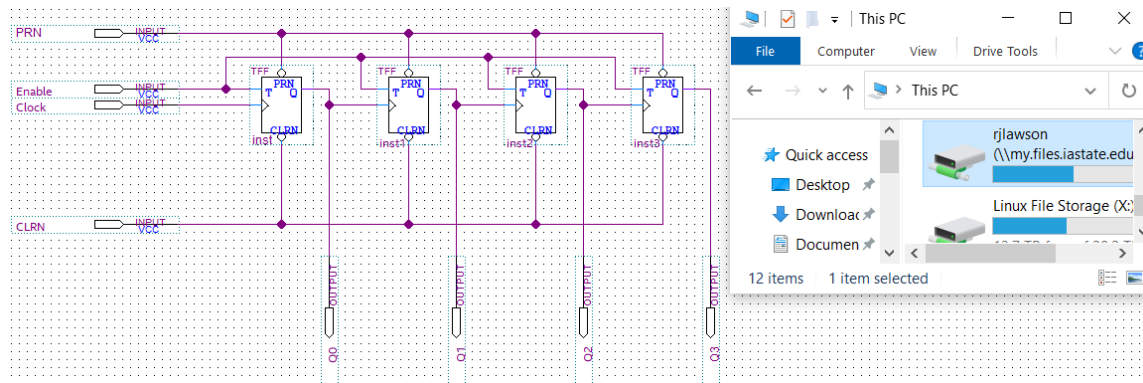
#### **Lab:**

- 1. Complete the lab according to the instructions**
- 2. Take screenshots of your ModelSim waveform (note: to receive points your NetID has to be present in the screenshot) and insert them into this document.**
- 3. Include screenshots of any related block design files or Verilog files in the report**
- 4. Complete this report and reupload it to Canvas**

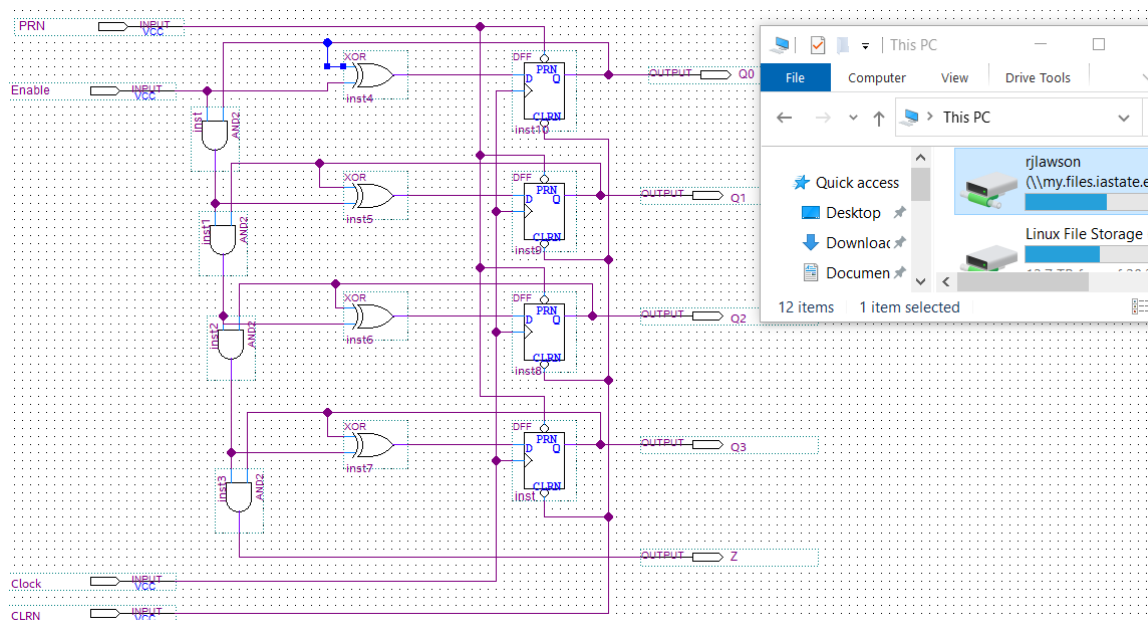
## PRELAB:

Refer to Chapter 5 in your textbook and the lab instructions to complete your pre-lab. Please read all the material and complete the circuit diagrams before you come to the lab.

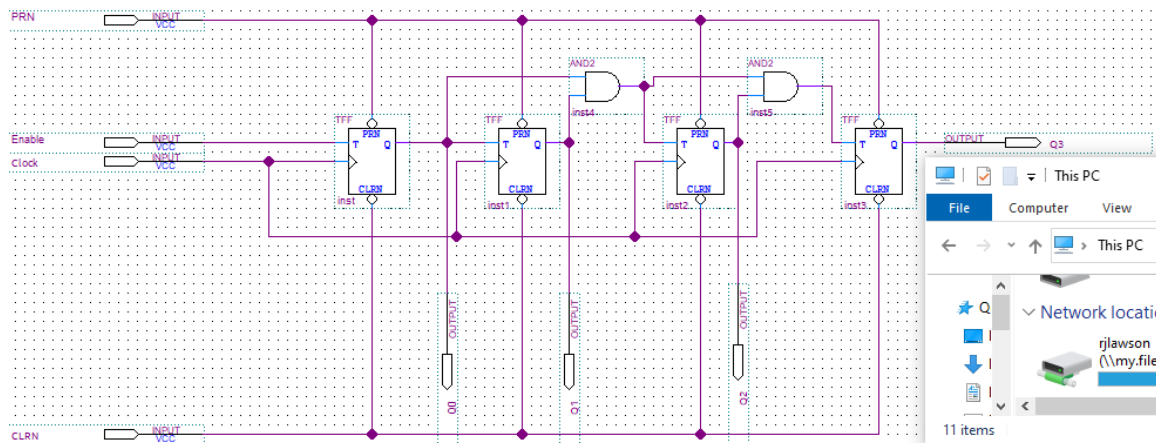
**Q1.** Draw the circuit diagram for the 4-bit **Shift Register** using D flip-flops in the space below.



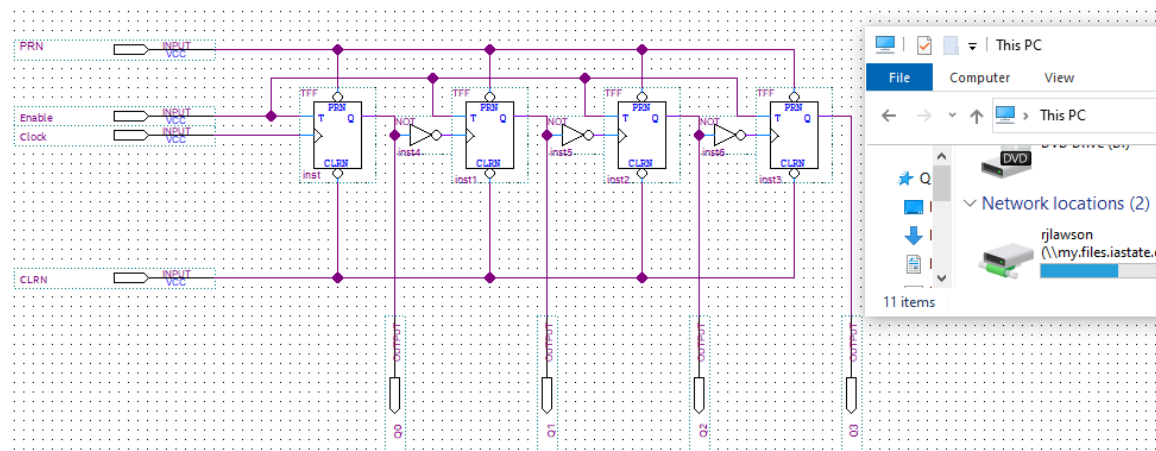
**Q2.** Draw the circuit diagram for the 4-bit **Synchronous Up-Counter** using D flip-flops in the space below.



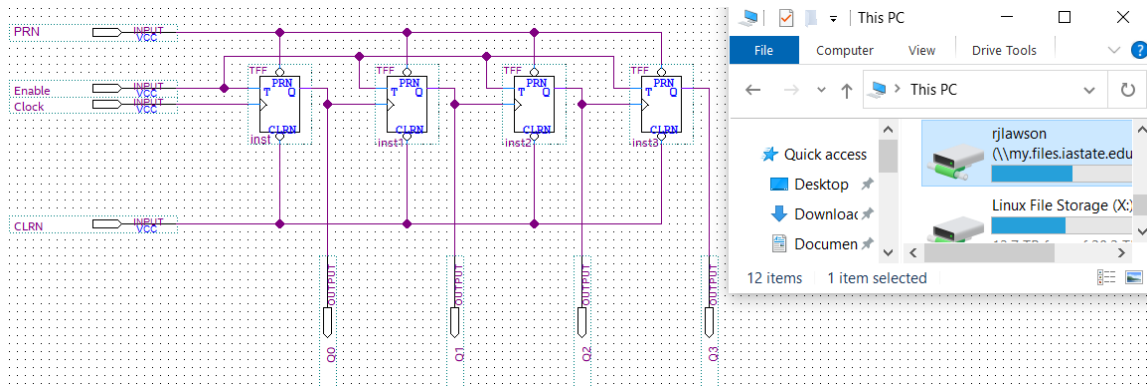
**Q3.** Draw the circuit diagram for the 4-bit **Synchronous Up-Counter** using T flip-flops in the space below.



**Q4.** Draw the circuit diagram for the 4-bit **Asynchronous Up-Counter** using T flip-flops in the space below.



**Q5.** Draw the circuit diagram for the 4-bit **Asynchronous Down-Counter** using T flip-flops in the space below.

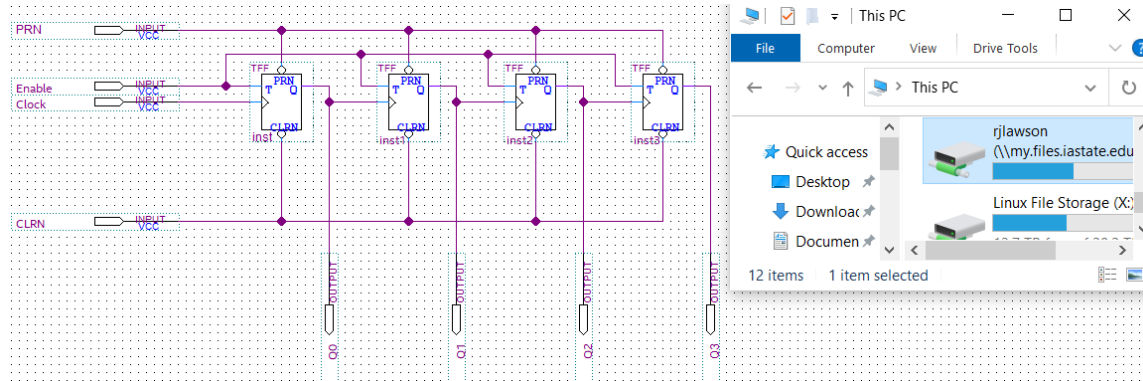


## LAB:

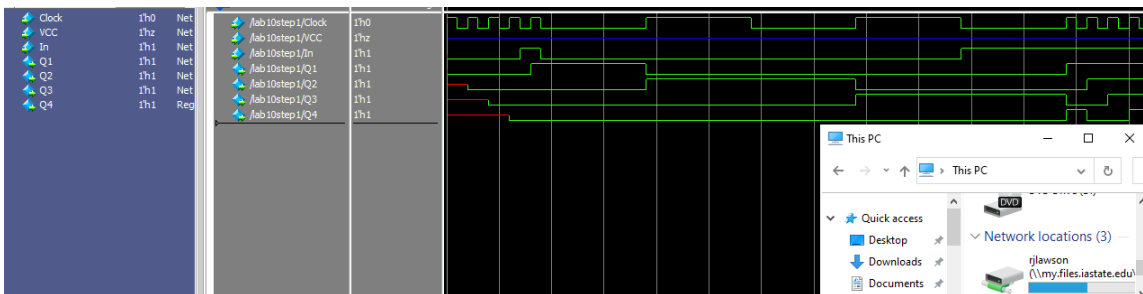
**2.0** Fill in the sequence table below. *Watch out for switch bouncing!*

<i>In</i>	<i>Q1</i>	<i>Q2</i>	<i>Q3</i>	<i>Q4</i>
t0 = 1	----	----	----	----
t1 = 0	1	----	----	----
t2 = 1	0	1	----	----
t3 = 1	1	0	1	----
t4 = 1	1	1	0	1
t5 = 0	1	1	1	0
t6 = 0	0	1	1	1
t7 = 0	0	0	1	1

<<<Insert a screenshot of shift register here>>>

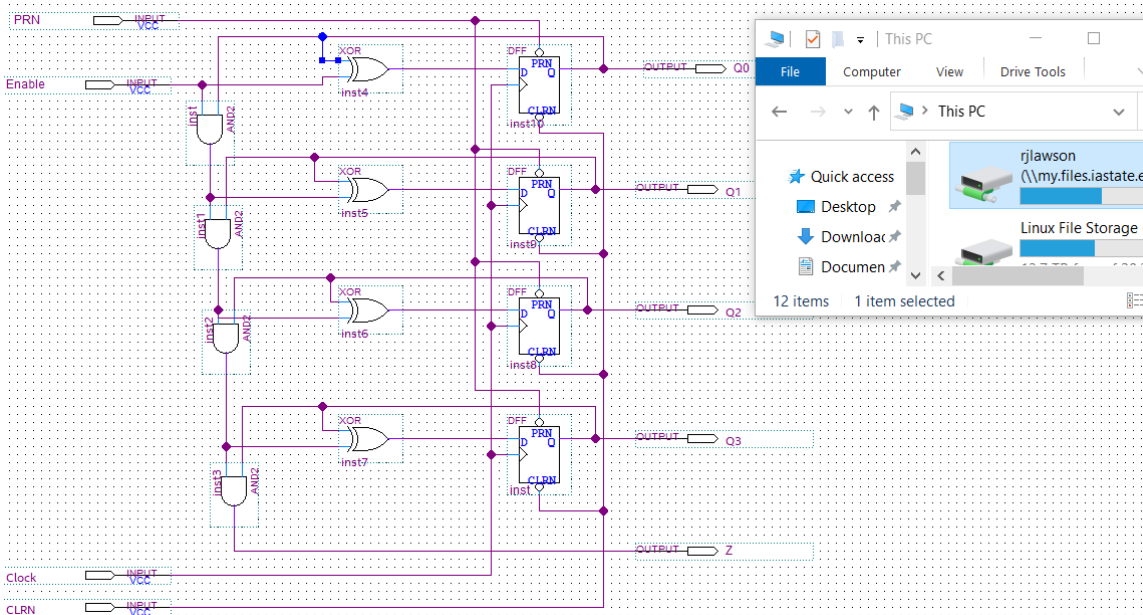


<<< Insert a screenshot of your waveform for shift register here>>>

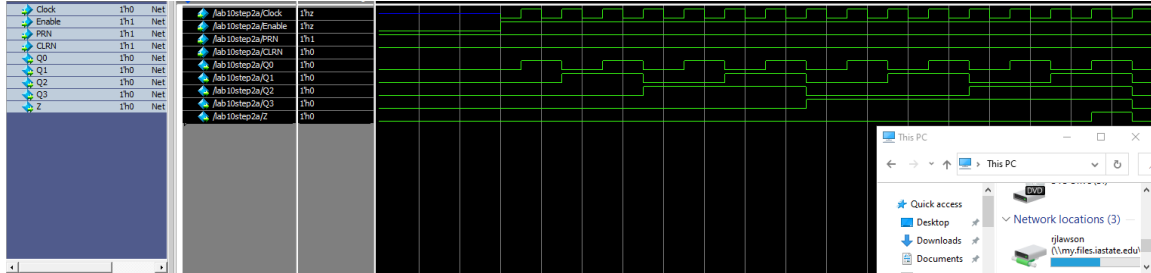


Synchronous counters:

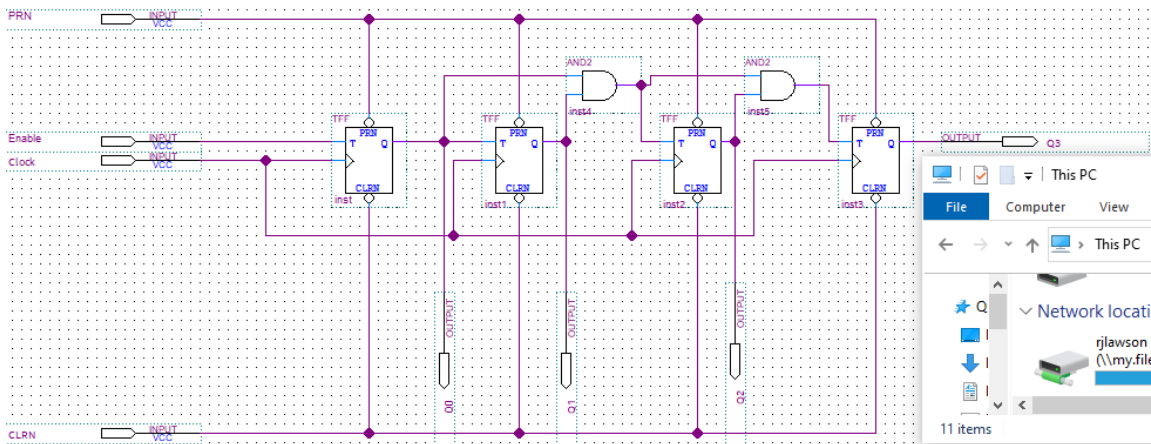
<<<Insert a screenshot of SYNC UP counter>>>



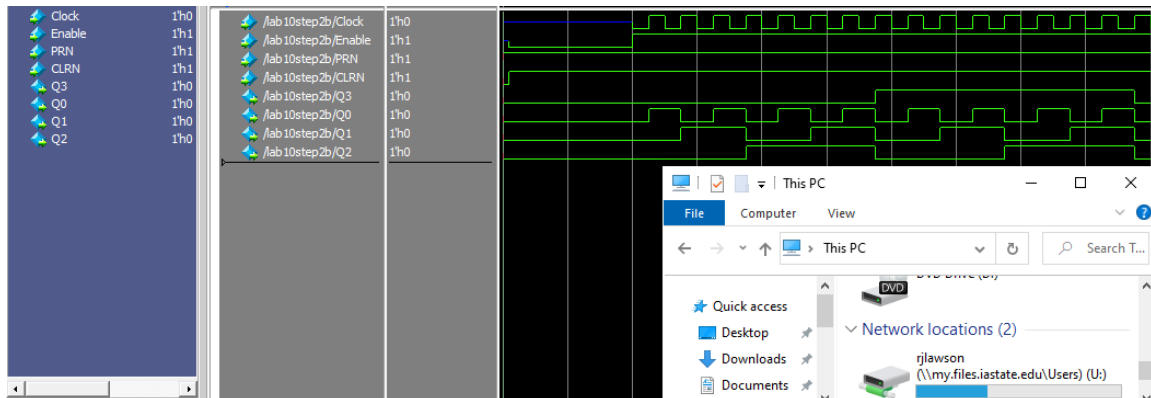
<<< Insert a screenshot of your waveform for SYNC UP counter here>>>



<<<Insert a screenshot of SYNC Down counter>>>

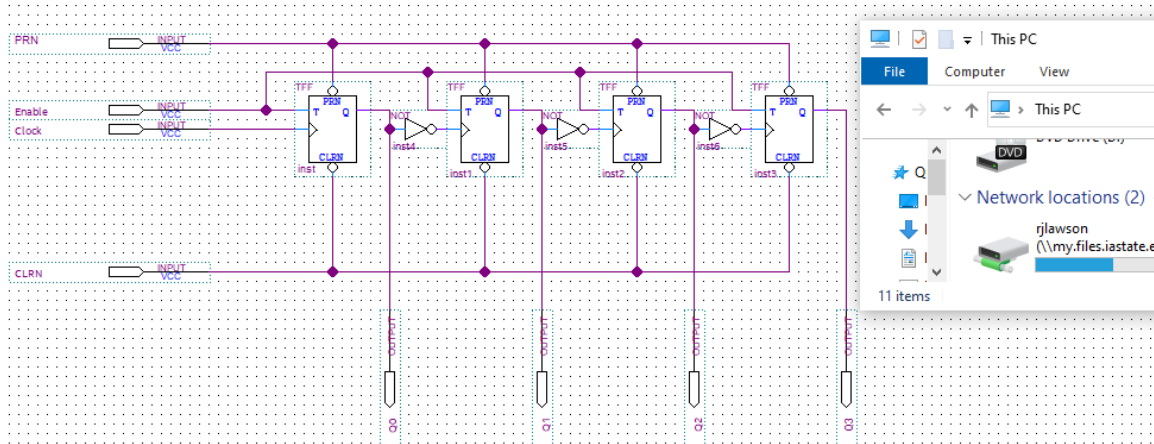


<<< Insert a screenshot of your waveform for SYNC Down counter here>>>

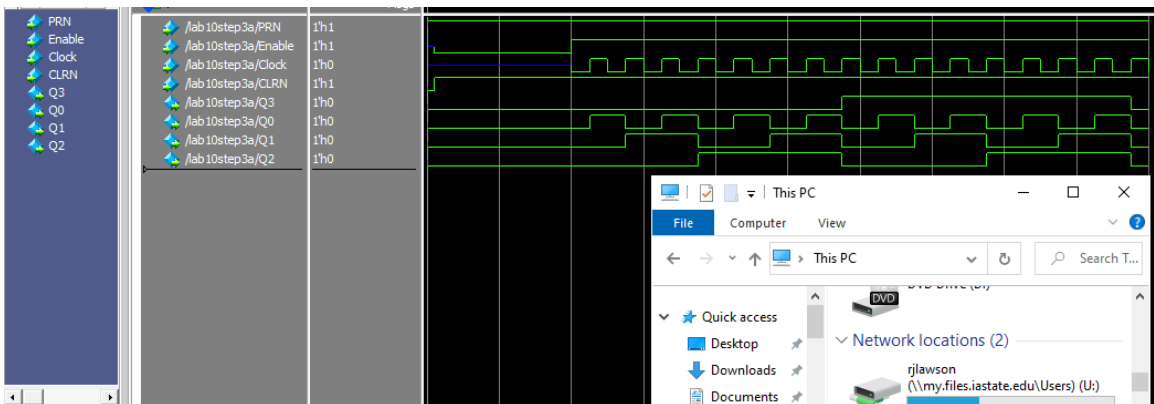


Asynchronous counters:

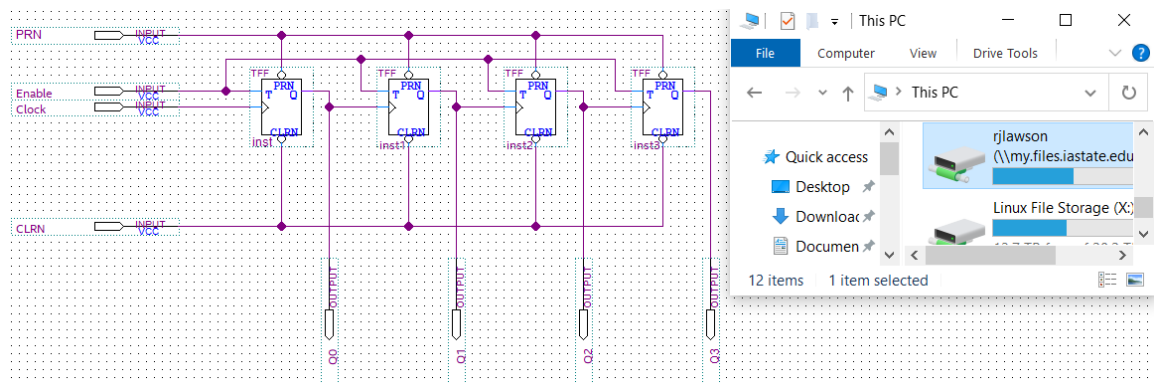
<<<Insert a screenshot of ASYNC UP counter>>>



<<< Insert a screenshot of your waveform for SYNC UP counter here>>>



<<<Insert a screenshot of ASYNC Down counter>>>



<<< Insert a screenshot of your waveform for ASYNC Down counter here>>>

