

Class:	CPE100L-1002	Semester:	Spring 2020
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		Document topic:	Postlab 11
Instructor's comments:			

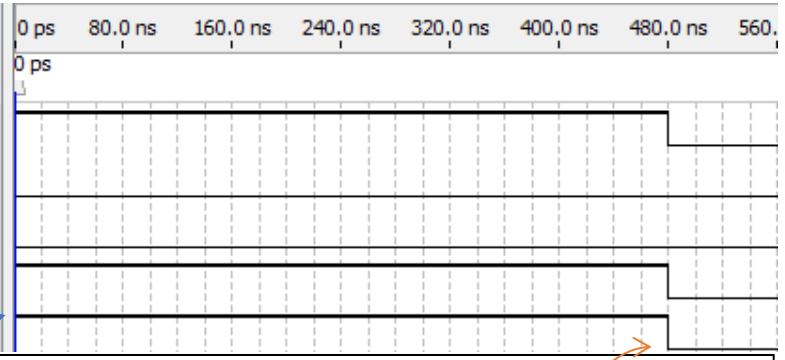
1. Introduction / Theory of Operation

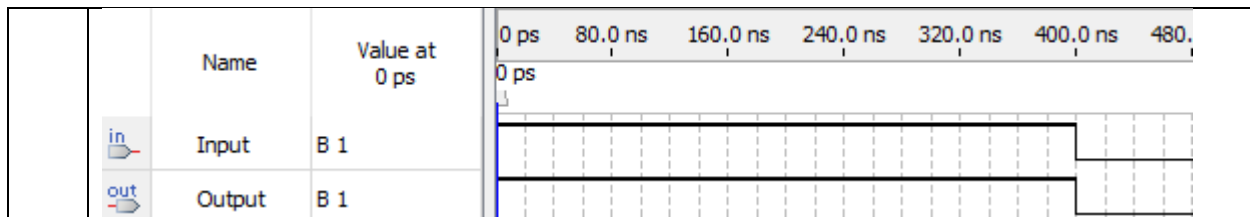
Lab 11 is about code locks, where we learn to use a simple counter to build a code lock with limited number of allowed combination errors.

2. Prelab Report

My prelab report will be attached with the submission.

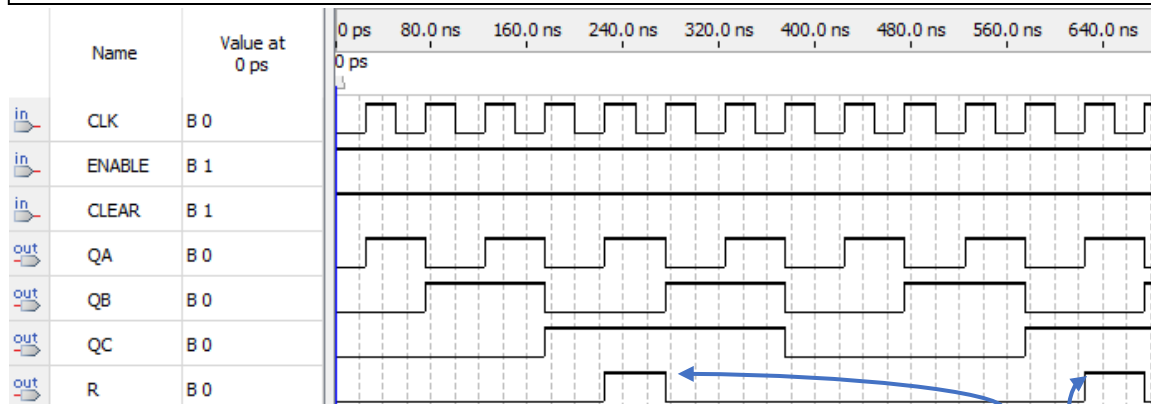
3. Results of the Experiment

Ex p	Experiment Results												
1	<p>a. Test results: how did you do your tests</p> <p>Instead of testing with the DE0 board, I tested with the simulation waveforms. In order to ensure that each of the blocks worked, I tested the waveforms for each block.</p> <div> <table border="1"> <thead> <tr> <th>Name</th><th>Value at 0 ps</th></tr> </thead> <tbody> <tr> <td>PW_0</td><td>B 1</td></tr> <tr> <td>PW_1</td><td>B 0</td></tr> <tr> <td>PW_2</td><td>B 0</td></tr> <tr> <td>PW_3</td><td>B 1</td></tr> <tr> <td>VALID_PW</td><td>B 1</td></tr> </tbody> </table>  </div> <p> Password Entry Block: Correct or valid password is "1" when the input combination of 1001 is inputted, and "0" otherwise. </p>	Name	Value at 0 ps	PW_0	B 1	PW_1	B 0	PW_2	B 0	PW_3	B 1	VALID_PW	B 1
Name	Value at 0 ps												
PW_0	B 1												
PW_1	B 0												
PW_2	B 0												
PW_3	B 1												
VALID_PW	B 1												



Display 'Open' / 'Bloc' Block:

Display was supposed to be similar to a 7-segment display, but I heard that it was to be changed to a simple output.

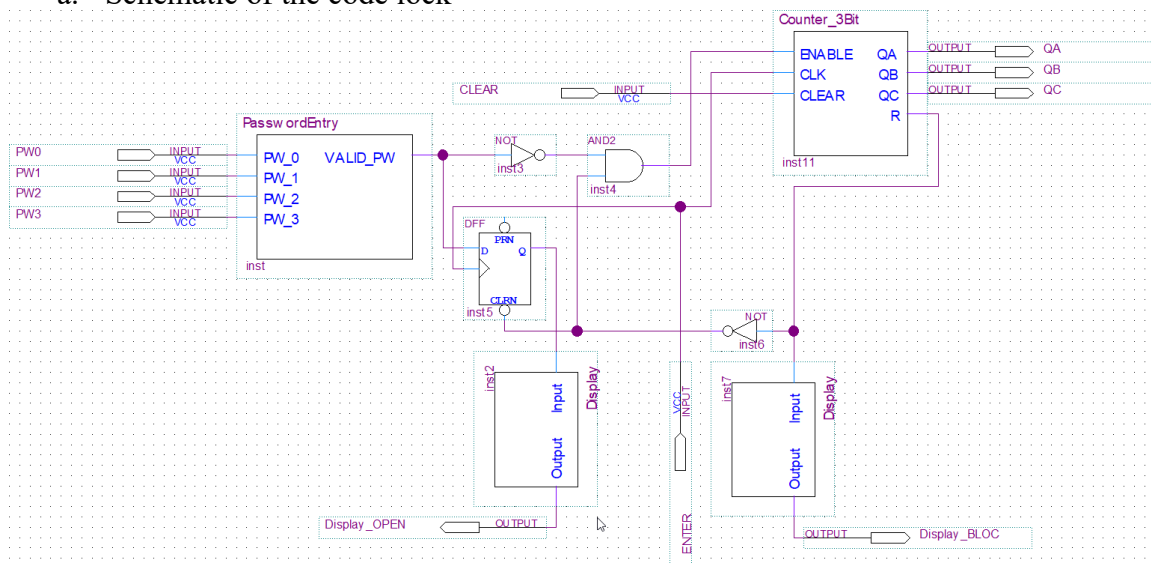


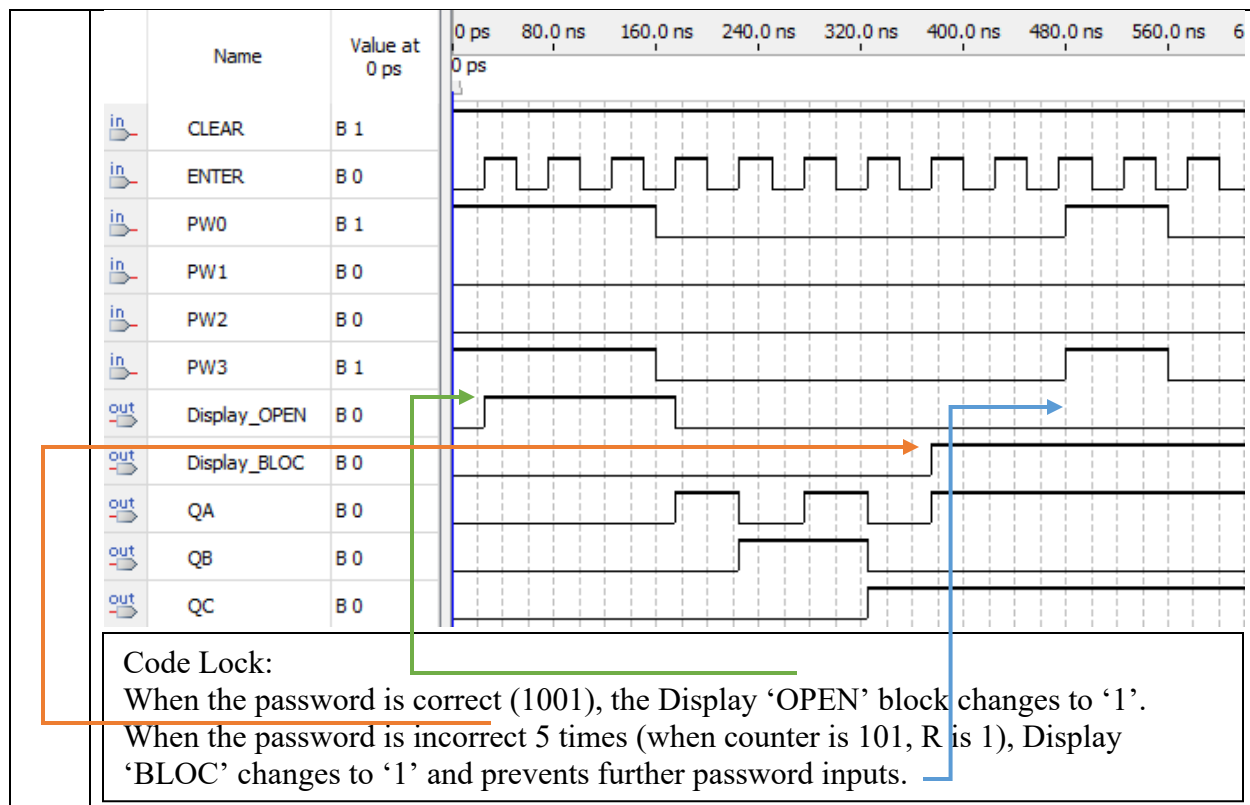
Count Failures / Three Bit Counter Block:

The count is not displayed, but according to the schematic I designed, R will be "1" whenever the combination is 101.

2

a. Schematic of the code lock





4. Summary

- 1) To design the code lock, I designed each of the blocks one by one. I started with the password entry block, then the display 'OPEN' and 'BLOC' blocks, and finally the count failures block.
- 2) To improve the code lock, I suggest that there be an alarm or siren when the password is wrong for the max R exceeded.
- 3) I do not think it would be possible to design the code lock with just combinatorial logic because the flip flops help to retain previous values. So if there were none of the flip flops for the sequential logic, then the code lock would not be possible.

5. Conclusions

This lab was much easier than the other labs. I learned that you can use a counter to count failures instead of simply counting. Due to the counting failures block, the R output was able to block the user from attempting more passwords. It is very interesting how you can connect the 'OPEN' and 'BLOC' outputs to simultaneously do different things. In order to finally implement the 'BLOC' output to be able to change to '1', I had to modify my 3-bit counter block design since it was slightly off. Instead of the enable being connected to the T input of the T Flip Flop, I made it a high 'VCC', which should not be happening, since the enable is used by the schematic.