

Practical 2 Instructions

Canvas Honorlock Quiz: *Practical 2 - Spring 2024*

RULES AND POLICIES:

By opening and starting this assignment, the student whose name is to be associated with the work submitted for this assignment wholeheartedly commits to the pledge presented in the "3701 Honorlock Rules and Policies" that was available prior to this quiz and is also available in the quiz as both an External and Internal link.

If an image is not appearing or not complete, use Ctrl-F5 to refresh the Canvas page if you are using a Windows computer and Ctrl-Shift-R if you are using a Mac computer.

If you can't see an entire image, text, or possible multiple-choice answer, zoom out. You can zoom out with Ctrl-minus, i.e., press the Ctrl key and the "-" key at the same time. Ctrl-plus can be used to zoom in.)

External Links:

- [3701 Honorlock Rules and Policies](#)
- [Pinouts](#)
- [DE10-Lite Pins.](#)

Internal Links:

- [3701_Honorlock_rules_and_policies.pdf](#)
- [pinouts.pdf](#)
- [DE10-Lite_Pins.pdf](#)

On Family, Device & Board Settings (or Assignments | Device)

- Select "**Board**"
- Change the **Family** to "**MAX 10**"
- Change **Development Kit** to "**MAX 10 DE10 – Lite**"
- **De-select** the checkbox labeled "**Create top-level design file**".

Possibly useful information:

```
-- VHDL Syntax Example
library ieee; use ieee.std_logic_1164.all;
entity NAND2a is port(
    A,B: in bit;
    C: out bit);
end NAND2a;
architecture behavior of NAND2a is
signal COut: bit;
begin
    ...
end behavior;
```

Top Level Instructions:

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Design, construct, and demonstrate the circuits that meet the following specifications. Use the DE10-Lite, breadboard, DAD, switches, LEDs, and resistors as specified to create the necessary inputs and outputs for your demonstration.

- Use only the following 74'xxx chips: ---
- Use of your PLD is --- (either allow or not allowed)
- Inputs: --- (activation-levels specified)
- Outputs: --- (activation-levels specified)
- DAD requirements will be specified

Detailed Description:

Design a circuit to ...

Required parts:

1. Draw a functional block diagram for this problem **on your scratch paper**.
2. Design a next state truth table for the described state machine **on your scratch paper**. Use the usual counting order for the table.
3. Design a voltage table, based on your truth table, **on your scratch paper**.
4. Derive any necessary equations **on your scratch paper**.
5. Design the entire circuit **on your scratch paper**.
6. Draw **all** of the **non**-DAD switch and LED circuit diagrams **on your scratch paper**.
7. Design the entire circuit in **Quartus**.
8. Simulate the design in Quartus.
 - A. ...
 - B. Thoroughly prove that your design works properly for all possible input values.
9. Design the necessary switch and LED circuits on your breadboard.
 - A. On your scratch paper, make a legend indicating the **true positions** of the switch(es), as you did in lab.
 - B. On your scratch paper, make a legend for the LEDs to indicate **which** LEDs correspond to **which signals**, as you did in lab.
10. Connect the necessary switch and LED circuits to the PLD. Restore the PLD's USB cable to your computer to power your circuits and also connect your DAD.
11. Program the PLD (using the sof, **not** pof).
12. Verify **to yourself** that your circuit is functioning properly and that you are done working (i.e., there is nothing more to design, program, or put on your scratch paper) and are ready to submit your work. Once you are ready, proceed to the last two items..
13. Archive this Quartus project and submit it as part of **this practical assignment**, as described below.
14. Use **CamScanner** (or equivalent), as described below (and in the assignment referenced here), to make a pdf file to submit as part of this practical to **Practical 2 PHONE - Spring 2024**.

Demonstration

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1. You will show your Quartus simulation, as described above.
2. You will demonstrate the proper functioning of your physical circuit, following the PI's instructions with inputs.

You will have only ONE chance to demo your work.

- If you think you are ready, read the question **again** to be sure that you completed **ALL** parts of this practical and all design, programming, and work on your scratch paper.
- Be prepared to show (and re-run) your simulation and to run your design, as instructed, by a PI or Dr. Schwartz.
- If ready prior to the end of the practical, after submitting the required work, use Zoom's chat to tell your PI that you are ready by sending **READY**.
- Do **not** ask us for any feedback on your design.

Submissions

You MUST complete the two file uploads (one to this assignment and another with your cell phone) before the end of your practical.

1. If you have not already done so, when there are **five minutes** remaining in your practical, you should stop working and start this process.
2. You must archive your Quartus design and upload it (in the next problem on this assignment).
3. With your phone, you must upload a **single pdf file** (use CamScanner or equivalent) to the Canvas assignment **Practical 2 PHONE - Spring 2024**. This file must contain each of the following:
 - A. A **clear** image of your breadboard with circuit including connections to Vcc and GND and to the DE10-Lite.
 - B. A **clear** image of your scratch paper showing each of the following.
 1. The **next-state truth table** and **voltage table**.
 2. All **equation derivations**.
 3. The hand-drawn **circuit diagram**.
 4. **Switch** and **LED circuit diagrams**.
 5. The switch and LED **legends**.
4. **Failure to upload these files before the end of the practical will result in a grade of zero.**

Quartus archive upload [File Upload Question]

You must **archive** your Quartus design and upload it here. (In the next question you must also upload a clear picture of your breadboard that shows your circuit, your DAD with the required connections, as well as your switch and LED legends, and also includes clear pictures of your scratch paper.) Failure to upload this file (and the one in the next problem) before the end of the Practical will result in a grade of zero.

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Canvas (non-Honorlock) Quiz: *Practical 2 PHONE - Spring 2024*

Use your cell phone to upload **a single pdf** file (use CamScanner or equivalent) containing each of the following:

- A. A **clear** image of your breadboard, with circuits, including connections to Vcc and GND and to the DE10-lite.
- B. A **clear** image of your breadboard connections to the DAD.
- C. A **clear** image of your scratch paper showing each of the following.
 1. The **next-state truth table**.
 2. All **equation derivations**.
 3. The hand-drawn **circuit diagram**.
 4. **Switch** and **LED circuit diagrams**.
 5. The switch and LED **legends**.
- D. **Failure to upload this file before the end of the practical will result in a grade of zero.**