ECE 527 SoC Design Machine Problem 1

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1. INTRODUCTION

This MP was designed to become familiar with the Xilinx tools. We set up the development environment on a lightweight ubuntu distribution and interfaced with the ZedBoard. We walked through the compilation process as well as practiced incorporating the Zynq hard IP core into the design by generating a Board Support Package and writing software in the Xilinx SDK.

2. Part A

2.1. Description

For the first part of the MP we had to write a small verilog module for the programmable logic fabric portion of the Xilinx Zinq 7000 chip. This module needs to read the positions of the 8 on board switches and display the switch position on the 8 user LEDs. The switch status was displayed on the LEDs after 3 clock cycles and the center button was used as a reset.

2.2. Assumptions

We did not have to make any assumptions for this part of the MP as the directions were very straight forward.

2.3. System Configuration

The part A of the machine problem was very simple so we only needed one module in the programmable logic fabric. This module took in inputs from the switches, a single input from the reset button, and a clock. The module output a vector to the LEDs containing information on the switch state. The module contained three buffering registers to ensure that the switch state appeared on the LEDs after exactly 3 clock cycles. The module is shown in figure 1.

2.4. Entities

Entity	Description
basic_i_o	Hardware top level, contains pipeline

2.5. Design

When designing we only considered one solution. Using a pipeline to transfer switch state information to the LEDs. This would ensure that the LEDs were updated with switch information after exactly 3 cycles for every change in the switches. Had we used a counter or other option it would have more complex logic and been harder to guarantee the LEDs were updated after 3 cycles.

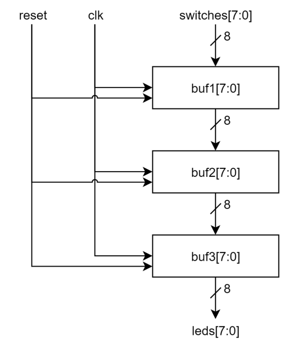

Figure 1. Block Diagram for Part A

2.6. Performance

This was a very small design and it took up very little resources on the Zinq 7000. The usage is shown in the table below. Figure 2 shows how the design was implemented on the device.

Table 1. Resource Usage Part A

Resource	Utilization	Available	Utilization %
LUT	1	53200	0.01
FF	24	106400	0.02
IO	18	200	9.00
BUFG	1	32	3.13

Because this design used minimal logic most of the power consumed by the device was static power. As the transistors were mostly siting idle across the programmable logic fabric.

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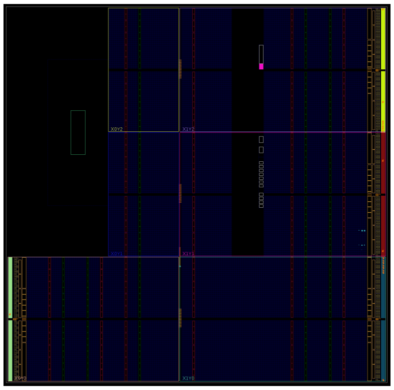

Figure 2. Device Mapping for Part A

Table 2. Resource Usage Part A

Type	Power
Static	0.122 W
Dynamic	0.007 W
Total	0.129 W

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3. MATH

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Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

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- Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as 3.5-inch disk drive.

- Avoid combining SI and CGS units, such as current in amperes and magnetic field in oersteds. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation.

- Do not mix complete spellings and abbreviations of units: Wb/m2 or webers per square meter, not webers/m2. Spell out units when they appear in text: . . . a few henries, not . . . a few H.

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$$\alpha + \beta = \chi \tag{1}$$

Note that the equation is centered using a center tab stop. Be sure that the symbols in your equation have been defined before or immediately following the equation. Use (1), not Eq. (1) or equation (1), except at the beginning of a sentence: Equation (1) is . . .

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- The word data is plural, not singular.
- The subscript for the permeability of vacuum ?0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter o.
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- Do not use the word essentially to mean approximately or effectively.
- In your paper title, if the words that uses can accurately replace the word using, capitalize the u; if not, keep using lower-cased.
- Be aware of the different meanings of the homophones affect and effect, complement and compliment, discreet and discrete, principal and principle.
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- The prefix non is not a word; it should be joined to the word it modifies, usually without a hyphen.
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- The abbreviation i.e. means that is, and the abbreviation e.g. means for example.

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Text heads organize the topics on a relational, hierarchical basis. For example, the paper title is the primary text head because all subsequent material relates and elaborates on this one topic. If there are two or more sub-topics, the next level head (uppercase Roman numerals) should be used and, conversely, if there are not at least two sub-topics, then no subheads should be introduced. Styles named Heading 1, Heading 2, Heading 3, and Heading 4 are prescribed.

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Positioning Figures and Tables: Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation Fig. 1, even at the beginning of a sentence.

Table 3. An Example of a Table

One	Two
Three	Four

Figure 3. Inductance of oscillation winding on amorphous magnetic core versus DC bias magnetic field

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity Magnetization, or Magnetization, M, not just M. If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write Magnetization (A/m) or Magnetization A[m(1)], not just A/m. Do not label axes with a ratio of quantities and units. For example, write Temperature (K), not Temperature/K.

5. CONCLUSIONS

A conclusion section is not required. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

APPENDIX

Appendixes should appear before the acknowledgment.

ACKNOWLEDGMENT

The preferred spelling of the word acknowledgment in America is without an e after the g. Avoid the stilted expression, One of us (R. B. G.) thanks . . . Instead, try R. B. G. thanks. Put sponsor acknowledgments in the unnumbered footnote on the first page.

References are important to the reader; therefore, each citation must be complete and correct. If at all possible, references should be commonly available publications.

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