EGRE 254 LABORATORY REPORT POLICY DOCUMENT

Objective

The objective of this document is to provide a common policy document for lab reporting requirements in EGRE 254 – Digital Logic Design. After reading this document, students should have a clear understanding of the policies regarding lab report preparation and submission.

Pre-Lab and Lab Work

Many labs have pre-lab data sheets in them. These must be filled out before lab and turned in at the beginning of lab. The pre-labs are intended to help familiarize you with the experiments and reduce the amount of time spent in the lab. The instructor will grade the pre-labs at the beginning of the lab. Any late pre-labs will automatically receive a zero. Most labs also have lab data sheets that must be filled out during the performance of the lab. You need to have read the lab assignment before entering the lab. You must get the TA to sign both the pre-lab and lab data sheets. **It is your responsibility to see that the TA signs these pages during the lab period.** You cannot blame the TA for "forgetting" to sign these sheets. The TA also keeps a separate list of students whose pre-labs and lab data sheets have been signed off, so forging a TA signature will not do any good and will result in an 'F' being given for the assignment. Any other action taken will follow University policy concerning academic misconduct.

Preparation of Lab Reports and Due Date

All labs must be submitted as hard copies; electronic copies will not be accepted. Prepare your lab report using Microsoft Word or some other text-editing package. Whichever you choose you will need to use equation editor or similar.

Notice that lab reports are due by the END of the next lab (a 1 week period). No late labs will be accepted. Labs that are not submitted by the end of the lab will receive a grade of zero.

Lab Attendance and Makeup Labs

Excused Absence: If a student misses a lab because of an excused absence, that student has 1 calendar week to contact the course instructor and schedule a makeup lab. The student will be allowed to perform the lab on the makeup date and submit a lab report with no grade penalty. If the student has an excused absence but waits longer than a week to schedule the make up lab, then this will be treated as an unexcused absence.

Unexcused Absence: If a student misses a lab because of an unexcused absence, the student will be assigned a grade of zero. The student must still schedule a makeup lab with the TA, and make a good-faith effort to perform the lab and submit a report.

Plagiarism/Academic Dishonesty

All lab reports are individual reports, and you should work alone unless specified otherwise. There is a zero-tolerance policy regarding copying of old lab reports or your classmate's lab reports. Any plagiarism/academic dishonesty will be reported to the University Honor Council as per University policy concerning academic misconduct. Refer to the syllabus and/or VCU's official honor policy for further details.

Lab Report Formatting

All reports should use Times New Roman 12-pt font for basic paragraph formatting, with single line spacing and 1" margins (as used in this document). No scanned handwritten text, equations, or figures are permitted in the report—you should use suitable software (equation editor, schematic capture tools, etc.) for all figures and equations. Any data collected during the experiment should be presented in an appropriate tabular format. Both figures and tables should be labeled appropriately and referenced in the lab report text. Your lab report should have the following sections:

1. *Cover Page*: The standard cover page needs to be filled out for each lab and should consist of the first page of your lab report.
2. *Personal Information*: Contact information (name, course, major, etc.) should be at the top of the beginning of your lab report.
3. *Abstract*: This is a brief summary of the lab experiment and should tell the reader the basics of the experiment performed and principle results of the experiment. This should be your thesis (e.g., you shouldn't refer to the lab as a lab, but instead think why you would perform such an experiment yourself).
4. *Theory*: This section details the theoretical principles behind the experiment being performed. It should consist of your theoretical expectations using the material covered in your book and in class. Also included in the theory section should be any calculations, simulations, or derivations you performed in order to design the required circuits for the lab.
5. *Procedure and Experimental Data*: This section details what you did in the experiment and the data recorded during the experiment. You should NOT duplicate the detailed instructions contained in the lab assignment (e.g., there should not be step-by-step instructions in your report).
6. *Conclusions*: This section contains any conclusions reached from the performance of the lab experiment. You should discuss any discrepancies between experimental results and predicted results, and offer reasons for these discrepancies. In addition, you should provide the actual conclusion of the lab (e.g., the implications of your thesis being proven).

All lab reports are assumed to be *informal* unless indicated otherwise in the lab assignment. That means that you don't need to have external sources other than your book and class materials.

Note that lab reports do not have to be dense or wordy—brevity is appreciated for a lab report. You should only include what is necessary to communicate your understanding of the lab material, with facts and figures to support your thesis. Extraneous "fluff" in your writing will result in a deduction of points as per the lab grading policy outlined below.

Lab Report Grading

Partial credit for labs will not be given. You will have to finish the whole lab and be signed off on all parts of the lab to receive a grade for that lab.

In general, lab report grading is based upon the following criteria:

1. Are all the required sections included?
2. Is the lab free of spelling mistakes and gross grammatical errors (e.g., missing words in sentences, sentence fragments, incorrect word usage like "their" for "there", etc.)?
3. Has the student constructed a relevant thesis under examination?
4. Is the information included in the theory section relevant to the lab or just filler material?
5. Does the student compare and/or contrast their theoretical expectation with the experimental results?
6. Has the student reached correct and relevant conclusions?
7. Are figures and equations formatted neatly and professionally? No scanned handwritten figures or equations are allowed.

You cannot achieve a good grade for your lab assignment if:

1. You have missing sections or missing experimental/pre-lab data in your lab report.
2. You have more than three combined spelling or gross grammatical errors.
3. You have major violations of the formatting guidelines presented in this document.

Specifically, the grading scale is as follows:

No lab report or sign-off sheets ------------------------------------- base: 0%
Improper lab report with all sign-off sheets ----------------------- base: 20%
Formatting -- 10%
Correct and relevant thesis -- 15%
Theoretical expectations --- 15%
Includes all experimental data -------------------------------------- 10%
Conclusion -- 30%

Attached is an example lab report.

ELECTRICAL ENGINEERING
School of Engineering

EGRE 254 – DIGITAL LOGIC DESIGN

Laboratory No. 2: Building and Testing Digital Hardware Using the CADET II Logic Trainer

Laboratory No. 3: Simulation of Lab 2 Circuits

Lecture Course Instructor: R. Klenke
Lab Section: Thursday 1100
Date Performed: 6 February 2014
Date Due: 13 February 2014
Student's Name: Georgios Bakirtzis
Partner's Name: Garrett Ward

Honor Pledge: *I have neither given nor received any unauthorized help on this lab. Signed:*

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Abstract – This report examines fundamental theorems of Boolean algebra and their applications to digital circuits. A comparison between two different implementations of the same function will be presented to demonstrate these fundamental theorems.

I. THEORETICAL BACKGROUND

Consider two functions f and g:

$$f(x, y, z) = x.\bar{y} + x.z \quad (1)$$
$$g(x, y, z) = x.(\bar{y} + z) \quad (2)$$

From the distributive property of Boolean algebra given below it can be shown that equations 1 and 2 are equivalent.

$$a.(b + c) = a.b + a.c \quad (3)$$

$$(2), (3) \Rightarrow g(x, y, z) = x.\bar{y} + x.z = f(x, y, z)$$
$$\boxed{\therefore g(x, y, z) = f(x, y, z)}$$

The two functions yield the same truth table:

Table 1: Theoretical outputs of f and g.

x	y	z	F	G
0	0	0	0	0
0	0	1	0	0
0	1	0	0	0
0	1	1	0	0
1	0	0	1	1
1	0	1	1	1
1	1	0	0	0
1	1	1	1	1

Notice that while the two functions are logically equivalent (e.g., they will yield the same result) the implementations using standard logic (AND, OR, NOT) will be different.

III. PROCEDURE

In order to verify the theoretical conclusion presented above, the two functions were simulated and their outputs were compared. In addition, the functions were also built and evaluated using 7400 series logic gates using the CADET board.

IV. EXPERIMENTAL RESULTS

Table 2: Experimental outputs of f and g.

x	y	z	F	G
0	0	0	0	0
0	0	1	0	0
0	1	0	0	0
0	1	1	0	0
1	0	0	1	1
1	0	1	1	1
1	1	0	0	0
1	1	1	1	1

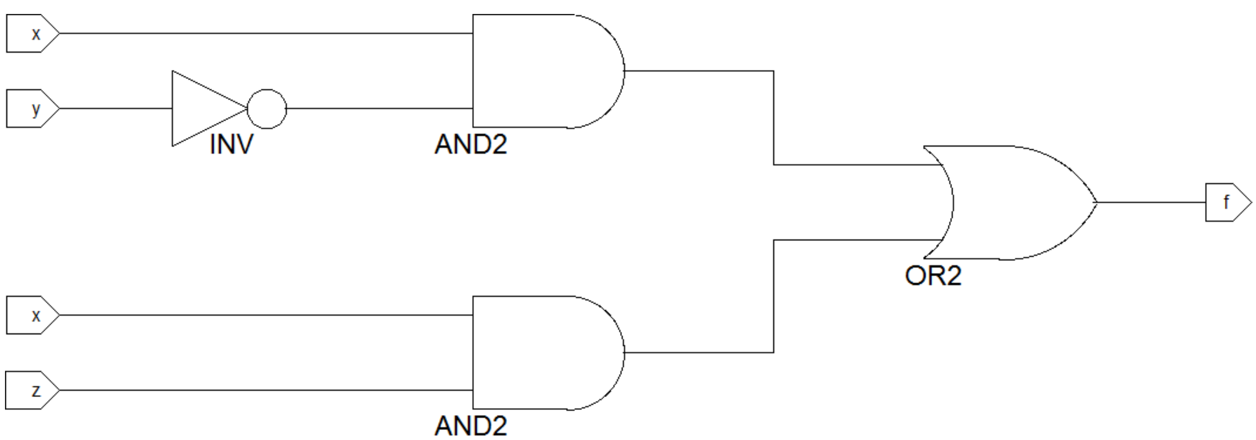

Figure 1: Function f(x, y, z) schematically implemented.

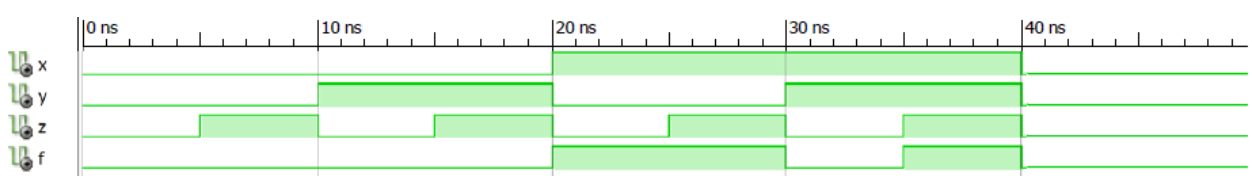

Figure 2: Output of the simulated circuit of function f(x, y, z).

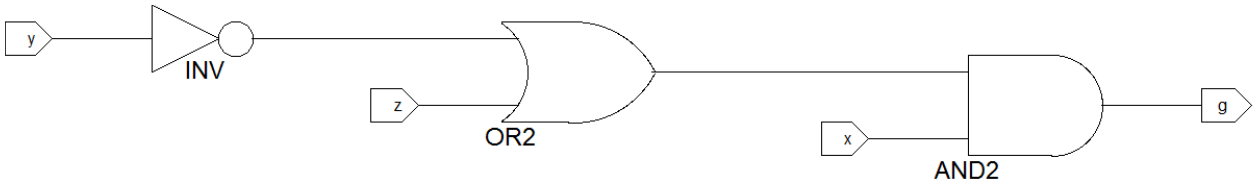

Figure 3: Function g(x, y, z) schematically implemented.

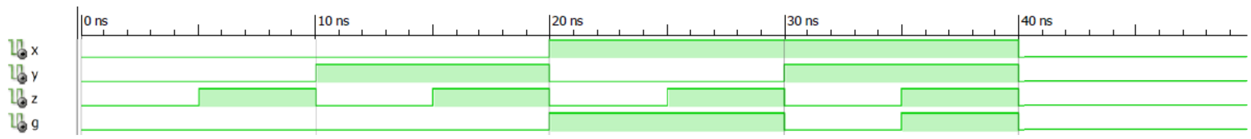

Figure 4: Output of the simulated circuit of function g(x, y, z).

The specifications of the simulation are given below:

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x <= '0', '1' AFTER 20 NS, '0' AFTER 40 NS;
y <= '0', '1' AFTER 10 NS, '0' AFTER 20 NS,
     '1' AFTER 30 NS, '0' AFTER 40 NS;
 z <= '0', '1' AFTER 5 NS, '0' AFTER 10 NS,
     '1' AFTER 15 NS, '0' AFTER 20 NS,
     '1' AFTER 25 NS, '0' AFTER 30 NS,
     '1' AFTER 35 NS, '0' AFTER 40 NS;
```

V. CONCLUSIONS

While the two functions have different implementations, as can be seen from Figure 1 and Figure 3, the output waveforms are identical, Figures 2 and 4. In addition, a comparison between the theoretical expectation, seen in Table 1, and of the experimental implementation, seen in Table 2, proves that the output of the functions f and g is equivalent.

It can be noticed that function g is the minimal form of function f. This allowed for an implementation of the same function with one less gate. Henceforth, using the fundamental principles of Boolean algebra it is possible to reduce the overall amount of gates in a logical circuit, which results in a minimal number of components used.

Notice: Attached after the conclusion should be all relevant documents (e.g., sign-off sheets for Lab 2 and filled out tables for Lab 3).