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E344 Assignment 1

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Report submitted in partial fulfilment of the requirements of the module Design (E) 344 for the degree Baccalaureus in Engineering in the Department of Electrical and Electronic Engineering at Stellenbosch University.

August 13, 2021

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   Plagiarism is the use of ideas, material and other intellectual property of another's work and to present is as my own.

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   Accordingly all quotations and contributions from any source whatsoever (including the internet) have been cited fully. I understand that the reproduction of text without quotation marks (even when the source is cited) is plagiarism

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   I declare that the work contained in this assignment, except where otherwise stated, is my original work and that I have not previously (in its entirety or in part) submitted it for grading in this module/assignment or another module/assignment.

22546448 Studentenommer / *Student number*	 Handtekening / *Signature*
MC van der Berg Voorletters en van / *Initials and surname*	August 13, 2021 Datum / *Date*

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Nomenclature

Update this list to make it applicable to your project.

Variables and functions

$p(x)$	Probability density function with respect to variable x.
$P(A)$	Probability of event A occurring.
ε	The Bayes error.
ε_u	The Bhattacharyya bound.
B	The Bhattacharyya distance.
s	An HMM state. A subscript is used to refer to a particular state, e.g. s_i refers to the i^{th} state of an HMM.
$\mathbf{S}$	A set of HMM states.
$\mathbf{F}$	A set of frames.
$\mathbf{o}_f$	Observation (feature) vector associated with frame f.
$\gamma_s(\mathbf{o}_f)$	A posteriori probability of the observation vector $\mathbf{o}_f$ being generated by HMM state s.
μ	Statistical mean vector.
Σ	Statistical covariance matrix.
$L(\mathbf{S})$	Log likelihood of the set of HMM states $\mathbf{S}$ generating the training set observation vectors assigned to the states in that set.
$\mathcal{N}(\mathbf{x}\|\mu, \Sigma)$	Multivariate Gaussian PDF with mean μ and covariance matrix Σ.
a_{ij}	The probability of a transition from HMM state s_i to state s_j.
N	Total number of frames or number of tokens, depending on the context.
D	Number of deletion errors.
I	Number of insertion errors.
S	Number of substitution errors.

Acronyms and abbreviations

Update this list to make it applicable to your project.

AE	Afrikaans English
AID	accent identification
ASR	automatic speech recognition
AST	African Speech Technology
CE	Cape Flats English
DCD	dialect-context-dependent
DNN	deep neural network
G2P	grapheme-to-phoneme
GMM	Gaussian mixture model
HMM	hidden Markov model
HTK	Hidden Markov Model Toolkit
IE	Indian South African English
IPA	International Phonetic Alphabet
LM	language model
LMS	language model scaling factor
MFCC	Mel-frequency cepstral coefficient
MLLR	maximum likelihood linear regression
OOV	out-of-vocabulary
PD	pronunciation dictionary
PDF	probability density function
SAE	South African English
SAMPA	Speech Assessment Methods Phonetic Alphabet

Chapter 1

Solar photovoltaic cells and solar modules

The document you submit must not have ANY red text in - the text in red in this template is for information only. Introduce the reader to what you want to present in this chapter. Think carefully of what you want to convey. You want the reader (e.g. another student) to understand the main concepts – they need to understand enough to safely and efficiently **use** and **design for** a solar module, but abstract enough to not get caught up in the minutiae of electrons. The person assessing your report will consider whether you have demonstrated that you were able to find, integrate (absorb), and effectively convey knowledge on this topic. So, write a short summary of information you gathered from literature (papers, web sites, datasheets). Include any references to literature you feel is needed. Be sure to cite all the references, which you can add in the `References.bib` file, using the \{`cite`} command.

Some examples of how to cite (all of these have been added in the `References.bib` file): It was stated by [2] that ... . Subsequently, he changed his mind and said in [3] that ... . While [1] claims it to be ... . Figure 1.1 shows a figure, which could paint a thousand words (if it does not, rather use words)! Table 1.1 could capture some of your datasheet and/or measured results.

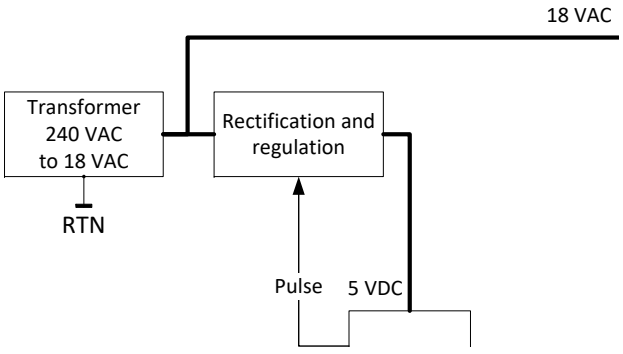


Figure 1.1: This is my caption, make me descriptive! And cite if you borrow figures [1].

Table 1.1: Example of a simple table.

	V_{OC} [V]	I_{CC} [A]	V_{pmax} [V]
Theroretical per cell	1.0	1.0	1.0
Datasheet per module	1.0	1.0	1.0
Measured dark 1.0	1.0	1.0	
Measured upside-down 1.0	1.0	1.0	
Measured oblique 1.0	1.0	1.0	
Measured facing 1.0	1.0	1.0	

Chapter 2

Lead acid batteries

Chapter 3

High-side switching circuit

3.1. Intro

Introduce the reader to **what you want to present** in this chapter (i.e. what are you trying to achieve by initiating this communication?). Try to put yourself in the readers' shoes - what would you ~~like~~ need to see to be convinced that the author (1) knew what they were doing and understood what they had to do (2) properly designed for the requirements, (3) simulation-tested their design, and (4) correctly and critically assessed the outcome.

Include any references to literature you feel is needed. In this section, you put a very short summary of infrormation you gatherered from literature (papers, web sites, datasheets) that you used to do the design. Be sure to cite the references, which you can add in the `References.bib` file.

3.2. Design

In this section, you need to capture your design, which should include the following:

- Design rationale, i.e. what your thinking was behind the design.
- References to literature/sources as appropriate [1], but preferably in the intro above.
- You can assume the reader is in their third year of their E&E engineering degree, and that they will not need detailed explanations of trivial information (e.g. what a resistor is, or what Ohm's law is).
- Design calculations, for example to determine resistor values and capacitor values, or to check for allowed voltage and current ranges and levels. These calculations should also give expected outputs, which hopefully matches the simulated values.
- Analysis of given or expected input conditions.
- Expected values and ranges based on your design.
- Explain your choice of supply by referring to the advantages and disadvantages of each.

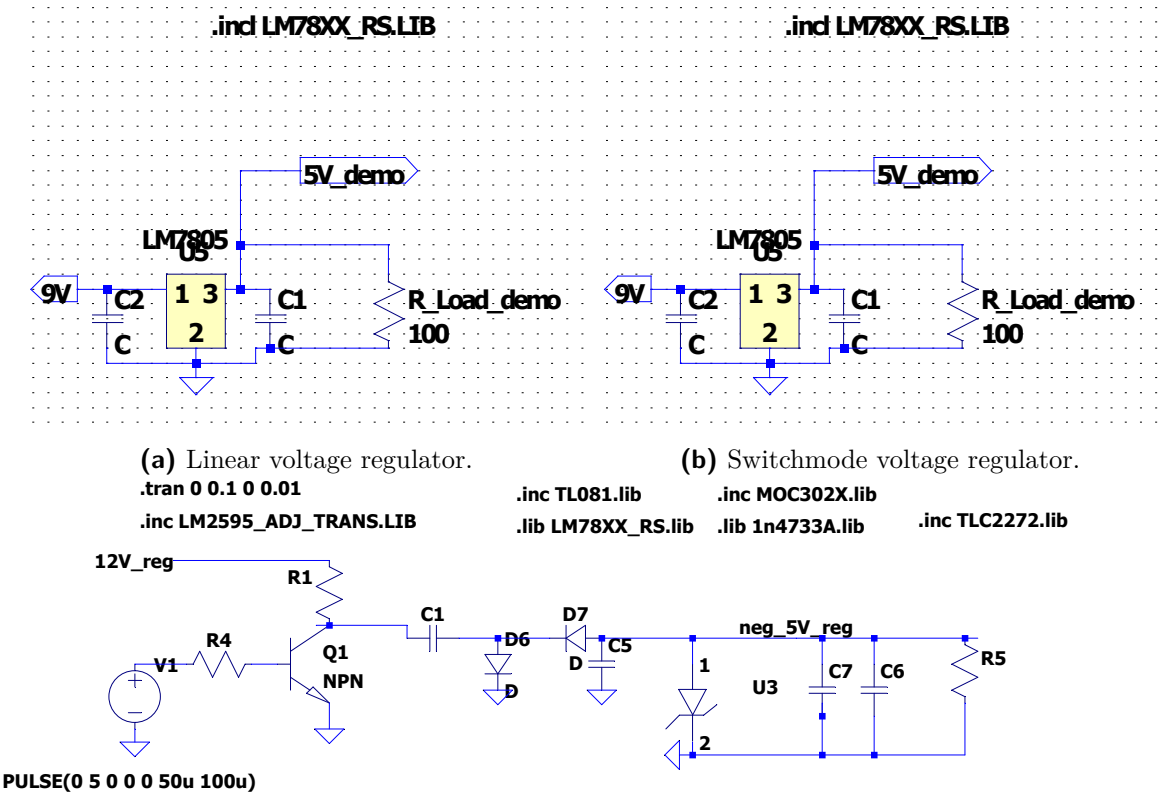
- Circuit diagram like the one in Figure 3.1. I used “print to PDF” from LTSpice, but feel free to use a cropped screengrab if you are PDF-challenged and do not have a PDF printer (there are some free PDF creators online). Also have a look at the demo video on SUNLearn.

For your benefit, here is how to write values with units: 150 mΩ or 199 myUnits, and this is how we write ranges: 2 to 5 kV.

Here is an inline equation $\frac{55}{45+3}$. Here is a numbered equation in Eq. 3.1.

$$a = \frac{55}{45+3}. \tag{3.1}$$

.



(a) Linear voltage regulator.

(b) Switchmode voltage regulator.

(c) Chargepump voltage regulator.

Figure 3.1: Circuit diagrams of the two voltage regulators, and another irrelevant one

.

3.3. Results

In this section, you want to demonstrate, by means of referring to simulation results, using the designed circuit, how your circuit behaves as you designed it in Section 3.2. Present and report on your simulated results in Figure 3.2. Be absolutely sure that the text and information in your report are readable.

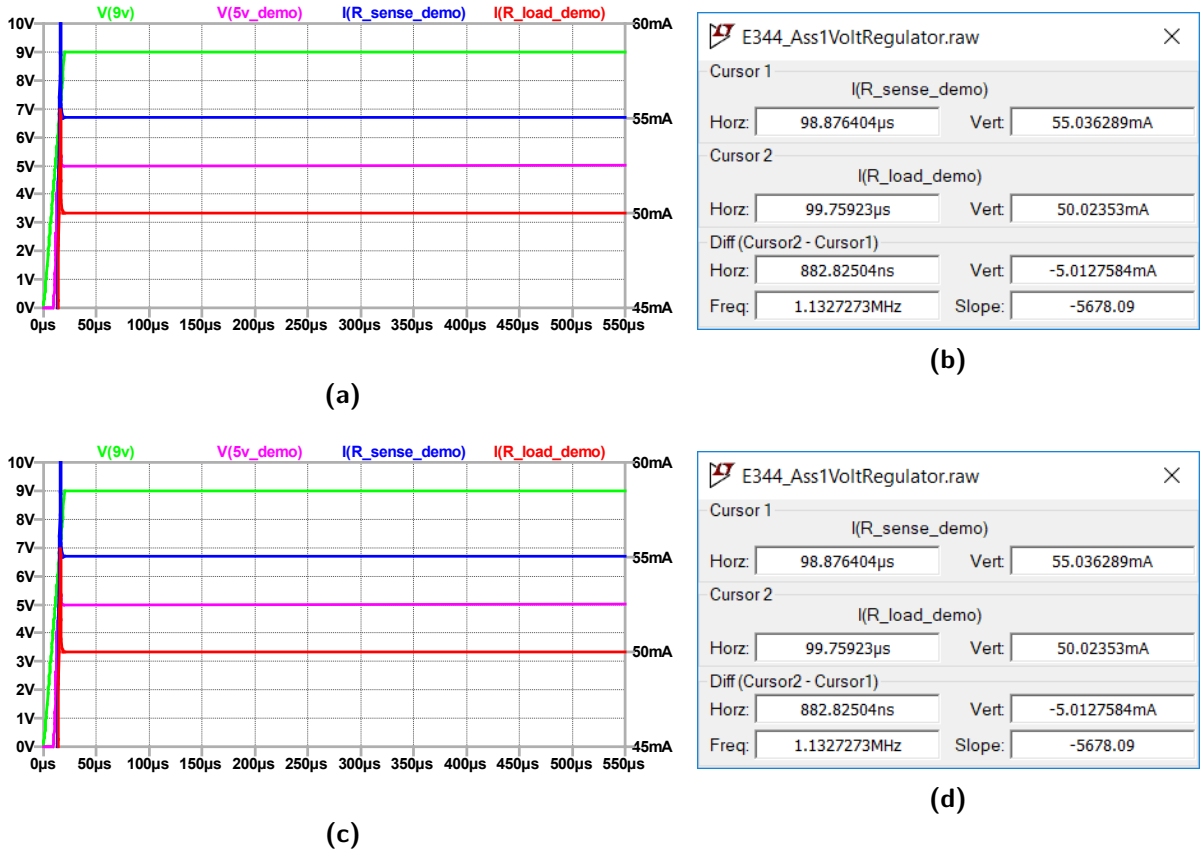


Figure 3.2: Voltage regulation, comparing the linear and switchmode regulators... (a) Blah blah. (b) Blah blah. (c) Blah blah. (d) Blah blah. As far as possible, please put input(s) and output(s) on the same plot rather than on separate plots. Based on the datasheet of XXXX in [1].

Table 3.1: Example of a simple table.

	2017	2018	Δ_{Abs}	Δ_{DiD}
A	9,868	10,399	+5	-11
B	10,191	10,590	+4	-12

Table 3.2: Example of another table.

Schools	Total energy used		Change	
	2017 [kWh]	2018 [kWh]	Δ_{Abs} [%]	Δ_{DiD} [%]
A	9,868	10,399	+5	-11
B	10,191	10,590	+4	-12

You can use screengrabs or photos of the oscilloscope, or download the CSVs and plot them as PDFs using Matlab, Excel or similar. You can also use tables, example of which are presented in Tables 3.1 and 3.2.

3.4. Summary

State whether your design performs as expected and what the limitations or things to keep in mind are.

Bibliography

[1] BBC, "How to make opamps amp op," 2018. [Online]. Available: www.electronics-tutorials.ws

[2] M. J. Booysen, S. J. Andersen, and A. S. Zeeman, "Informal public transport in Sub-Saharan Africa as a vessel for novel Intelligent Transport Systems," in *16th International IEEE Conference on Intelligent Transportation Systems (ITSC 2013)*, Oct 2013, pp. 767–772.

[3] S. Gerber, A. J. Rix, and M. J. Booysen, "Combining grid-tied PV and intelligent water heater control to reduce the energy costs at schools in South Africa," *Energy for Sustainable Development*, vol. 50, pp. 117 – 125, 2019.

Appendix A

Social contract

Download copy from SUNLearn, sign and include here (replace this one).

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E-design 344 Social Contract

2021

The purpose of this document is to establish commitment between the student and the organisers of E344. Beyond the commitment made here, it is not binding.

In the months preceeding the term, the lecturer (Thinus Booysen) and the Teaching Assistant (Kurt Coetzer) spent countless hours to prepare for E344 to ensure that you get your money's worth and that you are enabled to learn from the module and demonstrate and be assessed on your skills. We commit to prepare the assignments, to set the tests and assessments fairly, to be reasonably available, and to provide feedback and support as best and fast we can. We will work hard to give you the best opportunity to learn from and pass analogue electronic design E344.

I, ... have registered for E344 of my own volition with the intention to learn of and be assessed on the principals of analogue electronic design. Despite the potential publication online of supplementary videos on specific topics, I acknowledge that I am expected to attend the scheduled lectures to make the most of these appointments and learning opportunities. Moreover, I realise I am expected to spend the additional requisite number of hours on E344 as specified in the yearbook.

I acknowledge that E344 is an important part of my journey to becoming a professional engineer, and that my conduct should be reflective thereof. This includes doing and submitting my own work, working hard, starting on time, and assimilating as much information as possible. It also includes showing respect towards the University's equipment, staff, and their time.

Prof. MJ Booysen

Student number: .....

Signature: .....

Signature: .....

Date: 29 July 2021

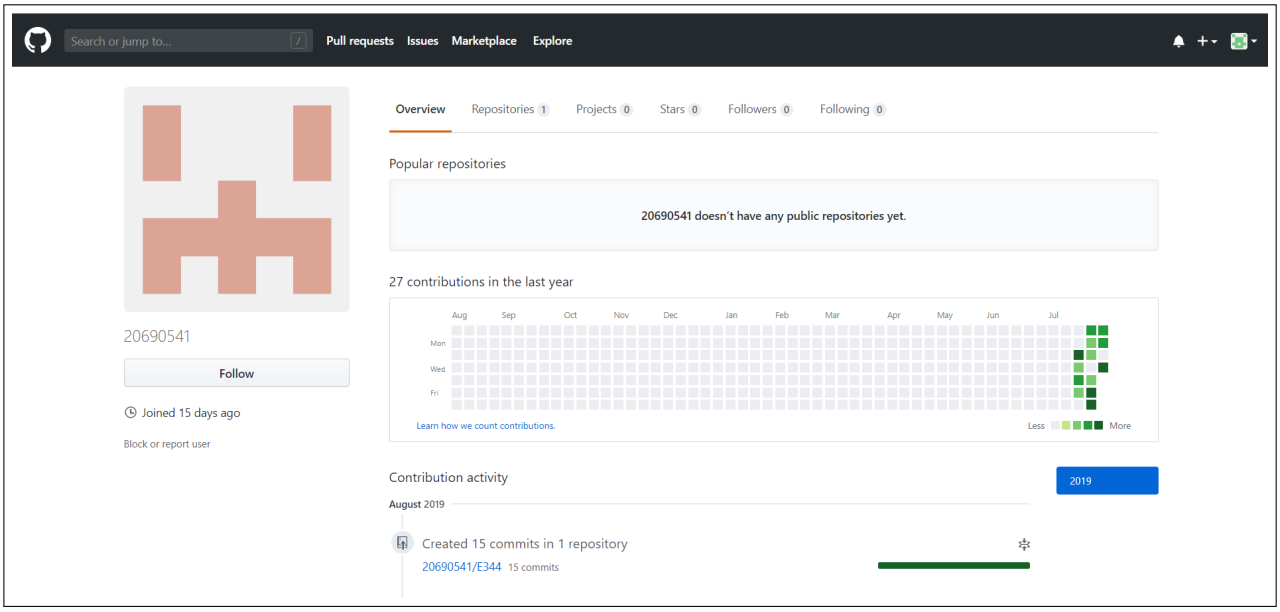
Date: .....

1

Appendix B

GitHub Activity Heatmap

Take a screenshot of your github version control activity heatmap and insert here.



Appendix C

Stuff you want to include

remove this!!

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

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