[Title Here]

[Student name]

[zID]

Abstract

The abstract briefly overviews the practical work, including key results and conclusions. Keep your abstract short, about one paragraph or 250 to 500 words. It must be clear enough that the reader can understand the report's key points. In general, try to address the following questions:

- **Why was the experiment conducted? (Big-picture/real-world view.)**
- **What was the specific problem/research question being addressed?**
- **What methods were used to solve the problem/answer the question?**
- **What results were obtained?**
- **What do these results mean?**
- **How do the results answer the overall question or improve our understanding of the problem?**

Introduction

The introduction/background section is where you introduce and narrow down your research question. You must ***succinctly*** explain the relevant theory and discuss any relevant laws and equations.

It states the ***objective*** of the experiment and provides the reader with background to the experiment. State the topic of your report clearly and concisely. This is also where you should indicate the method/s you will use for analysis, such as nodal analysis and/or numerical modeling.

This section serves to show ***your own*** comprehension of the problem. Provide background theory (if any), previous research, or formulas the reader needs to know. Explain variables that would not be obvious to other engineers (NV, for instance). Current (I) does not need an explanation for other engineers to understand. Labels are required so that the equation may be referred to later in the report without any confusion or need for a reprint.

Also, include any relevant circuit schematics or diagrams from the lab manual or LTSpice that need to be referred to throughout the lab report.

Aim

In each lab, you ***aim*** to do something. For example, to verify, investigate, measure, compare, or test a hypothesis. Summarise each aim in one or two sentences.

- Each aim should have a specific goal. Think about how you will know when you have achieved your aim. This should be apparent from your aim statement.
- Each aim in your experiment should be written in a complete sentence.

Methods

The method section is where you describe what you ***actually*** did during the practical work. You need to describe the actions you took during your practical work in a way that someone from your field has enough information to replicate the process and achieve a similar result.

You must also include any ***unplanned*** changes to the original process which occurred during the execution of the experiment. A great way to keep track of this is to use a lab notebook to note any changes you make during the practical work.

Writing about materials and/or experimental setup

1. Describe the materials used and/or the apparatus setup.
2. Include an image showing the relevant features of any object or material under investigation
3. Include a diagram of the experimental setup, with each component clearly labeled

Measurements and Results

The results section is where you present a ***summary*** of the data collected during your experiments. These results are not just a copy of the raw data from your lab notebook. Rather, it may involve calculation, analysis, and the drawing up of tables and figures to present your data.
This section is usually dominated by calculations, tables, and figures. Number and title tables and graphs.

Calculations

When you take your raw data and perform some sort of mathematical operation to change it, it is good practice to show the equations you used in your analysis and one worked example using each equation. Very long calculations or calculations that you repeat multiple times are usually included in an appendix. Likewise, your raw data can be placed in an appendix. Refer to appendices as necessary, pointing out trends and identifying special features.

Tables

Most numerical data are presented using tables or figures. These need to be clearly labeled following the standard conventions for captions, and titles must tell the reader precisely what data is being presented.

If a measurement is stated in the title, in a column of a table, or on the axis of a graph and it has units associated with it, these **must** be included (usually in brackets).

Table 1

[Table Title]

Column Head	Column Head [units]	Column Head [units]	Column Head [units]
Row Head	123	123	123
Row Head	456	456	456
Row Head	789	789	789

Figures

Graphs need to be clear, easily read, and well-labeled. In figures, the axes should be labeled with appropriate units, and the caption at the bottom of the figure clearly describes what the figure is about. If you must use figures from another source, indicate in the citation whether you have modified it in any way to avoid collusion or plagiarism. You must refer to every figure and table in your text so that the reader understands the content and purpose of each, **see Fig.1**. Explain clearly how you obtained final values, and tell the reader where to find raw data and sample calculations.

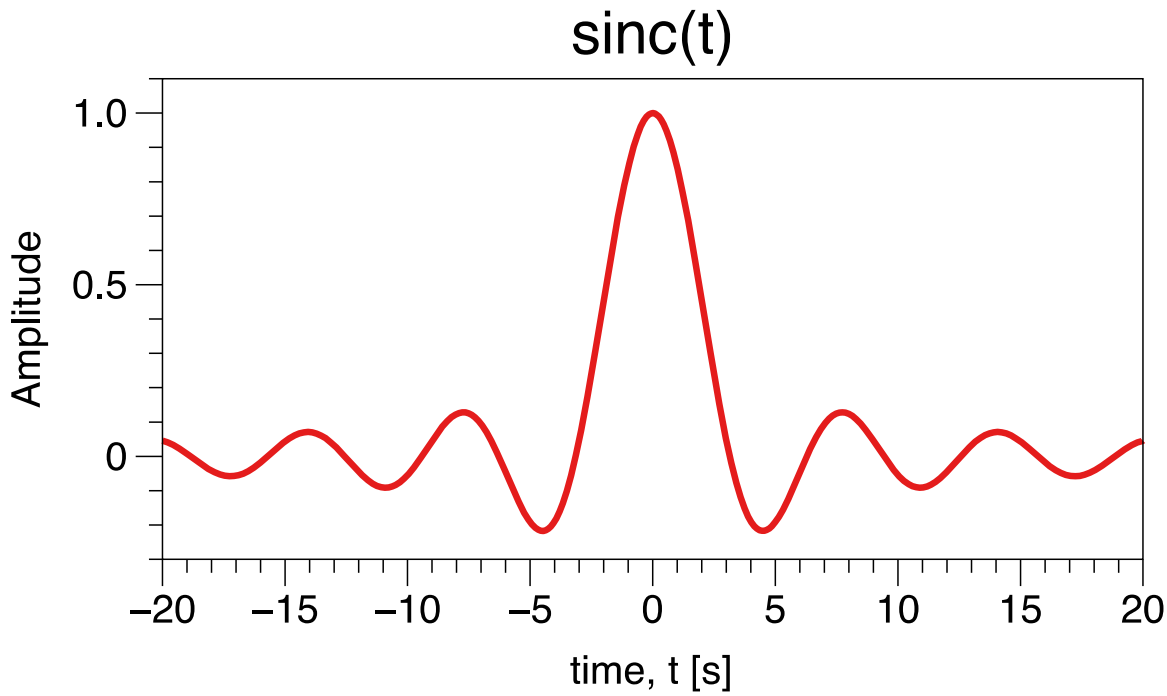

Figure 1: Impulse response of an *ideal* low-pass filter.

Realize that no analysis or interpretation is to be done in this section. It is merely meant to serve as the section to **REPORT** the data you collected in tabular, graphic, or another explanatory format.

Analysis and Discussion

Discussion is the most important part of your report because here, you show that you understand the experiment beyond the simple level of completing it. ***Explain. Analyze. Interpret!***
To do this, you need to summarise your key results, summarise unexpected results, and explain how your results relate to your aims and/or hypotheses, as stated at the start of the report.

1. **Summarise key results**
    - Identify and describe any trends or patterns you have observed. If these are numerical trends, simply saying phrases such as 'higher, lower, increase, or decreased' is vague. Instead, give a numeric value in addition to describing an increase or decrease.
    - Compare the experimental results with any predictions you made.
    - Interpret what the results mean in relation to the aims, research question(s), or hypothesis.

2. **Summarise key unexpected results**
    - Describe any results which were unexpected or didn't match any predictions.
    - Suggest explanations for unexpected results based on the theory and procedures within the experiment.
    - Evaluate how any sources of error might impact on the interpretation of your results in relation to the aims or research question(s).
3. **Discuss limitations**
    - Clarify how the limitations of the study might affect the accuracy and precision of the answers to your aim or research question.
    - Suggest how the experiment or analysis could have been improved.

This part of the lab focuses on the question of understanding "*What is the significance or meaning of the results*?"

Conclusions

The conclusion section is where you summarise your report. A conclusion is usually one paragraph or 200 to 300 words. In this way, a conclusion is very similar to an abstract but emphasizes the results and discussion more.

The conclusion should answer the question: ***So what?*** Focus on the significance and relevance of your results in relation to the aim of your experiment.

A conclusion never introduces any new ideas or results. Rather, it provides a concise summary of those which have already been presented in the report. When writing a conclusion, you should:

- Briefly restate the purpose of the experiment (the question it was seeking to answer).
- Indicate to what extent the aims of the experiment were achieved.
- Summarise the main points of your findings, including key values.
- Summarise important limitations and the cause of unexpected results.
- Recommend improvements to overcome experimental limitations.

References

When in-text citations are incorporated into your lab report (typically in the introduction or discussion), you must always include the full citations in a separate reference list. You may include any reading you have done.

Surname, F. M. (Year). Article Title. *Journal Title*, Pages From-To.

Surname, F. M. (Year). *Book Title.* City Name: Publisher Name.

Appendices

This section is optional, but it typically includes elements such as raw data, calculations, graphs, pictures, or tables that have not been included in the report itself for clarity in your report. Each kind of item should be contained in a separate appendix. Make sure you refer to each appendix at least once in your report.