3. Formal reports

Formal reports are intended to convey information about experimental work from the experimenter to the reader , and will be judged by the success with which they do so . The following points should assist in this task :

3.1 Always use proper complete sentences and write in a clear , grammatically correct English style using the third person and the past passive tense . e.g. . “The frequency was adjusted …” , not “Adjust the frequency …” or , ”We adjusted the frequency …“ .

3.2 Keep every sentences relevant to work . Do not get carried away with long accounts of things only remotely connected with the topic of the report .

3.3 No useful purpose is served in just describing of shape of the graph .

3.4 Do not make vague statements like “The experiment was a success ”.

3.5The purpose of laboratory sheet is to instruct you in how to perform the experiment . It doesn’t form the basis of a formal report . The report is to tell other people what you actually did and your deduction from the work .

3.6 Ensure that the number of significant figure relate to the accuracy of the measurements .

3.7 Use loose leaf A4 sheets stapled together .

4. Format of formal report

4.1 Front page

The front page should contain the title of the report , name , course and date .

4.2 Summary (or Abstract)

Not more than 100 words giving the objectives , an indication of the methods by which these were achieved and a statement of the main result and conclusions . This should be on a separate sheets in front of the main contents .

4.3 Contents sheet

4.4 Aim

It is necessary to state the aim of the experiment . This should provide essential formulation of the question to which answers are sought and should be more than simply a title since it determines the whole cause of investigation .

4.5 Introduction

There should be a brief introduction , so that an electrical engineer who is not familiar with the topic may understand enough to enable him to properly assess the relevance of the work . Here also the theoretical background to the experiment should be outlined and the result of standard theory should be given . Where appropriate suitable references should be listed .

4.6 Experimental procedure

The essential steps taken in carrying out the test and in making the calculations must be explained , reference being made to the equipment used and to any tables of results and graphs which should be included in the following Result section .

4.7 Results

These should include both experimentally and theoretically derived results . Graphical presentation is usually preferable when possible , and where several sets of results are to be compared , they should be plotted on the same graph . This applies particularly to the comparison of experimental and theoretical results . Where results are plotted , it is not necessary to include tables from which the points were obtained as these are already recorded in the laboratory log report .

4.8 Discussion

Here the results obtained and the shortcomings or otherwise of the methods by which they were obtained should be discussed . For example , random and systematic errors should be justified . Reasons for the observed characteristics should be given . Comparison between measured and theoretically derived results should be made and where these differ by more than the expected experimental error , a credible explanation should be found in terms of shortcomings in the theoretical model or in the experimental technique .

4.9 Conclusions

This last section should include brief abstracted conclusions from the arguments of the Discussion , and provide answers to the questions posed by the started object of the experiment . This section should not in general exceed 50 words .

4.10 Appendices

When derivation , tables and/or program listings form part of a formal report , they may distract the reader from the main flow of information . The report may be made more readable if such items are place in appendices at the end of the report . Hence , interested readers may refer to these appendices for more details .

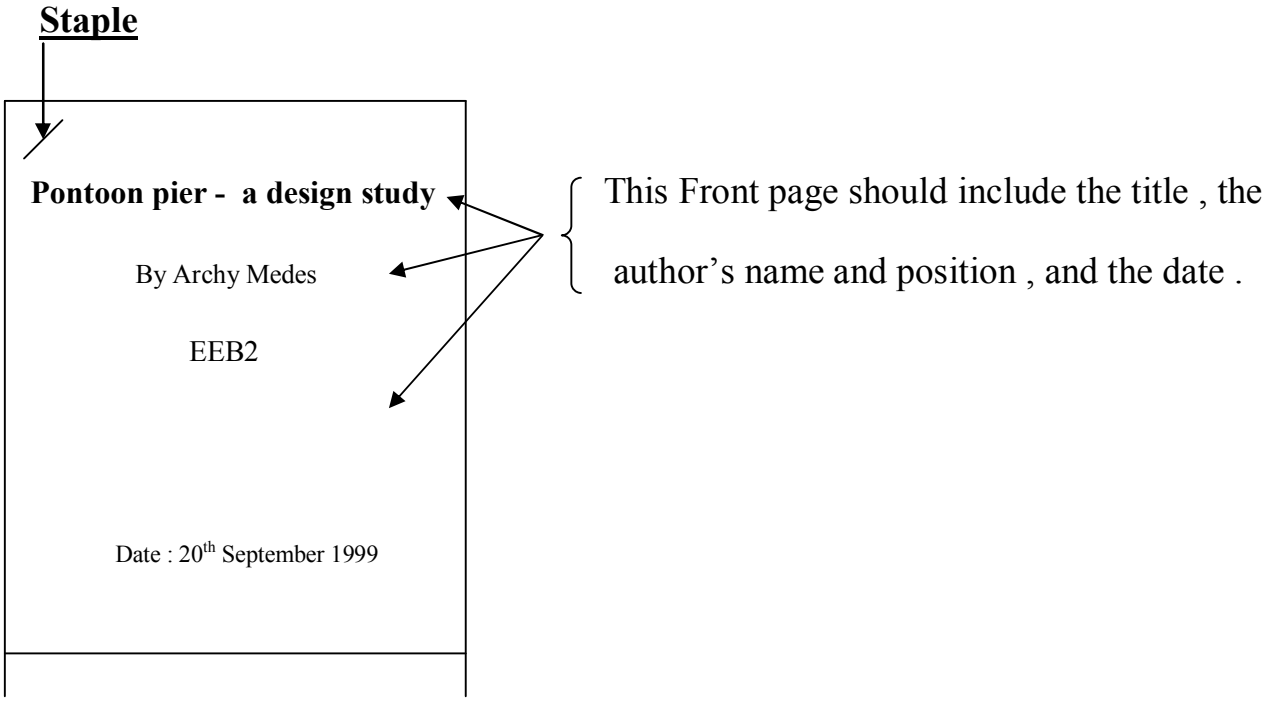
4.11 Bibliography

The bibliography contains references to related papers , text books , lab sheets and lecture notes .

Formal report example

The eighteenth century physicist Henry Cavendish discovered Ohm's law fifty years before the German schoolmaster . However , Cavendish rarely took the trouble to write up his findings . Consequently , the law is quite rightly ascribed to Ohm since it was Ohm who made information available to others. The moral of this story is that although you may do excellent laboratory work , you will not get the credit that your work deserves unless you develop the ability to communicate your results to others . This is the purpose of asking you to write a formal laboratory report – a report that has to be produced in the style of the paper that would be suitable for submission to an engineering journal .

The report should be stapled together using single staple in the top left-hand corner – this facilities easier handing of the report and avoids any difficulties that may
otherwise occur in reading marginal text if the report is bound/stapled along it's left-hand edge .



A summary (or abstract) of no more than 100 words enables a reader to scan quickly through a series of reports to find those of interest . It is essentially a precis of the report and it mast contain sufficient details so that the reader has a clear idea of what was achieved . Who knows , if the summary is attractively written , it may whet readers appetites and stimulate them to read the whole report !

One approach to composing a summary might be to right one sentence that precis each section of the report .

CONTENTS SHEET

The contents of short report may be shown on the title page – more extensive ones should always have a separate page listing the main sections and appendices and giving their page numbers .

Note : A contents sheet is a little use as a reference source if the report doesn't have numbered pages !

A clear and concise aim enables the reader to remain focused on the subject matter under discussion . Multiply aims may have the detrimental effect .

1. Aim
   The aim is to improve the response of a pontoon pier by increasing the damping and reducing the setting time .

2. Introduction
   A local boat hire firm uses a small pontoon pier to enable customers to step from the shore and into the boat . However , the pier oscillates considerably as customers step on/off the pontoon and when it is subjected to wave disturbances from passing motor boats; and so on…

The introduction should give the background to the report and outline its scope and purpose . It should enable an engineer who is not familiar with the topic to understand enough to enable him to assess relevance of the work . Theoretical background should be outlined here and the results of standard theory (not derivations) should be given . Suitable references should be listed in the bibliography .

Note that numbered pages , paragraphs , figures and equations facilitate easy reference .

The main body of the report contains the detailed facts and findings , shows how they were arrived at and indicates the inferences to be drown from them .

The main body would normally include the following sections in some from or other :

Experimental Procedure

Results

Discussion

Experimental procedure – the essential step in carrying out the tests and in making the calculations must be explained , reference being made to the equipment used and to any tables of results and curves (which should be included in the Results section) .

3. Experimental procedure

3.1**Mathimatical Model .** The schematic diagram of the system is shown in figure 2 below ; figure 3 illustrates the equivalent second order mass – spring – damper system . It was decided to example the system by getting a person of mass M2 to step quickly but carefully onto the pier.

Here should be the calculations

3.2 **Time Response** . As a result of the step input , I observed that the pontoon oscillated for approximately 10 seconds and completed about 4 oscillations in that time . In addition, when it had reached its steady state condition, it had settled 10cm deeper in the water.

|| Use the third person and the passive past tense when writing reports . In this example , the passage :

" … I observed that pontoon oscillated for …"

should have been written as :

" … the pontoon was observed to oscillate for … "

Results – the results section should include both experimentally and theoretically derived results . Graphical presentation is usually preferred where possible , and where several sets of results are to be compared , they should be plotted on the same graph . This applies particularly to the comparison of experimental and theoretical results .

4 .Results

4.1 Transfer function . The system of transfer function was deduced from the time response and found to be :

(calculations)

The details of the derivation are shown in appendix A ||

4.2 Improving the Time response. The preliminary design aimed to achieve specifications of a damping factor of 0.7 and setting time of about 1.5 seconds. The desired pol2e locations were derived from the time response specifications – derivation is shown in Appendix B on page 7. The desired pole locations were calculated to be :

(calculations)

In order not to disrupt the flow of the report by distracting the reader with mathematical detail, the derivation is contained in appendix. It is a question of personal judgement as to what retained in the main text and what is placed in the appendix. However, if a report includes program listing, these would nearly always be located in appendix; only lines of significant interest would be placed in the main text.

4.3 Proposed Design Implications. Assuming that the mass remains constant, examination of equation (1) below, indicates that in order to increase the coefficient by a factor of 7, the damping coefficient B must be increased sevenfold. Since it has been assumed that the damping is proportional to the cross sectional area (csa) of the barrel, a plank whose area is seven times the csa of the barrel should be lashed to the bottom of the barrel. In order that the coefficient of S is doubled, the 'spring constant' K must be doubled. Hence, 2 barrels are required instead of original one.

$$\frac{x(s)}{F(s)} = \frac{\dfrac{1}{M_1 + M_2}}{s^2 + \dfrac{B}{M_1 + M_2}s + \dfrac{K}{M_1 + M_2}} \quad (1)$$

(Here should be pictures and so on, it is not impotent)

Reproducing an equation may make it easier for the reader to interpret the text since all of the related information appears on the current page. This technique overcomes the problem whereby the reader has to turn pages in order to refer back to the equation.

A similar situation can occur when a detailed graph is contained in an appendix and the current text refers to that graph. If a simplified thumb nail sketch of the graph is reproduced on the current page, the reader may be able to interpret the text without reference to the appendix. Only readers interested in the nitty-gritty need refer to the appendix.

Discussion – this section should include a discussion of the results and the shortcomings or otherwise of the methods by which they were obtained. Reasons for the observed characteristics should be given. Comparison between measured and theoretically derived results should be made and where these differ by more than the expected experimental error, a credible explanation should be found in terms of the failings in the theoretical model or in the experimental technique.

5.DISCUSSION

5.1 Design. The design proposal was based on the premise that damping is proportional to the system's effective cross-sectional area. The proposed design indicated that6 the time response can be dramatically improved by the introduction of an additional barrel and some planking.

5.2 Further Simulation. The design was based on the situation where one person stepped onto the pontoon. Before acquiring another similar barrel and the necessary planking, further simulation should be carried out. In particular, the following question need to be answered:

- **a.** What is the effect if two or more people step onto the pontoon at the same time?
- **b.** What is the effect if one or more people are already on the pontoon and another person steps onto the pontoon?
- **c.** How does the proposed design respond to disturbances caused by passing boats?
- **d.** How would the system respond to a combination of passing boats and customers moving on/off the pontoon?

The conclusion section should include brief abstracted conclusions from the arguments of the Discussion, and provide answers to any questions posed by the stated aim of the experiment. In general, this section should not exceed 50 words.

For example: The underdamped pontoon pier was modeled as a second order system. Based on the assumption that the system's dumping was proportional to the cross-sectional area, the design proposal indicated that a second barrel and some additional planking could dramatically improve the system's performance. However, before any alterations are made to the pier, further simulations should be undertaken.

After that should be appendix A , appendix B and so on …,on the separated sheets, if they are needed as in this case . In this example's appendixes are DERIVATIONS OF THE SYSTEN'S TRANSFER FUNCTION and DESIRED TRANSFERE FUNCTION.

Bibliography is on the last sheet of report .