



INTERNAL ASSESSMENT APPROVAL FORM (INCLUDING COLLABORATIVE PROVISION)

This form is used to ensure that assessment specifications have been through an internal review process prior to external examination/approval and release to students. It should be completed for each assessment for a particular module. The assessment tasks, criteria and marking scheme should accompany this form.

PARTNER (and taught location if relevant):	Coleg Sir Gar				
EXTERNAL EXAMINER NAME:	Dr Alison Griffiths				
ASSESSMENT AUTHOR :	Liesel Williams				
MODULE TITLE:	Electrical Principles, Methods and Simulation				
MODULE CODE:	SGEE5002		MODULE LEVEL:	5	
COMPONENT NO. (e.g. 1 of 2):	1 of 1		COMPONENT WEIGHTING (e.g. 50% of the module):	100%	
ASSESSMENT PERIOD	☐ Semester 1	☐ Semester 1 <i>Re-sit</i>	☒ Semester 2	☐ Semester 2 <i>Re-sit</i>	<i>Other, please state</i>
TYPE OF ASSESSMENT:	☒ Coursework		☐ Examination		☐ Practical
LANGUAGE OF ASSESSMENT:	English		TRANSLATION REQUIRED (Y/N):	N	
FOR EXAMINATIONS ONLY. SPECIFY BELOW ANY ADDITIONAL MATERIAL(S) TO BE USED IN THE EXAMINATION					
<i>This box will expand as you type</i>					

INTERNAL MODERATOR PLEASE TICK TO INDICATE THAT THE ASSESSMENT INCLUDES:		<i>Please</i> ✓		Comments
		YES	NO	
1	Tasks that are specified clearly, accurately and comprehensibly, with appropriate use of language and neat presentation	☒	☐	
2	Tasks which enable the module learning outcomes to be demonstrated (as per the module syllabus)	☒	☐	
3	Tasks which conform to the assessment described in the module syllabus	☒	☐	
4	Tasks which are written at the appropriate level of the Framework for Higher Education Qualifications (see http://www.qaa.ac.uk/docs/qaa/quality-code/qualifications-frameworks.pdf?sfvrsn=170af781_14).	☒	☐	
5	Clear criteria for assessment and guidance about how marking/grading will be applied	☒	☐	
6	Guidance about expected evidence for submission, e.g. essay or report, word count, bibliography and references	☒	☐	
7	Reference to good academic conduct, for example referencing, plagiarism and Turnitin	☒	☐	
8	Actions to complete None <i>This box will expand as you type</i>			

SIGNATURE OF APPROVAL:	SIGNATURE	DATE
INTERNAL MODERATOR: I confirm that this version of the assessment specification is ready to be sent to the Partnership Team Leader	<i>R. Jones</i>	01/10/20

ONLY TO BE COMPLETED IF THE ASSESSMENT IS LINKED TO A COLLABORATIVE PARTNER

PARTNERSHIP TEAM LEADER PLEASE TICK TO INDICATE THAT THE ASSESSMENT INCLUDES:		Please ✓ YES NO		Comments
1	Tasks that are specified clearly, accurately and comprehensibly, with appropriate use of language and neat presentation			
2	Tasks which enable the module learning outcomes to be demonstrated (as per the module syllabus)			
3	Tasks which conform to the assessment described in the module syllabus			
4	Tasks which are written at the appropriate level of the Framework for Higher Education Qualifications (see http://www.qaa.ac.uk/docs/qaa/quality-code/qualifications-frameworks.pdf?sfvrsn=170af781_14).			
5	Clear criteria for assessment and guidance about how marking/grading will be applied			
6	Guidance about expected evidence for submission, e.g. essay or report, word count, bibliography and references			
7	Reference to good academic conduct, for example referencing, plagiarism and Turnitin			
8	Actions to complete <i>This box will expand as you type</i>			

SIGNATURE OF APPROVAL:	SIGNATURE	DATE
PTL: I confirm that this version of the assessment specification is ready to be sent to the External Examiner		

UWTSD PROVISION: please submit the completed document to the appropriate Programme Director.

COLLABORATIVE PROVISION: please submit the completed document (or make available electronically) to the Partnership Team Leader. This must be in accord with specific arrangements for sharing electronic documents (e.g. via SharePoint or similar).

The assessment tasks, criteria and marking scheme should accompany this form

THIS DOCUMENT IS ALSO AVAILABLE IN WELSH

LEVEL 5 ASSESSMENT SPECIFICATION

Student name:		Student ID number:	
Programme:	HNC Electrical and Electronic Engineering		
Module:	ELECTRICAL PRINCIPLES, METHODS AND SIMULATION		
Module code:	SGEE5002	Contribution to Overall Module Assessment (%):	100%
Lecturer:	Liesel Williams	Internal Verifier:	Robert Davies
Assignment Title:	Analysis, Simulation and Evaluation of Circuits and Systems	Word count (or equivalent):	2500
Submission deadline:	26th April 2021	Return date of provisional marks & written feedback:	26 th May 2021
Submission method:	All written assessments, where practical and possible, must be submitted via Turnitin unless otherwise instructed by the Lecturer. (Please DO NOT put this assessment specification into Turnitin or it will match many similarities with other students' submissions.) Alternative submission method (if applicable): Late submission of the assessment will result in a late penalty mark. Penalties for late submission: Up to one week late, maximum mark of 40%. Over one week late, 0%. Only the Extenuating Circumstances Panel may approve a change to submission dates.		
Academic honesty / referencing:	Academic honesty is required. In the main body of your submission you must give credit to authors on whose research and ideas your work is based. Append to your submission a reference list that indicates the books, articles, etc. that you have used, cited or quoted in order to complete this assessment.		

Module Learning Outcomes (from module syllabus)

1. Demonstrate a systematic understanding of the behaviour of electrical and electronic circuits and control systems through analytic methods based on advanced mathematical techniques.
2. Apply methods of analysis, modelling and simulation of electrical and electronic circuits, and control systems using an appropriate, industry standard, software package.

TASK DESCRIPTION

Aims and Objectives

The overall aim of the module is to gain a systematic understanding of advanced principles related to electrical and electronic engineering and control systems, and how to apply methods of analysis, modelling and simulation in order to predict the performance of such circuits and systems.

Assignment Tasks

The following task give guidance of what needs to be done and in what order.

Task 1 – Transient Analysis of a First Order RL Electrical Circuit

For the circuit shown in figure 1:

- 1.1 Select suitable component values (each student must choose different values) and calculate the time constant.
- 1.2 Draw the Laplace model, give the transfer function in terms of the time constant.
- 1.3 Write a suitable Matlab model program and perform an analysis of the transient responses to a 1V step input and measure the time constant. Provide suitably annotated graphical results.
- 1.4 Draw up a table with columns for theoretical and simulation results and make suitable comparisons
- 1.5 Critically analyse the performance of the circuit and draw up conclusions.

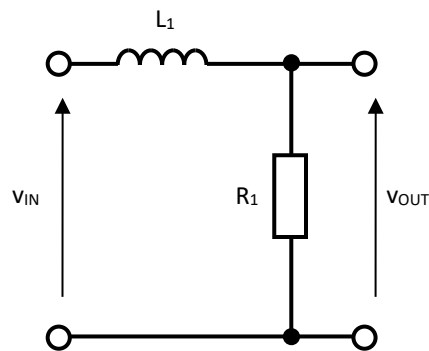


Figure 1

Task 2 – Transient Analysis of a First Order RC Electrical Circuit

For the circuit shown in figure 2:

- 2.1 Select suitable component values (each student must choose different values) and calculate the time constant.
- 2.2 Draw the Laplace model, give the transfer function in terms of the time constant.
- 2.3 Write a suitable Matlab model program and perform an analysis of the transient responses to a 1V step input and measure the time constant. Provide suitably annotated graphical results.
- 2.4 Draw up a table with columns for theoretical and simulation results and make suitable comparisons
- 2.5 Critically analyse the performance of the circuit and draw up conclusions.

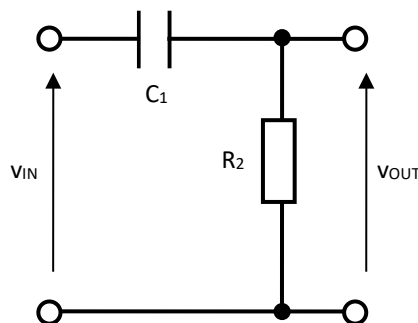


Figure 2

Task 3 – Frequency Performance Analysis of a First Order RL Electrical Circuit

For the circuit of figure 1, using the same component values selected in task 1:

- 3.1 Calculate the cut-off frequency and transpose the transfer function in terms of the cut-off frequency, and determine the type of type of frequency response and the phase shift at the cut-off frequency.
- 3.2 Write a suitable Matlab model program to perform a steady state frequency analysis and measure the cut-off frequency from the Bode plot and the phase shift. Provide suitably annotated graphical results.
- 3.3 Draw up a table with columns for theoretical and simulation results and make suitable comparisons
- 3.4 Critically analyse the performance of the circuit and draw up conclusions.

Task 4 – Frequency Performance Analysis of a First Order RC Electrical Circuit

For the circuit of figure 2, using the same component values selected in task 2:

- 4.1 Calculate the cut-off frequency and transpose the transfer function in terms of the cut-off frequency, and determine the type of type of frequency response and the phase shift at the cut-off frequency.
- 4.2 Write a suitable Matlab model program to perform a steady state frequency analysis and measure the cut-off frequency from the Bode plot and the phase shift. Provide suitably annotated graphical results.
- 4.3 Draw up a table with columns for theoretical and simulation results and make suitable comparisons
- 4.4 Critically analyse the performance of the circuit and draw up conclusions.

Task 5 – Transient Performance Analysis of a Second Order Series Electrical Circuit

For the circuit shown in figure 3:

- 5.1 Select suitable component values (each student must choose different values).
- 5.2 Draw the Laplace model and give the transfer function in standard format.
- 5.3 Determine the transient performance parameters of the system for a step input from the transfer function.
- 5.4 Write a suitable Matlab model program and perform a transient analysis. Take suitable measurements of performance. Provide suitably annotated graphical results which must be labelled and readable.
- 5.5 Place results in a table and evaluate the performance of each circuit and make comparisons between theoretical predictions and model results.
- 5.6 Investigate by analysis and modelling, the effects of varying the value of the resistor in each circuit upon its performance (all four types of damping). Produce graphic results from Matlab. Summarise results in a table and make comparisons.
- 5.7 Critically analyse the performance of the circuit and draw up conclusions.

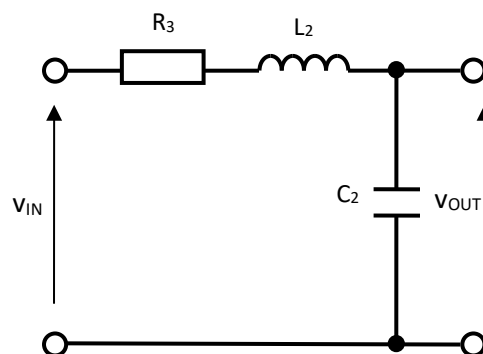


Figure 3

Task 6 – Transient Performance Analysis of a Second Order Parallel Electrical Circuit

For the circuit shown in figure 4:

- 6.1 Select suitable component values (each student must choose different values).
- 6.2 Draw the Laplace model and give the transfer function in standard format.
- 6.3 Determine the transient performance parameters of the system for a step input from the transfer function.
- 6.4 Write a suitable Matlab model program and perform a transient analysis. Take suitable measurements of performance. Provide suitably annotated graphical results which must be labelled and readable.
- 6.5 Place results in a table and evaluate the performance of each circuit and make comparisons between theoretical predictions and model results.

- 6.6 Investigate by analysis and modelling, the effects of varying the value of the resistor in each circuit upon its performance (all four types of damping). Produce graphic results from Matlab. Summarise results in a table.
- 6.7 Critically analyse the performance of the circuit and draw up conclusions.

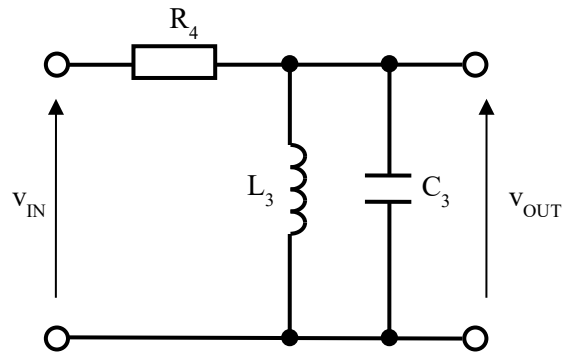


Figure 4

Task 7 – Frequency Performance Analysis of a Second Order Series Electrical Circuit

For the circuit of figure 3, using the same component values as task 5:

- 7.1 From the transfer function, determine the frequency performance parameters such as cut-off frequencies etc from theory.
- 7.2 Write out a suitable Matlab model program and perform a frequency analysis. Take suitable measurements of performance. Provide suitably annotated graphical results which must be labelled and readable.
- 7.3 Evaluate the performance of each circuit and make comparisons between theoretical predictions and model results.
- 7.4 Investigate by analysis and modelling, the effects of varying the value of the resistor in each circuit upon its performance. Produce graphic results from Matlab.
- 7.5 Critically analyse the performance of the circuit and draw up conclusions.

Task 8 – Frequency Performance Analysis of a Second Order Parallel Electrical Circuit

For the circuit of figure 4, using the same component values as task 6:

- 8.1 From the transfer function, determine the frequency performance parameters such as cut-off frequencies etc from theory.
- 8.2 Write out a suitable Matlab model program and perform a frequency analysis. Take suitable measurements of performance. Provide suitably annotated graphical results which must be labelled and readable.
- 8.3 Evaluate the performance of each circuit and make comparisons between theoretical predictions and model results.
- 8.4 Investigate by analysis and modelling, the effects of varying the value of the resistor in each circuit upon its performance. Produce graphic results from Matlab.
- 8.5 Critically analyse the performance of the circuit and draw up conclusions.

Task 9 – Frequency Performance Analysis of a First Order Electronic System

- 9.1 Select a suitable value for C4 for the electronic system shown in figures 5 and determine the expected frequency performance.
- 9.2 Write a suitable Matlab model program and produce frequency responses. Take readings of cut-off frequency, phase shift and roll-off, tabulate results and compare with theoretical values.
- 9.3 Critically analyse the performance of the system and draw up conclusions.

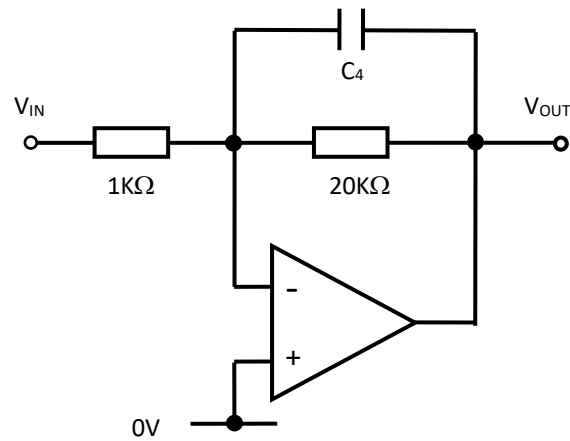


Figure 5

Task 10 – Frequency Performance Analysis of a First Order Electronic System

10.1 Select a suitable value for C_5 for the electronic system shown in figures 6 and determine the expected frequency performance.

10.2 Write a suitable Matlab model program and produce frequency responses. Take readings of cut-off frequency, phase shift and roll-off, tabulate results and compare with theoretical values.

10.3 Critically analyse the performance of the system and draw up conclusions.

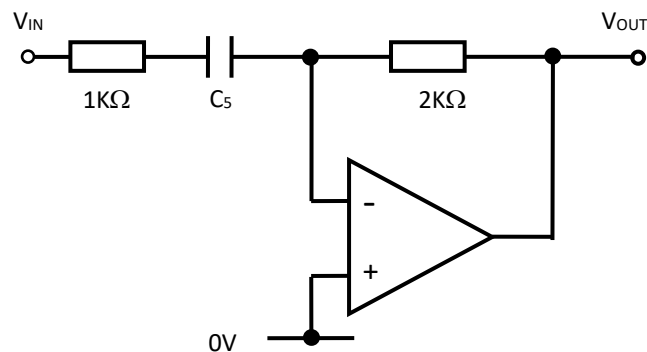


Figure 6

Task 11 – Frequency Performance Analysis of a Fourth Order Electronic System

11.1 Analyse the system shown in figure 7 and using a Matlab model approach, produce a frequency response of the gain at points V_A , V_B , and V_C on the same graphs.

11.2 Critically analyse your results and compare with theory. Evaluate the system's performance and consider how it could be redesigned to produce the same cut-off frequency as the system in figure 5. How does the overall performance of these two systems compare?

11.3 Critically analyse the performance of the system and draw up conclusions.

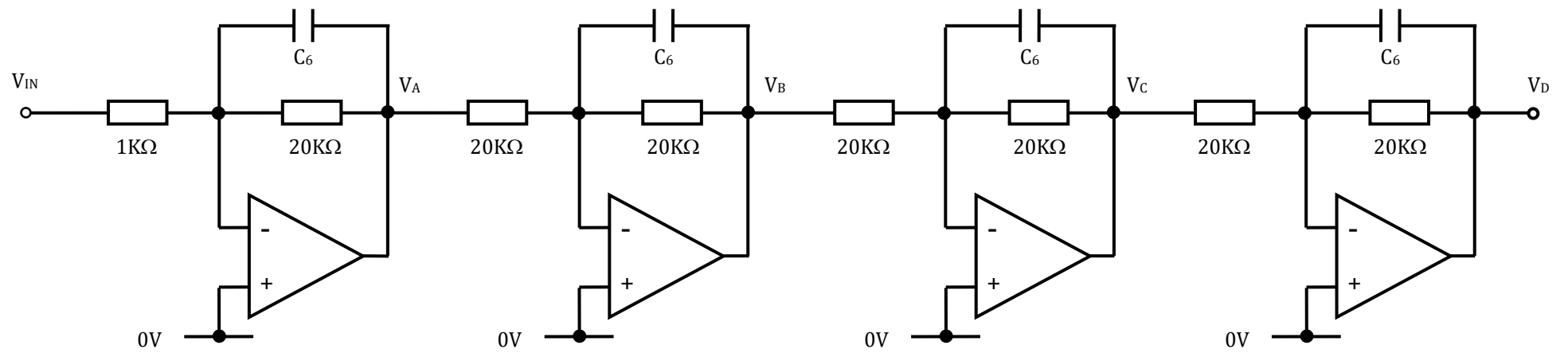


Figure 7

Task 12 – First Order Control System Analysis

Analyse the system model shown in figure 8.

- 12.1 Determine the open loop performance, plot the argand diagram and comment on its stability.
- 12.2 Produce the overall closed loop transfer function in terms of K, plot the argand diagram for $K = 1$ and comment on its stability.
- 12.3 Determine the minimum value of K required in the feedback and use a root locus plot in Matlab to confirm it.
- 12.4 Build the model using Simulink and measure its response to a step input with 3 different values of K below and above the calculate value. Present all your mathematical workings, add annotations to your graphical results.
- 12.5 Draw up a table with columns for theoretical and simulation results and make suitable comparisons
- 12.6 Critically analyse the performance of the circuit and draw up conclusions.

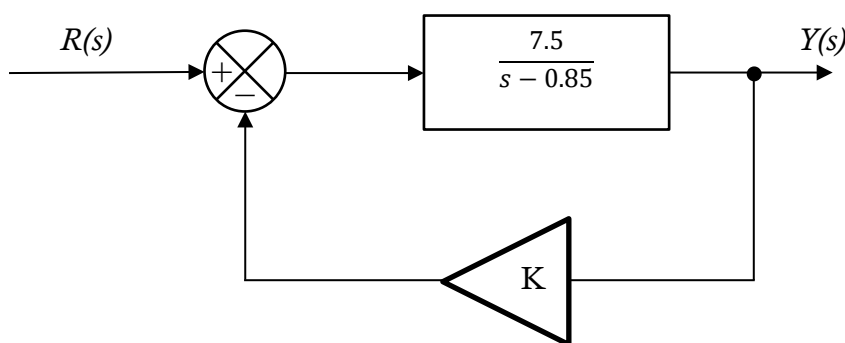


Figure 8

Task 13 – DC Motor Model Analysis

A DC permanent magnet motor has the following parameters:

- Armature resistance = 1.5 Ohms
- Armature inductance = 0.165H
- Rotor inertia = 0.00042 Kg m²
- Friction coefficient = 4.6 x 10⁻⁶ Nm/rad/s
- Motor voltage constant = 0.063 V/rad/s
- Motor torque constant = 0.062 Nm/A
- Maximum armature voltage = 24V

- 13.1 Develop a mathematical model of the motor and its load, produce the transfer function with the disturbance initially set to zero.
- 13.2 Deduce the electrical time constant, natural frequency, damping factor, stall torque and theoretical friction-less no-load-speed.
- 13.3 Plot the poles and comment on their location in the argand diagram.
- 13.4 Build a model of this motor system using Matlab Simulink.
- 13.5 Analyse the speed and torque responses of the motor over 20 seconds to an armature voltage step input of 15Vdc with the disturbance set to zero and thus measure the no-load-speed and torque of the motor. Measure the settling time.
- 13.6 Analyse the speed and torque responses of the motor over 20 seconds to an armature voltage step input of 15Vdc with the disturbance of 0.03Nm after 10 seconds and thus find the speed and current.
- 13.7 Draw up a table with columns for theoretical and simulation results and make suitable comparisons
- 13.8 Critically analyse the performance of the circuit and draw up conclusions.

Task 14 – Proportional Speed Control System

- 14.1 Convert the motor model into a subsystem for simplicity. Add an outer loop to include a proportional controller with a step speed setpoint of 140 rad/s and speed feedback with a disturbance of 0.03Nm after 10 seconds. Use the standard PID block (set up for P only) and ensure the armature voltage is limited to maximum voltage. Run the auto tune feature and obtain the optimum value for the constant K_p .
- 14.2 Replicate the control system twice and feed the speed output signals into a 3-input scope. Manually adjust the values of K_p in the two new controllers above and below the auto tuned value. Run the simulation and measure the steady state error, rise time, overshoot (if any) for all three responses.
- 14.3 Discuss the effect of increasing or decreasing K_p .
- 14.4 Draw up a table with columns for theoretical and simulation results and make suitable comparisons
- 14.5 Critically analyse the performance of the circuit and draw up conclusions.

Task 15 – Proportional-Integral Speed Control System

- 15.1 Save your Matlab file under a new name and convert each controller to PI. Auto tune the first and use the same value of K_p in all three systems.
- 15.2 Change the value of K_i in the other two controllers to demonstrate the effect of tuning. Measure the rise time, overshoot percentage, the settling time and the steady state error.
- 15.3 Summarise all your results in a table, critically analyse and make comparisons. What can you now say about the effect of adding integral control and its behaviour when tuned. What is the effect of changing K_i ? Draw up conclusions.

Task 16 – Proportional-Integral-Derivative Speed Control System

- 16.1 Save your Matlab file under a new name and convert each controller to PID. Auto tune the first and use the same value of K_p and K_i in all three systems.
- 16.2 Change the value of K_d in the other two to demonstrate the effect of tuning. Measure the rise time, overshoot percentage, the settling time and the steady state error.
- 16.3 Summarise all your results in a table, critically analyse and make comparisons. What can you now say about the effect of adding derivative control and its behaviour when tuned. What is the effect of changing K_d ? Draw up conclusions.

Task 17 – Controller Comparisons

- 17.1 Save your Matlab file under a new name and make one system P control, another PI control and the third can remain a PID controller.
- 17.2 Plot the response of the three types of controller on the same scope and demonstrate the effects of controller improvement from P to PI to PID.
- 17.3 Summarise all your results in a table, critically analyse and make comparisons. Draw up conclusions.

Task 18 – Overall Conclusions and Recommendations

For the whole assignment, summarise all your conclusions here, state what you now know, make overall conclusions and recommendations which must include your suggestions on improvement of circuits and systems.

GUIDANCE FOR STUDENTS IN THE COMPLETION OF TASKS

You are required to present an electronic report containing detailed observational notes of your work. The report must contain 2500 words and should be preceded by a title page, table of contents. Structure the report by task number.

Your pages should be numbered and your figures must also be numbered and listed. The Turnit-in Rubric will be used to record your marks with your tutor's feedback.

Your title page for the report should contain the following information:

Course:	HNC Electrical and Electronic Engineering
Module:	SGEE5002 Electrical Principles, Methods and Simulation
Assignment:	Analysis, Simulation and Evaluation of Circuits and Systems
Name:	????? ??????
University number:	XXXXXXX
Date submitted:	DD/MM/YYYY
Word count:	?????

Further guidance:

- Do not use a styled document (template) and don't add your company logo.
- Do not include photographs of course notes or formative classroom work.
- All pages and figures must be numbered and listed in the Table of Contents and List of Figures.
- There is no need to include whole datasheets; simply cite their source or include a "snip" of the relevant information.
- Write all sections in the third person.
- Note which sections of your report have been identified above as places where the marks will be awarded and use your word allocation wisely.
- Save your report as a .pdf with your university number as the file name.
- The TurnIt-In rubric will be used to record your marks and provide you with tutor feedback.

Going Over the Word Limit

If you are found to have exceeded the specified word limit for an assessment, your work may be subject to a penalty:

- Under length - No penalty, but your work is probably missing key information
- Up to 10% over length - No deduction off final mark
- 11% or more over length - Deduction of 5 marks off final mark (but cannot reduce mark below 40%)

To measure the word count, DO NOT use Turnit-In and do not include the following:

- Assignment brief
- Index, Table of Contents and Table of Figures
- Formula and calculations (use MSEquation or text boxes to contain these)
- Reference list or bibliography
- Appendices used for: large results tables, computer code listings, data sheet extracts and any other 3rd party information

Spot checking of declared word counts will be carried out by your lecturer and second marker.

NOTE: The guidance offered below is linked to the five generic assessment criteria overleaf.
Significant differences from Level 4 are highlighted in red.

1. Engagement with Literature Skills

Your work must be informed and supported by scholarly material that is *relevant* to and *focused* on the task(s) set. You should provide evidence that you have accessed an appropriate *range* of sources, which may be academic, governmental and industrial; these sources may include academic journal articles, textbooks, current news articles, organisational documents, and websites. You should consider the *credibility* of your sources; academic journals are normally highly credible sources while websites require careful consideration/selection and should be used sparingly. Any sources you use should be current and up-to-date, mostly published within the last five years or so, though seminal/important works in the field may be older. You must provide *evidence* of your research/own reading throughout your work, using a suitable referencing system, including in-text citations in the main body of your work and a reference list at the end of your work.

Guidance specific to this assessment: *Not assessed by this assignment.*

2. Knowledge and Understanding Skills

At level 5, you should be able to demonstrate: **sound** knowledge and **critical understanding** of the well-established concepts and principles of the subject area and **the way in which those principles have developed; knowledge of the main methods of enquiry in the discipline.** *Knowledge* relates to the facts, information and skills you have acquired through your learning. You demonstrate your *understanding* by interpreting the meaning of the facts and information (knowledge). This means that you need to select and include in your work the concepts, techniques, models, theories, etc. appropriate to the task(s) set. You should be able to explain the theories, concepts, etc. meaningfully to show your understanding. Your mark/grade will also depend upon the *extent* to which you demonstrate your knowledge and understanding.

Guidance specific to this assessment: *This will be assessed by your introduction to each task and your understanding of its requirements and your explanations of your results.*

3. Cognitive and Intellectual Skills

You should be able to **critically analyse information, and propose solutions to problems arising from that analysis, including the critical evaluation of the appropriateness of different approaches to solving problems.** Your work must contain evidence of logical, analytical thinking, **evaluation and synthesis.** For example, to examine and break information down into parts, make inferences, compile, compare and contrast information. This means not just describing what! But also justifying: Why? How? When? Who? Where? At what cost? **At all times,** you must provide justification/evidence for your arguments and judgements. Evidence that you have reflected upon the ideas of others within the subject area is crucial to you providing a reasoned and informed debate within your work. Furthermore, you should provide evidence that you are able to make sound judgements and convincing arguments using data and concepts, **with an understanding of the limits of knowledge, and how this influences analyses and interpretations.** **Sound, valid conclusions are necessary and must be derived from the content of your work.** Where relevant, alternative solutions and recommendations may be proposed.

Guidance specific to this assessment: *This will be assessed by your analysis of each circuit and system, your calculations and predictions of performance and your comparisons between theory and simulations, your conclusions and recommendations.*

4. Practical Skills

At level 5, you should be able to use/**deploy a range of established techniques within the discipline, and apply underlying concepts and principles outside the context in which they were first studied, including, where appropriate, the application of those principles in an employment context.** You should be able to demonstrate

how the subject-related concepts and ideas relate to real world situations and/or a particular context. How do they work in practice? You will deploy models, methods, techniques, and/or theories, in that context, to assess current situations, perhaps to formulate plans or solutions to solve problems, or to create artefacts, some of which may be creative. This is likely to involve, for instance, the use of real world artefacts, examples and cases, the application of a model within an organisation and/or benchmarking one theory or organisation against others based on stated criteria. You should show awareness of the limitations of concepts and theories when applied in particular contexts.

Guidance specific to this assessment: This will be assessed by your use of Matlab and Simulink and by the presentation quality of your results including graphical annotations.

5. Transferable Skills for Life and Professional Practice

Your work must provide evidence of the qualities and transferable skills necessary for employment requiring the exercise of personal responsibility and decision-making. This includes demonstrating: professional development to advance existing skills and acquire new competences that will enable you to assume significant responsibility within organisations; that you can initiate and complete tasks and procedures, whether individually and/or collaboratively; that you can use appropriate media to effectively communicate information, arguments and analysis in a variety of forms to specialist and non-specialist audiences; fluency of expression; clarity and effectiveness in presentation and organisation. Work should be coherent and well-structured in presentation and organisation.

Guidance specific to this assessment: This will be assessed by the written and presentational quality of your report including page numbering, figure quality, figure numbering and listing, writing style, punctuation, grammar and spelling.

Achieving the PLOs for IET/Eng Accreditation

The following PLOs have been targeting to be satisfied or partially satisfied by this assignment. Details are given below. The marking scheme on the next page will also be used to record your PLO achievements and comments will be found in the Turnit-in Rubric.

SM1i - Knowledge and understanding of the scientific principles underpinning relevant current technologies, and their evolution. This will be partially satisfied by your explanations of each circuit and system.

SM2i - Knowledge and understanding of mathematics and an awareness of statistical methods necessary to support application of key engineering principles. This will be partially satisfied by your explanations of each circuit and system and particularly your mathematical calculations used and included in the appendix.

EA1i - Ability to monitor, interpret and apply the results of analysis and modelling in order to bring about continuous improvement. This will be partially satisfied by your analysis and modelling of each circuit and system and by your conclusions and recommendations.

EA3i - Ability to use the results of engineering analysis to solve engineering problems and to recommend appropriate action. This will be satisfied by your tuning of the motor controllers and by your recommendations.

EA2i - Ability to apply quantitative methods in order to understand the performance of systems and components. This will be satisfied by your analysis and modelling of each circuit and system in and by your conclusions and recommendations.

STUDENT FEEDBACK FORM

This section details the *extent* to which the assessment criteria are demonstrated by you, which in turn determines your mark. The marks available for each category of skill are shown. Lecturers will use the space provided to comment on the achievement of the task(s), including those areas in which you have performed well and areas that would benefit from development/improvement.

Generic Assessment Criteria	Marks available
1. Engagement with Literature Skills	
n/a	0
2. Knowledge and Understanding Skills	
Explanations for electric circuits Explanations for electronic systems Explanations for control systems	30
3. Cognitive and Intellectual Skills	
Analysis of electric circuits Analysis of electronic systems Analysis of control systems Conclusions and Recommendations	30
4. Practical Application Skills	
Simulation and Testing of electric circuits Simulation and Testing of electronic systems Simulation and Testing of control systems Presentation of results	30
5. Transferable Skills for Life and Professional Practice	
Quality of the report and word count	10

Assessment Mark (Assessment marks are subject to ratification at the Exam Board. These comments and marks are to give feedback on module work and are for guidance only until they are confirmed.)	Late Submission Penalties (tick if appropriate)		%
	Up to 1 week late (40% Max)		
	Over 1 week late (0%)		

GENERIC ASSESSMENT CRITERIA

Level 5

In accordance with the Framework for Higher Education Qualifications, at the end of Level 5 students will be expected to have developed sound knowledge and critical understanding of the well-established concepts and principles in their field of study, and of the way in which those principles have developed. They will have learned to apply those concepts and principles more widely outside the context in which they were first studied, including, where appropriate, the application of those principles in an employment context. They will have knowledge of the main methods of enquiry in the subject area, and ability to evaluate critically different approaches to problem solving. They will possess an understanding of the limits of their knowledge, and how this influences their analyses and interpretations. They will be able to use a range of established techniques to initiate and undertake critical analysis of information, and to propose solutions to problems arising from that analysis. They will be able to effectively communicate information, arguments and analysis in a variety of forms to specialist and non-specialist audiences, and deploy key techniques of the discipline effectively. They will be able to undertake further training, develop existing skills and acquire new competences that will enable them to assume significant responsibility within organisations. They will have the qualities and transferable skills necessary for employment requiring the exercise of personal responsibility and decision-making.

Level 5	FAIL	MARGINAL FAIL	SATISFACTORY (3 rd / Pass)	GOOD (2.2 / Pass)	VERY GOOD (2.1 / Merit)	EXCELLENT (1 st / Distinction)	EXCEPTIONAL (1 st / Distinction)
Category	0-29%	30-39%	40-49%	50-59%	60-69%	70-84%	85-100%
Engagement with literature (including reading, referencing, academic conventions and academic honesty)	Little or no evidence of reading and/or reliance on inappropriate sources. Views and findings mostly unsupported and non-authoritative. Referencing conventions used incoherently or largely absent.	Poor engagement with essential reading. No evidence of wider reading. Reliance on inappropriate sources, and/or indiscriminate use of sources. Heavily reliant on information gained through class contact. Inconsistent and weak use of referencing.	Engagement with a limited range of mostly relevant and credible sources. Some omissions and minor errors. Referencing conventions evident though not always applied accurately or consistently.	Engagement with an appropriate range of literature, including sources retrieved independently. Some over-reliance on texts. Referencing may show minor inaccuracies or inconsistencies.	Engagement with a wide range of literature, including sources retrieved independently. Selection of relevant and credible sources. Very good use of referencing, with no/very few inaccuracies or inconsistencies.	Engagement with an extensive range of relevant and credible literature. Consistently accurate application of referencing.	Exceptional engagement with an extensive range of relevant and credible literature. High-level referencing skills consistently applied.
Knowledge and understanding (Sound knowledge and critical understanding of the well-established	Major gaps in knowledge with unsatisfactory, uncritical understanding of the subject matter. Much irrelevant material. Substantial	Fragmentary knowledge, with only superficial critical understanding. Some significant inaccuracies and/or irrelevant material.	Limited but adequate knowledge and critical understanding of the well-established concepts and principles within	Knowledge is reasonably detailed and accurate. A good critical understanding of the well-established concepts and	Knowledge is reasonably extensive. Exhibits very competent critical understanding of the well-established concepts and	Excellent, detailed knowledge and highly critical understanding of the well-established concepts and principles of the subject and the	Exceptionally detailed knowledge and outstanding critical understanding of the well-established concepts and principles of the

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concepts and principles in their field of study; knowledge of the main methods of enquiry in the discipline.)	inaccuracies. Significantly flawed understanding of the main methods of enquiry in the discipline.	Incomplete or partially flawed understanding of the main methods of enquiry in the discipline.	the subject area, with a few gaps in the selection of material. A narrow critical understanding of the main methods of enquiry.	principles and the main methods of enquiry, with minor gaps in the selection of material.	principles of the subject and the main methods of enquiry. Breadth and depth of knowledge.	main methods of enquiry.	subject and the main methods of enquiry. May go beyond established theories.
Cognitive and intellectual skills (Critical evaluation and analysis of concepts and principles; argument and judgement; the limits of their knowledge, and how this influences their analyses and interpretations.)	Wholly or almost wholly descriptive work. Little or no critical evaluation and analysis of concepts and principles. Failure to develop arguments, leading to illogical or invalid judgements. Unsubstantiated generalisations or opinion, made without use of any credible evidence.	Largely descriptive work, with superficial use of critical evaluation and analysis of concepts and principles. Weak development of arguments and judgements. Information accepted uncritically, uses generalised statements made with scant evidence and unsubstantiated opinions. Ideas sometimes illogical and contradictory.	Limited attempt at critical evaluation and analysis of concepts and principles, tending towards description. Some evidence to support arguments and judgements but these may be underdeveloped, with a little inconsistency / mis-interpretation or failure to fully recognise limits of knowledge.	Some critical evaluation and analysis of concepts and principles, though descriptive in parts. An emerging awareness the limits of their knowledge and ability to use evidence to support the argument though with some tendency to assert/state opinion rather than argue on the basis of reason and evidence. Mostly valid arguments and logical judgements.	Sound critical evaluation and analysis of concepts. Is selective in the range of evidence used and synthesises rather than describes. Ability to devise arguments that show awareness of different stances, and use evidence convincingly, to support appropriate and valid judgements.	Excellent critical evaluation and analysis of concepts and principles leading to logical, evidence-based, reasoned arguments and judgements. Explicit recognition of other stances and a strong awareness of the limits of their knowledge. A capacity for independent thought and ability to 'see beyond the question', suggesting some grasp of the broader field and wider concepts.	Outstanding critical evaluation and analysis of concepts and principles. Uses evidence exceptionally well to connect ideas, and support highly logical and persuasive, arguments and judgements. Evidence of independent thought and ability to 'see beyond the question', suggesting a clear grasp of the broader field and wider concepts. Perceptive recognition of the limits of their knowledge, and how this influences their analyses and interpretations.

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Practical skills (Apply underlying concepts and principles more widely outside the context in which they were first studied; use a range of established techniques; propose solutions to problems arising from analysis.)	Limited or no use of established methods, materials, tools and/or techniques. Little or no appreciation of the context of the application. Limited understanding of the application of theory to practice or making appropriate links between the two. Very weak problem-solving skills outside the context in which they were first studied.	Rudimentary application of established methods, materials, tools and/or techniques but without consideration and competence. Flawed appreciation of the context of the application. Weak understanding of the application of theory to practice, with only occasional evidence of making appropriate links between the two. Weak problem-solving skills outside the context in which they were first studied.	An adequate awareness and mostly appropriate application of established methods, materials, tools and/or techniques. Basic appreciation of the context of the application. Theoretical knowledge and understanding applied in practice, but not always making logical links between the two. Can identify problems and propose basic solutions outside the context in which they were first studied.	A good and appropriate application of established methods, materials, tools and/or techniques. Clear appreciation of the context of the application. Mainly consistent, accurate and logical application of theory to practice, making appropriate links between the two. Can identify problems and propose mostly appropriate solutions outside the context in which they were first studied.	A very good application of a range of established methods, materials, tools and/or techniques. Very good consideration of the context of the application, with perceptive insights. Consistent, accurate and logical application of theory to practice, making appropriate links between the two. Can identify problems and propose appropriate solutions outside the context in which they were first studied. Evidence of some creativity.	An advanced application of a range of established methods, materials, tools and/or techniques. The context of the application is well considered, and insightful. Consistent, accurate and logical application of theory to practice, making well-developed links between the two. Can identify problems and propose excellent, creative solutions outside the context in which they were first studied.	Exceptional levels of application and deployment skills using established methods, materials, tools and/or techniques. Consistent, accurate and logical application of theory to practice, making highly developed links between the two. Can identify routine and non-routine problems and propose quite sophisticated, creative solutions outside the context in which they were first studied.
Transferable skills for life and professional practice (Effectively communicate in a variety of forms to specialist and non-specialist audiences; the qualities and	Communication medium is inappropriate or misapplied. Work is poorly structured, disorganised and/or confusingly expressed. Very weak use of language and/or	Communication medium is poorly designed and/or not suitable for the audience. Work is poorly presented in a disjointed manner. It is loosely, and at times incoherently, structured, with	Can communicate in a suitable medium for the audience but with some room for improvement. Mostly ordered presentation and structure in which relevant ideas / concepts are	Can communicate effectively in a suitable medium for the audience, but may have minor errors. Mostly coherent, organised work, in a suitable structure and is for the most part clearly	Can communicate well, confidently and consistently in a suitable medium for the audience. Work is coherent, fluent, well-structured and organised. Can work very well autonomously	Can communicate professionally confidently and consistently in a suitable medium for the audience. Work is coherent, very fluent and is presented proficiently. Can work	Can communicate with an exceptionally high level of professionalism, highly suitable for the audience. Work is exceptionally coherent, very fluent and is

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transferable skills necessary for employment requiring the exercise of personal responsibility and decision-making.)	very inappropriate style. Failure to work effectively as part of a group. Little or no evidence of the skills for employment requiring the exercise of personal responsibility and decision-making.	information and ideas often poorly expressed. Weak use of language and/or inappropriate style. Flawed approach to group work, meeting only partial obligations to others. Limited evidence of the skills for employment requiring the exercise of personal responsibility and decision-making.	reasonably expressed. Work may lack coherence in places. Can work as part of a group, meeting most obligations to others but perhaps with limited involvement in group activities. Demonstrates the basic skills for employment requiring the exercise of personal responsibility and decision-making, with some areas of minor weakness.	expressed. Can work effectively independently and/or as part of a team, with clear contribution to group activities. Demonstrates the skills for employment requiring the exercise of personal responsibility and decision-making, with some areas of strength and some of minor weakness.	and/or as part of a team, with very good contribution to group activities. Demonstrates very good skills for employment requiring the exercise of personal responsibility and decision-making, with just occasional minor weakness.	autonomously with initiative. Where relevant can work professionally within a team, showing leadership skills as appropriate, and meeting obligations. Demonstrates excellent skills for employment requiring the exercise of personal responsibility and decision-making and an appetite for further development.	presented professionally. Can work exceptionally well within a team, showing leadership skills. Demonstrates exceptional skills for employment requiring the exercise of personal responsibility and decision-making and an appetite for further development.