



Engineering Science

Assignment

General assessment information

This pack contains general assessment information for centres preparing candidates for the assignment component of National 5 Engineering Science Course assessment.

It must be read in conjunction with the specific assessment task(s) for this component of Course assessment, which may only be downloaded from SQA's designated secure website by authorised personnel.

Valid from session 2013/14 and until further notice

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Introduction

This is the general assessment information for National 5 Engineering Science assignment.

This assignment is worth 60 marks. The marks contribute 40% of the overall marks for the Course assessment. The Course will be graded A-D.

Marks for all Course Components are added up to give a total Course assessment mark which is then used as the basis for grading decisions.

This is one of two Components of Course assessment. The other Component is a question paper.

This document describes the general requirements for the assessment of the assignment Component for this Course. It gives general information and instructions for assessors.

It must be read in conjunction with the assessment task for this Component of Course assessment.

Equality and inclusion

This Course assessment has been designed to ensure that there are no unnecessary barriers to assessment. Assessments have been designed to promote equal opportunities while maintaining the integrity of the qualification.

For guidance on assessment arrangements for disabled candidates and/or those with additional support needs, please follow the link to the Assessment Arrangements web page: www.sqa.org.uk/sqa/14977.html

Guidance on inclusive approaches to delivery and assessment in this Course is provided in the *Course Support Notes*.

What this assessment covers

This assessment contributes 40% of the total marks for the Course.

The assessment will assess the skills, knowledge and understanding specified for the assignment in the *Course Assessment Specification*. These are:

- ◆ practical application of knowledge and skills from the Units to develop a solution to an appropriately challenging engineering problem
- ◆ skills in analysing a problem, designing a solution to the problem, simulating or constructing a solution to the problem, and testing and reporting on that solution

Assessment

Purpose

The purpose of this assessment is to generate evidence for the Added Value of this Course by means of an assignment.

Assessment overview

The assignment is a meaningful and appropriately challenging task, which should clearly demonstrate application of knowledge and skills, at an appropriate level, from both the *Mechanisms and Structures* and the *Electronics and Control* Units (as defined in the 'Further mandatory information on Course coverage' section of the *Course Assessment Specification*).

The assignment is designed to allow candidates to demonstrate their ability to work independently, as they are required to do in the other Component of the Course assessment, the question paper.

The assignment is set by SQA. A bank of assignments will be provided and centres may select from the bank.

Marks will be awarded for:

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| ◆ Analysing the problem | 10 marks |
| ◆ Designing a solution | 10 marks |
| ◆ Constructing/simulating a solution | 20 marks |
| ◆ Testing the solution | 10 marks |
| ◆ Reporting on the solution | 10 marks |

The assignment will be internally marked by centre staff, in line with the marking instructions provided in this document.

Full instructions for candidates are contained within each assessment task.

Assessment conditions

Assessors must exercise their professional responsibility in ensuring that evidence submitted by a candidate is the candidate's own work.

This assessment is a single assessment event. Candidates should undertake the assessment at an appropriate point in the Course. This will normally be when they have completed most of the work on the Units in the Course.

This is an open book assessment. There are no restrictions on the resources to which candidates may have access.

Candidates must undertake the assessment independently. However, reasonable assistance may be provided prior to the formal assessment process taking place. The term 'reasonable assistance' is used to try to balance the need for support with the need to avoid giving too much assistance. If any

candidates require more than what is deemed to be 'reasonable assistance', they may not be ready for assessment or it may be that they have been entered for the wrong level of qualification.

Reasonable assistance may be given on a generic basis to a class or group of candidates, for example, advice on how to develop a project plan. It may also be given to candidates on an individual basis. When reasonable assistance is given on a one-to-one basis in the context of something the candidate has already produced or demonstrated, there is a danger that it becomes support for assessment and assessors need to be aware that this may be going beyond reasonable assistance.

Clarification may be sought by candidates regarding the wording of a brief or specification or instructions for the assessment if they find them unclear. In this case, the clarification should normally be given to the whole class.

Some guidance may be provided during the analysis and design stages, but the candidate should work independently throughout the implementation, testing and evaluation stages.

Assessor input and advice on the candidate's analysis and design is acceptable in order to allow the candidate to progress to the next stages of the assessment. The assistance provided must be recorded so that the candidate's own analysis and design work can be marked/judged fairly.

As this assignment is a summative assessment, support and guidance during implementation, testing and evaluation stages should be limited to minimal prompts and questioning, referring the candidate to the instructions provided in the assessment task.

The assignment will be conducted under some supervision and control. Assessors should put in place processes for monitoring progress and ensuring that the work is the candidate's own and that plagiarism has not taken place. For example:

- ◆ regular checkpoint/progress meetings with candidates
- ◆ short spot-check personal interviews
- ◆ checklists which record activity/progress
- ◆ photographs, film or audio evidence

Group work approaches as part of the preparation for assessment can be helpful to simulate real-life situations, share tasks and promote team working skills. However, group work is not appropriate once formal work on assessment has started.

Once the assignment has been completed and submitted, it should not be returned to the candidate for further work to improve their mark.

Evidence to be gathered

The following candidate evidence is required for this assessment:

- ◆ the completed solution (model or photographs and/or hard copy from simulation software)
- ◆ a record of progress through the task (see below), including all items of evidence specified within the assessment task
- ◆ a short report on the testing of the solution (in written, electronic and/or oral form)

This evidence must be retained for quality assurance purposes.

General Marking Instructions

Assessors should allocate a mark out of 10 for each of the six subsections, by following the instructions given below, and record this mark on the candidate assessment record, with a comment justifying why each mark was awarded.

Marks for internally assessed Components must be submitted to SQA by your centre. Evidence for this assessment should be retained in the centre for SQA quality assurance purposes. Further information on this will be provided by SQA.

For each of the sections, the assessor should select the band descriptor which most closely describes the evidence gathered.

Once the best fit has been selected, follow this guidance:

- ◆ if the evidence almost matches the level above, the highest available mark from the range should be awarded
- ◆ if the candidate's work just meets the standard described, the lowest mark from the range should be awarded
- ◆ otherwise the mark from the middle of the range should be awarded

Notes:

- ◆ If the evidence completely matches the highest level band descriptor for any section, and has been produced by the candidate working independently, 10 marks should be awarded for that section.
- ◆ Zero (0) marks should be awarded for any section where no evidence has been produced by the candidate.

Band descriptors for section 1:**Analysing the problem:** system specification, system and sub-system diagrams

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| Complete and detailed specification, system and sub-system diagrams, showing all inputs, processes and outputs, and interactions between sub-systems, produced by the candidate working independently. | 9-10 |
| Partially complete specification and system and sub-system diagrams, showing most inputs, processes and outputs, produced by the candidate working independently. | 6-8 |
| Incomplete specification and system/sub-system diagrams, omitting several significant inputs, processes or outputs, produced by the candidate working independently; or, completed, but requiring significant advice and guidance | 3-5 |
| Incomplete, despite significant advice and guidance | 0-2 |

Band descriptors for section 2:**Designing a solution:** designing control and mechanical sub-systems

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| Complete and correct flowchart, with detailed design and sketches for appropriate mechanical and structural sub-systems, produced by the candidate working independently. | 9-10 |
| Complete and correct flowchart, with outline design sketches for mechanical and structural sub-systems, produced by the candidate working independently. | 6-8 |
| Incomplete flowcharts and/or designs for sub-systems, omitting significant aspects, produced by the candidate working independently; or, complete, but requiring significant advice and guidance | 3-5 |
| Incomplete flowcharts and designs, despite significant advice and guidance | 0-2 |

Band descriptors for section 3a:**Constructing / simulating a solution:** mechanical sub-systems

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| Design fully simulated and/or constructed, working safely and independently, with decisions on materials and components fully justified | 9-10 |
| Most aspects of design simulated and/or constructed, working safely and independently, with decisions on materials and components justified | 6-8 |
| Some aspects of design simulated and/or constructed, working safely and independently, with limited justifications for decisions on materials and components | 3-5 |
| Few aspects of design simulated and/or constructed, working safely and independently, with no justifications for decisions on materials and components; or requiring supervision to ensure safe working | 0-2 |

Band descriptors for section 3b:**Constructing/simulating a solution:** electronic/control sub-systems

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| Design fully simulated and/or constructed, including correct microcontroller code, fully integrated with mechanical sub-system, working safely and independently | 9-10 |
| Most aspects of design simulated and/or constructed, with working microcontroller code, working safely and independently | 6-8 |
| Some aspects of design simulated and/or constructed, working safely and independently | 3-5 |
| Few aspects of design simulated and/or constructed, working safely and independently; or requiring supervision to ensure safe working | 0-2 |

Band descriptors for section 4:**Testing the Solution**

| | |
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| Test plan is logical and thorough, and well justified; all faults diagnosed independently, and all required adjustments carried out, working safely and independently | 9-10 |
| Test plan partially developed, with some justification; most faults diagnosed independently, and most required adjustments carried out, working safely and independently | 6-8 |
| Poor test plan, incomplete testing, incomplete fault diagnosis and/or adjustments, working safely and independently | 3-5 |
| No test plan (tests carried out, but without planning); or requiring supervision to ensure safe working | 0-2 |

Band descriptors for section 5:**Reporting:** keeping a record of progress, record of testing, and evaluation

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| Record of progress complete, consistent and clear, with full record of testing, and clear, valid, reasoned evaluation, all produced by the candidate working independently | 9-10 |
| Record of progress mainly complete, consistent and clear, with full record of testing, and some evaluative comments, all produced by the candidate working independently | 6-8 |
| Record of progress incomplete, lacking clarity and consistency, with limited record of testing, and few evaluative comments, all produced by the candidate working independently | 3-5 |
| Record of progress significantly incomplete, unclear or inconsistent, limited record of testing, and no evaluative comments. | 0-2 |

The example below shows an extract from a possible *candidate's record of progress*, to provide an indication of the level of response required.

Note that the *record of progress* may be handwritten, or kept in electronic form (word processed document or blog entry), or spoken and recorded, or in any other appropriate format.

National 5 Engineering Science assignment (example extract from) Record of Progress

| | |
|-------|-------------------|
| Name: | <i>A. Learner</i> |
| Date: | <i>02/03/14</i> |

What I have done today:
Today, I completed my model. I took some photos of it to keep as evidence. I started working on my test plan.

What help I needed today:
The photos worked out Ok, but I had to get some help to download them to the computer and save them. I wasn't sure what a test plan was – but my teacher explained that it just meant writing how I would check my model was working properly.

Evidence I have produced, and where and how it is stored:
The photos are flood1.jpg and flood2.jpg. They are in MyDocuments on the network. I have started writing my plan on the stage 4a sheet.

Administrative information

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History of changes

| Version | Description of change | Authorised by | Date |
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