

Examiners' Report January 2008

GCE

GCE Engineering (8371/9371)

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GCE Applied Engineering

Principal Moderator's Report January 2008

Unit 2 - 6932

The Role of the Engineer

General Comments

Of the relatively small number of submissions this January, more than half were assessed accurately, with many being very accurate. However, almost half of the portfolios received for moderation had been marked generously, by up to 10 or 11 points.

Some centres awarded high scores for quantity; this includes giving credit to 'non-student work' such as leaflets, fliers, catalogues, pamphlets, long printouts from different companies or websites, etc., all of which attract no marks because they do not address any of the criteria across the 3 mark bands; nor does it reflect the work of the candidate.

Most centres now appear to be guiding their candidates well by directly addressing the six criteria 'a' to 'f' and setting their portfolios out to follow this format. There are still a few centres who seem happy for their candidates' portfolios to contain up to nine numbered sections, some with decimal paragraph numbering and with their own section headings, which in some cases do not report on the role of the engineer and do not follow the guidance in the specification assessment grid. This makes assessment difficult and frustrating, which is all the more frustrating for moderators when it is considered that with a bit more guidance in the right direction, the candidate could have increased the score by as much as 10 or 12 marks.

Each portfolio should be put together using the simplest of rules or patterns:

- A4 paper, as far as possible, held together by one treasury tag - no folders, binders, plastic sleeves or pockets, presentation wallets, buckle clips, ring binders, etc - as these impede the moderation process.
- There can be a brief introduction to set the scene (about half a page at most), then the six sections which should have titles reflecting the six outcomes 'a' to 'f'.
- If reference is made to any document from an engineer, use only snippets within the main body of the portfolio. If an appendix is not referred to in the main body of the portfolio it is ignored.
- The portfolio should be about one engineer - some candidates write about a team and give very broad coverage, but lack any depth beyond mark band 1 for one engineer.

Coursework Authentication Sheets (CAS) and Mark Record Sheets were not included by about half a dozen centres, but these were sent by return of post after requested using an E6 form by the moderator.

Assessment criteria

The candidates, and possibly the engineers, need to be fully aware of the 'verbs' within each statement to help the candidate understand what they need to cover. This will help everyone involved to generate the required evidence and disregard all other unnecessary detail.

Assessment criterion (a)

Most candidates did this section well, but none of them had addressed mark band 3 by giving any justification for why the engineer did things in the way s/he did. A handful of portfolios mentioned CVs and job descriptions and tried to expand on these in detail, but the question and answer session, which would have been essential, between the candidate and engineer did not seem to take place after the candidate had had a chance to read them. One or two low scoring portfolios contained a list of their engineer's qualifications, and some wrote several pages about the different grades of engineer and the different types of engineer, all of which are not relevant to any of the assessment criteria.

More than one portfolio started with several pages of introduction with long detailed histories of the company where their engineer worked. Although interesting, this work does not address the criteria, so should be avoided or kept to an absolute minimum.

Assessment criterion (b)

Many candidates appear to have interpreted 'technologies' to mean 'machines'. Machines are part of this, but communication technologies such as email, mobile phones, laptops, palmtops, PCs with a range of software applications, CAD, CAM, CNC, etc., should also be included where relevant. Three or four of these should normally provide sufficient material to address this outcome across all the mark bands.

Where the engineer and company being investigated make little use of technology, especially modern technology, the candidate is best advised to find another engineer.

Several candidates seem to lose focus on their engineer at this stage and write pages and pages about the latest CAD software, then finish by saying that the engineer doesn't have access to the latest software, but 'this is what could be done if he did'.

Assessment criterion (c)

The difference between 'c' and 'd' continues to present problems. Criterion 'c' focuses on the legislation and standards which affect the product or service which the engineer is responsible for providing, whereas 'd' is about the health and safety standards which affects the way they carry out their work.

Some candidates produced a combined section to cover all aspects of legislation, standards and health and safety standards, and there is some overlap in all industries, but assessors need to be reminded that the assessment grid is flexible and if one section contains information and evidence which addresses another outcome, credit should be given for this. For instance, if a candidate does not attempt section 'c', but actually covers the legislation and standards in section 'a' or section 'd' then relevant scores can be awarded for section 'c'.

Assessment criterion (d)

Health and Safety standards are generally set by employers, using current relevant legislation as the minimum acceptable standard. All employees must abide by the Health & Safety at Work Act 1974, but not all candidates mentioned this. Some mentioned 'risk assessments', but failed to mention the Management of Health and Safety at Work Regulations (1999) which outlines the requirements for them. COSHH regulations were referred to in a few cases, but in most cases, the candidates failed to fully address mark band 3 by reporting on how the engineer ensured that appropriate standards had been met. Some candidates reported that the standards would be met or the engineer 'would be in trouble'. This does not address the requirements of mark band 3. There were several instances where pages of legislation details, taken from the Internet, had been used to bulk out the portfolio. Please advise candidates that marks can only be awarded for their own work.

Assessment criterion (e)

This continues to be the most challenging area of this unit. Evaluation and testing of the product or service to ensure 'fitness for purpose' consistently causes the most problems. Some evaluation was carried out by the candidates, but this was generally reporting on the testing carried out by the company with little candidate involvement. This criterion in particular needs to be discussed with candidates in the earliest stages of their work due to the large proportion of marks which can be gained from doing this section in depth.

Assessment criterion (f)

Although some candidates reached mark band 2 on this outcome, it continues to be a problem if section 'e' is not addressed properly. To achieve high marks, each point raised must follow on from a comment mentioned in section 'e'. Many did not. To be able to suggest improvements to products or services possibly necessitates that candidates to be given more background information and opportunities to practice such investigations throughout the year. As with the previous criterion, expecting candidates to have gained sufficient experience and knowledge to be able to suggest modifications, with justifications, is a real challenge for all but the most determined of candidates.

Annotation

When a remote moderator receives the candidates' work, the purpose is to check whether the centre assessor(s) have made reasonable decisions and allocated the correct score or points. Some of the portfolios received in this series contained good annotation on the MRS to indicate where the assessor believed the evidence to be. Simply writing the assessment grid criteria 'verbs' such as 'describing', 'justifying', 'evaluating', etc in the margin at the exact point where the evidence appeared in the portfolio worked even better. To the centres who did this - thank you.

GCE Applied Engineering

Principal Moderator's Report January 2008

Unit 3 - 6933

Principles of Design, Planning and Prototyping

General Comments

Despite a limited number of entries for this examination series, it is pleasing to report that some high quality work in engineering was presented for moderation, some of which exceeded expected AS levels of response.

Where centres had previous experience of preparing candidates for this course, improvements in their performance were in evidence and it was also obvious that some centres had heeded advice offered in the Summer 2007 Principal Moderator's report. There was a continued improvement too in the majority of candidates' approach to 'Engineering' coursework where scientific and mathematic concepts were considered and there was less reliance on a 'Design & Technology' approach which focused on form and function without justification.

A diverse and appropriate range of coursework projects was undertaken by candidates and Edexcel approved titles such as 'PCB holder' and 'can shaker' were in evidence. It was obvious that positive teacher intervention had been a feature of many candidates work, as all tasks seen provided opportunities to access the full range of marks on offer.

In setting problems for candidates, most centres limited the choice of tasks to one or two design briefs or focused all candidates on the same theme or task. This strategy enabled planning and resources to be centralised and teacher input to be effective and relevant to all candidates. Where candidates identified their own design brief, this sometimes resulted in low levels of performance, but where teacher intervention was effective, candidates were much more focused and more likely to achieve success.

All centres submitted samples of work on time, but some failed to include authentication sheets - these must be included. Most centres submitted marks appropriately, but some used copies of the assessment criteria photocopied from the subject specification and wrote marks on these. Where this occurred, there was no accompanying annotation, which hindered moderation. Some centres used their own assessment grids to record marks, which were often difficult and awkward to follow.

Teacher assessment was generally acceptable and there was an improvement in this aspect of administration, as would be expected as centres become more familiar with assessment requirements. Assessment criterion 'C' was the most problematical for centre assessors and was often generously marked where the evidence presented did not match the credit given or the criteria statements in the subject specification.

Assessment criterion (a)

There was a continued improvement in the work submitted in this criterion and most candidates scored well. The use of CAD packages to produce engineering drawings continues to grow, as does the expertise of candidates using them. However, there were still a number of candidates who failed to include title blocks, or use appropriate dimensioning that conformed to British Standards.

All candidates were able to produce drawings that could be termed 'engineering drawings' and these usually included some industry standard symbols and drawing conventions. Most candidates now understand what the requirements of a 'range' of engineering drawings should involve and produced pictorial views, assembly drawings, exploded views etc. Some drawings lacked important dimensions, while others were not drawn to scale.

Assessment criterion (b)

As was the case last year, when planning their project, most candidates were able to produce some realistic timings with reference to processes and the established design brief. Planning usually included a time chart or Gantt chart, but some planning lacked details and understanding of the necessary sequence of events required to achieve a successful outcome within a realistic time span.

The quality of specifications presented by candidates varied in content and detail. Most candidates were able to identify some key points that were considered important, but not many attempted to justify specification statements with additional information.

Sometimes, specification points that were presented were superficial and generic and lacked technical information that could have been used to evaluate the final outcome.

Although there was better evidence of success this year, a significant number of candidates continued not to understand how to structure a technical specification which resulted in a rambling and disorganised group of statements that lacked continuity and cohesion. Candidates would benefit in future from using appropriate sub-headings to present linked information logically.

Assessment criterion (c)

In this assessment criterion, the standard of performance was particularly disappointing and many candidates failed to gain access to the higher range of marks available, although some centre assessors gave high levels of credit where there was not enough evidence to support the marks awarded.

Most candidates managed to present a range of alternative design ideas relating to their chosen project using some appropriate design strategies, but design ideas were often not well analysed in terms of possible materials and processes that could be used in their manufacture and there was little evidence of research information being used in the designs presented. Some ideas were low level, lacking a true understanding of the problems involved and in other cases candidates appeared to have already decided what their final solution was going to be and did not explore their problem fully.

The review of alternative ideas was generally not well done and many candidates failed to evaluate their design ideas against points of specification, or use the specification as a basis for their alternative designs.

Health and safety issues were not well considered by most candidates and where this did take place, considerations were usually focused on the use of machinery and processes employed during manufacture of the product and did not consider the health and safety issues linked to product design proposals.

Assessment criterion (d)

In this assessment section, most candidates succeeded in producing a practical outcome to their chosen problem that reflected their final design proposal and some work was of a very high calibre. Some candidates displayed making skills that were limited and modest, but centres awarded marks appropriately and in this assessment section there was little over-rewarding.

Some products were unfinished and not working as intended and where this was the case, candidates had run short of time, highlighting the importance of effective time management.

Despite submitting photographic images of practical work, a significant number lacked the detail necessary to illustrate the complexity of task and the higher-level skills necessary to gain higher marks. A series of photographs taken over a period of time during manufacture is the ideal way of highlighting processes used and providing examples of precision and attention to detail that may not be readily noticeable in an image of the finished product.

Photographic evidence can also be employed to support a candidate's awareness of health and safety issues when working.

Some candidates provided details of materials and their selection based on mathematical or scientific reasoning, but many did not. Candidates would benefit in future from consulting materials data/performance information, or referring to the knowledge and understanding they have accumulated via their study of Unit 1 when specifying and justifying their choice of materials and processes to be used during product manufacture.

Assessment criterion (e)

Most candidates provided appropriate evidence of oral presentations, which included hard copies of Powerpoint slides, CD Roms and teacher witness statements, which were generally informative and provided useful annotation regarding individual candidate performances. Where centre assessors award marks in the higher regions for criterion E, it is essential that evidence beyond simple witness statements is supplied in support of the credit given.

**GCE Applied Engineering
Principal Moderator's Report January 2008
Unit 5 - 6935
The Engineering Environment**

Although this unit was available, no student work was submitted for moderation this January.

GCE Applied Engineering

Principal Moderator's Report January 2008

Unit 6 - 6936

Applied Design, Planning and Prototyping

General Comments

There were only a few entries for Unit 6 this January, but projects were consistently interesting, varied and challenging to candidates. All projects were appropriate to the expected A2 level of response and they all allowed candidates potential access to the full range of marks available. In all cases, centre assessors awarded marks broadly in line with Edexcel's standards.

In this unit, candidates are given the opportunity to display the knowledge and understanding, manufacturing skills and engineering expertise they have gained over their course of study and to apply this to a design and make exercise, which the students in this cohort successfully achieved.

All candidates approached their work through product design, and some interesting, useful and realistic products emerged as a result. It was pleasing to note that candidates applied engineering principles to selection and justification of materials and processes and were able to steer away from the D&T approach to product design, where often the use of materials is not justified scientifically, i.e. no calculations in determining limits, values etc. are considered and products are justified in terms of aesthetics and form, rather than through technical and functional reasoning.

Most candidates were well organised and presented logically prepared coursework folders with appropriately titled sections that were easy to follow.

Teacher assessment was generally accurate, but slightly generous in criteria 'B' and 'D', where identification and justification of regulations and standards appropriate to their product manufacture was not well done and although some candidates produced presentations of their progress, they failed to elicit feedback from their audience, or to say how this would affect decisions during further product development.

Assessment criterion (a)

Most candidates were able to gather some information from a range of sources that were specific to the problem selected for investigation. The best research was selective, focusing only on information that was relevant and helpful to the development of designs and the formation of a comprehensive product specification. Some candidates were too general in their approach to research, producing irrelevant and general information with little attempt at selection or analysis. It is important that candidates focus closely on being highly selective in their research to ensure that the gathered information is useful in informing subsequent stages of design development and is directly relevant to the needs of the problem under investigation.

Specification writing ranged from excellent, where candidates used previous research as a basis for identifying key technical points, to superficial, where simplistic and general statements were offered that could have been applied to other products.

It is essential that a strong specification is developed, as it is influential throughout the design process because ideas and their development will be referenced to it to check that the design requirements and client needs are being fulfilled. Similarly, testing, evaluation and suggested future modifications should be referenced to the points of specification to check the success of the final outcome.

Assessment criterion (b)

The level of response in this assessment section was generally good and accurately marked. Most candidates used their product specification to evaluate design proposals, but this was sometimes lacking in detail and brief, especially where weak specifications were in existence. Candidates were able to produce alternative ideas and to demonstrate development into a viable final design proposal. Marks in this section are awarded for creative and realistic designing and development of proposed solutions. Although good modelling and testing by some candidates was seen, some failed to develop their designs as outlined in the assessment criteria, relying on a description of how their final design proposal would be made, without refining or changing an original idea.

Candidates should explore a range of approaches to their work in this section, demonstrating their knowledge and understanding of their engineering studies, including consideration of technical detail, materials, techniques and processes when producing realistic design proposals. As work progresses, alternative designs and their details should become linked and strands of continuity should be seen in higher quality responses as one idea moves to the next to be improved upon, reflecting knowledge and understanding gained from the study of other units in the engineering course.

Assessment criterion (c)

Most candidates were able to organise and carry out discussions with other engineers/peers and record feedback from these meetings. However, some candidates produced general evidence of superficial discussions that were of little help in modifying or improving design proposals and were sometimes self-congratulatory and limited.

Assessment criterion (d)

Most candidates were able to produce some form of a plan for production for their product, outlining a sequence of events, use of processes and materials and making some reference to time and deadlines. The best examples of planning included quality control and health and safety issues. Unfortunately, some plans were superficial and lacked the detail necessary to meet the higher marks range.

The inclusion and consideration of relevant standards and regulations was not well done and most did not score well in this section. Examples of regulations and standards that could have been presented include ISO 9000/2000, which relates to quality management; ISO 9002, promoting quality standards such as RFT (right first

time); OHS 18001, which relates to health and safety at work; ISO 14000, which deals with environmental standards.

Assessment criterion (e)

The quality of practical work produced by some candidates was very good and justifiably scored high marks in this section. Where work was of a lower level and less demanding, manufacturing standards were often still high. The centre awarded marks appropriately across the whole range of standards in this section.

During manufacture, candidates should demonstrate their understanding of a range of materials by selecting, using and justifying those that are appropriate to their needs in terms of properties and working characteristics that were detailed in the specification and work-plan.

Candidates must show demanding and high-level making skills in order to achieve the high category of marks in this section, so it is essential that the product under construction offers enough complexity to allow access to high marks. As evidence of the quality of manufacture, clear photographs must be submitted that show enough detail to support the credit awarded during centre assessment. As photographic evidence is the only proof of manufacturing quality, it is essential that images convey details of levels of difficulty and complexity of construction, so it is unlikely that a single image will achieve this. A series of photographs taken over a period of time during manufacture is the ideal way of highlighting processes used and providing examples of precision and attention to detail that may not be readily noticeable in an image of the finished product.

Assessment criterion (f)

Some candidates showed very good responses to this assessment section, which involved evaluating the product against the specification and photographic evidence of the product in use. Client involvement and feedback were also in evidence, which led to realistic suggestions and designs for modifications focused on improving the performance of the product, which in turn reflected good commercial practice.

Some candidates offered only superficial evaluative comments, which did not involve third-party comment, or discussion with the client.

On completion of the prototype product, candidates are asked to test and evaluate the outcome to check its fitness for purpose and this should be done with reference to commercial techniques where possible.

The finished product must be tested under realistic conditions to determine its success, and this can be done best by using the points of specification to check product performance and its quality. Candidates should describe in detail any testing they carry out and results should be objective, and considered by the client for their effectiveness, which is why it is important to include measurable parameters in the specification that can be used as controls.

Statistics

6932 The Role of the Engineer

Grade	Max. Mark	A	B	C	D	E
Raw Boundary Mark	60	46	40	34	29	24
Uniform Boundary Mark	100	80	70	60	50	40

6933 Principles of Design, Planning and Prototyping

Grade	Max. Mark	A	B	C	D	E
Raw Boundary Mark	60	48	42	36	30	24
Uniform Boundary Mark	100	80	70	60	50	40

6936 Applied Design, Planning and Prototyping

Grade	Max. Mark	A	B	C	D	E
Raw Boundary Mark	60	52	46	40	34	28
Uniform Boundary Mark	100	80	70	60	50	40

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