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Examiners' Report Summer 2009

GCE

GCE Engineering (8731/9731)

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General comments

The style and format of this examination paper is now well established and centres are very familiar with the idea of candidates being presented with an illustration of a product about which they are expected to answer a number of questions. However, in contract to other recent papers a design question was introduced at Q08(b). It should be noted by centres that a design question will now appear in all subsequent 6931/01 papers.

Overall the 2009 paper included some very varied responses ranging from the highly knowledgeable, where candidate were able to describe or discuss the Engineering concepts at length to the very weak, where very little in-depth understanding of the subject was in evidence.

The questions on this paper, as in previous years, were designed to be "ramped" with the easiest questions early in the paper and the harder towards the end. Interestingly, in a number of instances, examiners found some of the weaker candidates, who did not score well at the start of the paper, scored well on the final question.

Comments on individual questions

Question 1 Mean score 5.70 from 6 marks

The table format for this question is now well established. In general the majority of candidates were able to respond well this question. Most knew about the risks of the stated process and most were able to take it forward and state any precautions that should be undertaken with the stated process. Most candidates scored either 5 or 6 marks out of the possible 6 available.

Question 2(a) Mean score 3.02 from 8 marks

The responses in this question which specifically focused on classes of material and their properties varied greatly. In most instances, candidates were able to state the required material. However, when it came to giving significant properties for those materials, responses on the whole tended to be very weak. The answers in this element tended to be very generic. There was a distinct lack of technical engineering knowledge and understanding. For example, when responding to the non-ferrous class of material, very few mentioned specific materials such as brass or duralumin and technical statements such as age hardening or corrosion resistant were few and far between.

Question 2(b)(i) Mean score 0.83 marks from 1 mark
Question 2(b)(ii) Mean score 0.90 marks from 2 marks

The majority of candidates scored 2 out of the possible 3 marks in this question. They knew that cast iron was a ferrous metal. However, when it came to giving reasons why cast iron gave the washing machine stability, responses tended again to lack technical knowledge and understanding. Most knew that cast iron was heavy, but few candidates were able to give a second reason why the cast iron gives stability to the washing machine.

Question 3(a) Mean score 2.73 from 6 marks

On the whole this question was reasonably well answered. The majority of candidates were able to describe quite accurately the pressure die casting process. The main issue with the responses to this question were again the correct use of technical language. At this level some knowledge of technical language is expected and in a number of responses this level was not achieved.

Question 3(b) Mean score 2.46 from 4 marks

Candidates clearly had a good working knowledge of both pressure die casting and sand casting and some very good explanations of the advantages of die casting over sand casting were presented. It was clear from the responses that a good number of students had gained first hand experience of sand casting.

Question 4 (a) Mean score 2.24 from 3 marks
Question 4 (b) Mean score 2.37 from 3 marks
Question 4 (c) Mean score 1.75 from 3 marks

The style of question 4 is tried and tested and the majority of candidates were able to use the information presented in the table to answer the given questions. The majority of explanations of why particular materials were used for various elements of the washing machine were on the whole sound and well thought through.

Question 5

Prior to commenting on individual elements of this question, it is perhaps pertinent to comment generally on this question. This question dealt specifically with the heat treatments that could be used on steel. It was clear from the somewhat generic responses that the knowledge and understanding of these processes was somewhat weak. This question was one of the weakest performed on the paper. Although candidates had a vague understanding of the processes, there was a distinct lack of in-depth knowledge of the underlying engineering principals involved in the processes.

Question 5(a) Mean score 1.68 from 3 marks

The majority of candidates knew that to harden high carbon steel, the metal would be needed to be heated up and then cooled. However, very few mentioned that the temperature of the steel would need to be "red" hot or 900°C or, at critical temperature. A significant number of candidates suggested that the steel should be left to cool in air.

Question 5(b) Mean score 0.42 from 3 marks

Very few candidates had any understanding of the tempering process. Very few talked about heating the metal to a controlled temperature and even fewer mentioned oxide colours during the process. This was a poorly answered question.

Question 5(c) Mean score 0.48 from 3 marks

Many candidates repeated the question in their responses and used the phrase "to make the material normal". Again, there was little reference to the heat that steel is heated to in the process and few mentioned the "critical temperature".

Question 6(a) Mean score 2.88 from 6 marks

The questions on "shape memory alloy" and "heat shrink sleeving" were on the whole well done. Candidates clearly had a good understanding of both these materials and the majority gained reasonable marks. It is evident from the responses that quite a lot of work is being undertaken in centres on "new and smart" materials.

Question 6(b) Mean score 1.73 from 5 marks

Sadly, many students clearly did not have sufficient understanding of the extrusion process needed to answer this question. However, where candidates understood the process the notes and sketches produced in this question were on the whole well executed. It was clear that the many candidates had a reasonable understanding of the process of extrusion and how extruded work is produced. In some instances the labelling on diagrams was perhaps not as clear as it could have been.

Question 7(a) Mean score 2.20 from 4 marks

In this question, there was some confusion over the advantages and disadvantages of metal and plastic materials used in the washing machine. In a significant number of papers the same point was presented as both an advantage and disadvantage. As in other parts of the paper, it was felt that there was a lack of technical knowledge and responses tended on the whole to be rather simplistic. Mention of technical factors such as tensile strength or density was sadly missing from the majority of responses.

Question 7(b) Mean score 1.81 from 3 marks

The responses in this question again lacked technical knowledge and understanding. Examiners would like to have seen technical knowledge rather than comments such as "does not rust".

Question 7(c) Mean score 1.80 from 3 marks

On the whole candidates were able to identify the correct material for the drive belt in the washing machine and the majority of justifications were quite acceptable. A few responses were somewhat off the mark and suggested materials such as aluminium or steel for the drive belts. This suggested either a massive gap in knowledge or a misunderstanding or miss-reading of the question.

Question 8(a) Mean score 0.79 from 2 marks

The majority of candidates identified that the levelling of the feet on the washing machine was important to help reduce rocking and vibration. A number of candidates went into great detail describing how the floor would be damaged by vibration. However, preventing damage to the floor was not accepted as the main purpose of the levelling feet.

Question 8(b) Mean score 5.87 from 10 marks

This was the "new" question in the paper – a design question was included and the resulting design ideas produced varied considerably. The most successful candidates were those who took on board and referred to the bullet points in the question. By ticking off each point as it was dealt with in the response the better performing candidates were able to ensure that all the points required by the examiners had been covered in their solution. The higher scoring responses ensured that reference was made to elements such as fixing the device to the bottom of the washing machine, the adjustable element of the device and the dimensions. Examiners were expecting to see detailed sketches that clearly indicate all the elements of the question.

It should be remembered by centres that this style of design question will be included in all future 6931/01 examinations.

Question 9(a) Mean score 1.64 from 6 marks

The questions at the end of the paper are designed to give differentiation and the responses by candidates should indicate to the examiner an in-depth understanding of Engineering. In this question candidates were asked to describe the meaning of (i)Ductility, (ii) Malleability and (iii)Toughness, three common engineering terms. In the majority of responses candidates only gave partial answers. To gain the two marks available in each question two points needed to be included in the response. For example, in the toughness question a typical response would be "the ability to withstand a blow" which would gain one mark. For the second, the addition of "without fracture" would be required. Students should be informed of the way in which papers are marked and that it is sensible to look at the mark allocation of each individual question.

Question 9(b) Mean mark 3.77 from 6 marks

On the whole, the responses to this question were quite satisfactory. Candidates knew about the properties and limitations of the three stated materials and were well able to discuss the various issues that would come into play if used as casing in the washing machine.

Conclusions:

When compared to previous years candidate performance on this paper was very similar. The main observation is that in a number of instances it was felt that the knowledge and understanding of Engineering was not as deep as perhaps it should be. In the majority of questions a second or third mark is given for that extra point made by the candidate. Students should be encourage to look at the number of marks available on each question and make sure that responses include a sufficient number of points or justifications.

GCE Applied Engineering
Principal Moderator's Report June 2009
Unit 2 – Paper 6932/01
The Role of the Engineer

General comments

There was a full range of abilities shown from the candidates who entered this unit. From work that shows minimal effort and poor guidance through to some excellent examples of how to achieve a high grade in this unit.

The majority of centres have established good links with the industry and their work is showing the benefits of experience. Several portfolios still start with a few pages describing the range of engineering sectors and a company history, when a brief introduction of half a page would be adequate. Centres and candidates should not include work that does meet any of the criteria or mark bands as it will not achieve any marks.

The best way to ensure access to all the available assessment criteria is to pay more than a single visit to the company or engineer. The developing relationship and generation of material should be focused across the mark bands.

A handful of centres allowed their candidates to submit work with appendices totalling 5 or 6 times the volume of the actual work. If any work is important, it should be in the main body. If reference is required to material and the source is adequate then at most a paragraph will suffice. This could easily go into the report itself.

Annotation is improving in some centres, by using the verbs from the assessment criteria, e.g. – describe, explain, justify, etc – written alongside the evidence in the margin. This helps the moderator locate the relevant evidence and easily agree the marks awarded.

Several centres still send work for moderation bundled up in folders, binders, comb bound, etc., and each year we ask that the portfolios are treated like any other examination material, which is the use of one treasury tag through the top left hand corner of the A4 sheets of paper. Anything else impedes the processes of moderation and awarding.

Assessment criterion (A)

In this section, several candidates, from a range of centres, provided a list of operations for making something at the place where an engineer works. Candidates should be reminded they are to provide a series of descriptions and justifications for tasks being carried our by the engineer.

Some candidates also use a poorly-focussed questionnaire which leads them to ask their engineer questions which do not lead into the criteria across the mark bands. Some candidates appear to have shadowed someone for a week or so, and written a diary of tasks undertaken – including 'answer phone' – many times. A fuller understanding of the requirements of assessment criterion (A) would have produced some good results as many candidates had written a lot of very good material, but it was about the wrong subject. Choosing the correct engineer and product to result in

full coverage of the 6 assessment criteria, across the 3 mark bands, is vital part of succeeding in unit 2.

Assessment criterion (B)

Technologies are still being misinterpreted to mean 'machines' and a large number of portfolios feel as if they have been done by candidates who have never seen the details of the assessment criteria or the specifications requirements. Many candidates lost marks, on what is one of the easier criterion, due to describing the machines used in making processes in various details through poor preparation. CAD, CAM and communications is generally a range which most industries have, and others can be added as appropriate.

Assessment criterion (C)

The majority of centres did not achieve high marks in this criterion. As in previous years, 'c' and 'd' have been overlapped and confused by several candidates. Candidates did provide a good range of standards, BS and CE, ISOs, etc., and legislation for environmental impact reduction such as the 'clean air act' was thoroughly covered by some.

Information covering the complexities of legislation faced by engineering companies and its impact on design and manufacture needs to be provided. This includes areas such as employment and legal requirements, environmental, Health and Safety, safety-critical, product or service-specific. 'Standards' then need to be seen as different from legislation. E.g. quality, Health and Safety management standard and ISO 14000. In some cases (safety-critical aero, auto), standards are legislation, or they are intertwined. Some of this complexity might be expected of some candidates at AS level.

Assessment criterion (D)

Several candidates did well with this, but many are still not reading the criterion. 'Identify' suggests that the health and safety standard, or associated legislation, should have a name, but many referred to 'risk assessments' without mentioning the acts or regulations which require them to be done, such as the Management of Health and Safety at Work Regulations or PUWER and the rest of the 'Six-Pack'. The way companies interpret these to develop their own 'standards of working' are expected for this criterion, but rarely covered in any detail.

Assessment criterion (E)

This has consistently shown to be the difficult section for candidates, and one in which only the strongest candidates achieve the high marks which are available. Some candidates unnecessarily wrote lengthy reports about the evaluation of the whole company, as if they were evaluating a leaflet or brochure about the company. Candidates should provide an evaluation of the product, service provided or worked on by their chosen engineer. Selection of products such as a jet aircraft or a high class motor car, evaluation became almost trivial due to the lack of focus.

Assessment criterion (F)

Many candidates suggested modifications which were trivial and not relevant. Without a strong 'e' section to build on, criteria 'f' is very hard to achieve more than a few marks. If the candidate has not found a suitable engineer and met with them regularly with addressing the mark scheme/criteria in mind, then it is very unlikely they will be able to suggest improvements. Assessment criterions 'e' and 'f' remain the areas where the difference in candidates abilities is best shown, which is how it was designed.

The choice of product is essential to succeeding, the candidates who chose high-end products that cannot (realistically) be improved upon are likely to score low marks, which could have been improved with initial tutor guidance when choosing a product and engineering. Conversely, one company donated a bus seat to a centre and an amazing number of tests and evaluation methods were created, leading to some excellent realistic and detailed suggestions for modification.

INSET training is available for GCE Engineering with sessions on assessment and delivery. Bespoke training can also be obtained by contacting Edexcel via www.edexcel.com or by contacting your regional office.

GCE Applied Engineering
Principal Moderator's Report June 2009
Unit 3 – Paper 6933/01
Principles of Design, Planning and Prototyping

General Comments

As in all previous years of this unit, moderators report that some excellent work in engineering was seen, along with a growing improvement in understanding the requirements for coursework success. As teachers and students become ever more familiar with the course, performances have improved and it is obvious that centres are acting upon advice offered through feedback reports from moderators, Principal Moderator reports and Inset.

Fewer examples of the 'Design & Technology' approach which focused on form and function without justification were seen and there was an improvement in some students' approach to 'Engineering' coursework where scientific and mathematic concepts were considered, although this aspect of students work is not strong.

A wide range of coursework projects was undertaken by students and Edexcel approved titles such as PCB holder, can shaker and drill stand continue to be popular choices. The manufacturing aspects of this unit were invariably where students scored most marks and the choice of project was key to allowing students access to the full range of marks available. A continuing problem for a significant number of students is where electronic project work is taken on. Although there were a few excellent electronic projects seen, there appears to be little in-depth understanding of electronics generally and this leads to simplistic circuitry being used which does not reach the required AS level of response.

As in previous years, many centres limited the choice of tasks to one or two design briefs and a significant number of centres focused all students on the same initial task. This strategy enabled planning and resources to be centralised and teacher input to be effective and relevant to all students.

Most centres submitted samples of work on time, but many failed to include authentication sheets. 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.

Moderators complained of poor packaging of samples from some centres. Loose, unidentified pages, several pages in one plastic sleeve, folders containing manufacturers' brochures, worthless in terms of credit, were all avoidable issues that added to the burden of moderation.

Teacher assessment was generally good and where there was disagreement between teacher and moderator marks, the discrepancies were usually minor.

Assessment criterion (A)

Centres are now very competent at awarding marks in this criterion and are often slightly harsh, being reluctant to award the highest mark where the evidence presented by students complies in full to the assessment criteria. Most students used CAD packages this year to produce high quality engineering drawings. However, a significant number still failed to complete title blocks, or use appropriate dimensioning that conformed to British Standards. Many students produced a range of high quality engineering drawings, but failed to include enough information to enable the successful manufacture of the designed prototype.

Some students are still generating engineering drawings from 3D sketches created in CAD packages such as ProDesktop, a practice which should be discouraged, as this does not engender any real understanding of the skills and techniques used to produce authentic engineering drawings.

Assessment criterion (B)

As was the case last year, when planning their project, most students 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. Some students presented retrospective diaries of events instead of forward looking plans, while others included the whole of the design process in their time charts instead of focusing only on the manufacturing of their product and where this occurred, plans lacked appropriate detail. Some centres are now producing templated planning sheets to be used by students, which is acceptable as it is the information inputted by a student that gains marks.

When producing product specifications, almost all students were able to identify some key points that were considered important, but there was a lack of justified statements. For example, the statement "the bearing should be made from nylon" is not justified until the statement "because this material is self-lubricating and requires no maintenance" is added to qualify the first part of the statement.

Specification points were generally relevant and many more students are now able to include technical, measurable statements, avoiding meaningless generalisations such as "the product must look good" or "it should not be too heavy."

A good deal of time and effort was spent by some students collecting research, but a lot of this was unfocused and did not relate directly to the problem in hand and was not referred to when developing the product specification.

Assessment criterion (C)

This assessment criterion continues to be the weakest for most students who struggle to offer a range of viable solutions to the problem in hand and show little development leading up to a final design proposal. It is obvious from work submitted in this section that many students have already decided on what their product will be and any other design ideas are cosmetic and ill considered. Although more students appreciated the 'Engineering' approach to their work, where materials choices and selection of processes need to be scientifically/mathematically justified, many missed opportunities to explore these justifications. Where electronic circuitry was

included in project work, it was usually of very low level and was often based on a 'found' circuit that students had not developed at all. More credit could have been gained from illustrating the proposed circuit in circuit modelling software such as 'Crocodile Technology' or 'Livewire' , then developing the circuit into a Printed Circuit Board using an appropriate software package such as 'PCB Wizard'. Where electronic solutions to problems were proposed, there was generally much more emphasis placed upon the design and development of the case in which to place circuitry, rather than the technology and electronic engineering behind the proposed solution.

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

Assessment criterion (D)

In this assessment section, evidence was seen of high quality skills presented by a significant number of students who had succeeded in producing successful prototypes. Most students succeeded in producing a practical outcome to their chosen problem that reflected their final design proposal, but some, although fewer this year, displayed making skills that were limited and modest. Almost all products were finished and working as intended, which was good to see.

Despite students' submitting photographic images of practical work, a significant number of these lacked the detail necessary to illustrate the complexity of the task and the higher-level skills necessary to gain higher marks. Some images of the finished product only appeared on the printouts of students' ICT presentations and were often small and of poor quality. Ideally a range of photographs of a product under manufacture would be the most helpful imagery to moderation and at least one large, clear photograph of the completed product should be included in a student's design folder.

A few centres sent no photographic evidence of students' practical work, relying on witness statements to justify marks awarded. This practice is not acceptable and where this was the case, centres were asked to supply images, without which, no marks could be awarded.

Assessment criterion (E)

Most students provided appropriate evidence of oral presentations, which included hard copies of Powerpoint slides, and teacher witness statements, which were generally informative and provided useful annotation regarding individual student 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 June 2009
Unit 4 – Paper 6934/01
Applied Engineering Systems

The majority of centres assessed this paper with a reasonable level of accuracy, but a minority did require some adjustment to their scores in some areas of the paper. Further problems with the administration and paperwork of the unit included centres failing to send authentication sheets, which is a requirement for all such qualifications, and a minority also sent all copies of the OPTEMs sheets, which then had to be forwarded to the correct address, which is given along the side of the OPTEM.

There are still candidates whose work appears to contain work taken from the internet as a source of information without reference to the source. Where this was suspected the work is passed to the Edexcel Compliance Unit who check through the suspected areas to confirm any potential plagiarism.

The majority of centres submitted the work as examination scripts, either using exam booklets or loose leaf A4, held together using a treasury tag. Some centres still seem to consider the presentation in folders, binders or wallets as essential. Please be reminded that this is an examination, being sent for moderation, not a display presentation.

The annotation provided by some centre assessors provided very helpful guidance to moderators by indicating where the evidence was for each outcome. Annotation was generally ineffective as simply giving page numbers is of little help. Page numbers are expected as a bare minimum, and the best annotation proved to be done by writing the key words from the assessment grids alongside the candidate's work, to show the exact location of the evidence.

Activity 1

The solution to this activity can be obtained by using either mathematical or graphical techniques. Candidates appear to either have a strong grasp of this or not, and it was clear that weaker candidates didn't appear to know how to get started with this fundamental area of engineering. Those who performed well demonstrated a good understanding and the range of sources which were used to compare the results to the actual values for the metal was impressive.

Many centres appear to have access to the relevant equipment, but by allowing the learners to let the computerised machine produce the graphs, they are being deprived of access to the details of the performance curves which are better absorbed by manually plotting them.

The final calculations, where the extension of the material is determined, were completed effectively by most, but some candidates had obtained results which were unusual, such as the material for the extension being several times its original length, without adding comment or analysis of this outcome.

Activity 2

Explanations of how the bell circuit worked were attempted by all, and the results were quite good across all entries. The block diagrams were done thoroughly and the explanation of energy types and conversions during its operation appear to have been understood quite well by all candidates.

The range of alternative solutions was interesting, in that some had different electrical circuits, 'ding-dong' type bells and electronic oscillators. A handful had also included mechanical systems of bell and pull chain or rope. All these demonstrated some understanding of the engineering involved in electro-mechanical systems and devices.

Activity 3

The was a wide range of design solutions for monitoring light levels with a range of ideas presented. Some candidates demonstrated a thorough understanding of the problem and how to solve it, and included details of health and safety and other constraints required by the task.

Many ignored the guidance given in the task, about an 'off the shelf' data logger being used and much effort went into designing one. Where this occurred, moderators tried to allocate marks for demonstration of engineering principles and practicalities, to ensure knowledge and understanding were rewarded.

This activity remains the differentiator between the strong and weak candidates, but overall, the solutions were good. A knowledge and understanding of a range of engineering ideas were evidenced.

Many ideas involved too much complicated detail on the actual circuits, and the evidence indicated that at least one group of candidates actually built the gadget to monitor light levels.

GCE Applied Engineering
Principal Moderator's Report June 2009
Unit 5 – Paper 6935/01
The Engineering Environment

General Comments

The majority of centres are ensuring that their candidates are carrying out effective work for this unit. The selection of engineers and products is essential. This is not the type of qualification where candidates can be successful by searching the internet for information without meeting engineers, enquiring about their work and all the relevant factors that impact on them. Some centres are using work experience as a vehicle to obtain evidence for unit 5, and generally this is working well.

Candidate performance varied from the very weak, scoring single figures, to the excellent, with some candidates scoring almost the full 60 marks. Following moderation, some marks were considered to be excessive, and a few were very generous indeed. These will be adjusted following moderation. Many centre assessors are now using excellent annotation using 'assessment verbs' and criteria in the margin to indicate where a learner had 'justified' a specific activity. At the other extreme, some centres merely annotate a few 'approximate' page numbers on the mark record sheet, with scores for each assessment criteria, but not totalled up, no comments written anywhere as if the assessment had been done without opening the work.

Centres with weaker candidates are advised to seek advise through INSET or the Ask the Expert service in order to present the qualification accordingly and prevent their learners being excluded from opportunities.

There are a small number of centres who include a large packs of materials, such as an appendix or separate lever arch file, collected about the product or company without any reference to them in their work. Please only send the candidates' work for moderation and avoid appendices. If it is worth including then summarise it in half a page and include it at a relevant point and save the material for future reference.

Assessment criterion (A)

The candidates who asked their engineer about the standards used throughout engineering produced good portfolio content. Others tried to search for relevant standards or simply state that they probably use them which suggests a visit never happened or the visit wasn't done individually and carefully. No marks can be awarded for this criterion unless the candidates include detailed descriptions of the actual standards and how they affect the engineer, product and service. Copying and pasting content or linking to websites results in no marks.

A growing number of centres are now focusing on this criterion and some high marks have awarded. Use of BS and ISO references is also indicting a deeper understanding of the requirements of this unit.

Assessment criterion (B)

Most candidates achieve high marks by listing a few documents and describing their purpose and use by the engineer. A small number of centres do not support their candidates by discussing their chosen engineer. This can lead to comments such as 'the company wouldn't show me any documents because of the Data Protection Act', or 'because they are copyright'. Some include documents and include comments like 'look at all these'. With no identification, description or reference to how they affect the product or service this results in no marks being awarded.

Assessment criterion (C)

The section on energy efficiency is being covered well by most centres and includes details of efficiency assessment, use of power, installing insulation, other green issues, etc.. Several candidates scored top marks. It is essential that each candidate asks their engineer about this, as with all the other sections, or the portfolios can only contain general comments at best.

Assessment criterion (D)

Many candidates mixed 'c' and 'd' together, which is acceptable, but it makes it difficult to allocate marks. If this section is alone, it is essential for the assessor to annotate the work to help indicate where each part is addressed. This will help a remote moderator analyse the score. If the evidence is not clearly annotated, the moderator will not easily be able to confirm the marks and the scores are likely to be reduced. Environmental impact can also tie in with the assessment criteria of 'a' and 'b'. If the evidence clearly shows this, and the annotation refers to the respective assessment criteria and mark band verbs, the moderator will agree the score, if the work can be found.

Assessment criterion (E)

Many candidates scored very highly on this section, but a large number still seem to interpret 'technology' as 'machines'. Machinery forms a part of technologies such as CNC, CAD/CAM, etc. used by engineers, but the use of mobile phones, internet, laptops, PDAs, cameras, satellite navigation, and many other applications of new technologies are not included by almost half of the candidates who submit work. Again, this section can earn candidates 12 marks, and is one which should interest the candidates because they have generally been surrounded by developing communications technology throughout their lives.

Assessment criterion (F)

In this section, the greatest difficulty arises due to the nature of the requirements. Typically, if a group of students collectively visit a company together, they all tend to write down what the work force has told them. It follows then that little originality and thought can be expressed for improvements and recommendations. Although the word 'testing' is not used in this outcome, in order to carry out some kind of evaluation, the results of tests can be referred to, which may provide a more realistic focus for some candidates.

As with unit 2, a long term developmental relationship with an engineer or a company does tend to help the performance of candidates across all learning outcomes, much more than a single visit and walk round the place of employment.

GCE Applied Engineering
Principal Moderator's Report June 2009
Unit 6 – Paper 6936/01
Applied Design, Planning and Prototyping

General Comments

It is pleasing to report that this year, almost all students were able to build on their AS experiences and produce work of true A2 standard. There was good evidence of the use of scientific and mathematic data, reflecting the desired Engineering approach to project work. As was the case last year, almost all coursework submitted for moderation was appropriate to the requirements of this unit, allowing students access to the full range of marks.

An improvement in approach and performance by most students was evident, as centres are becoming more familiar and comfortable with the requirements of this unit. Only a minority of students failed to reach the expected A2 level of response, but this was invariably recognised and marked appropriately by centres. The vast majority of products designed and manufactured were useful prototypes that could be said to have been arrived at through engineering product design, an approach to be encouraged.

In general, teacher assessors were accurate and consistent in their marking, but there were some areas of difficulty experienced by some students.
Research was often carried out diligently and copiously, but was sometimes unfocused and general and was not referred to when developing a product specification or producing ideas. Criterion B, 'design and development', continues to be a weakness for many students and criterion C 'discussion with peers or engineers', although improved is still not well understood. Testing was often superficial, where students failed to justify tests, or carry them out under realistic conditions. Evaluation was often subjective and did not include the views of a client or user-group.

In the submission of work for moderation, most students were well organised and presented logically prepared coursework folders with appropriately titled sections that were easy to follow. Problems for moderation occurred when students failed to number pages or organise work under headed sections. It was not uncommon for a moderator to be guided by teacher annotation to pages that did not contain the appropriate evidence to support marks awarded and too many mark sheets were not annotated at all. The number of pages submitted by some students was unnecessary. It was not uncommon to see more than one hundred A4 sheets in a design folder, which is far more than the number recommended. A skill in presenting work is selectivity and another is succinctness; there is no point in proving that a student is operating at a particular level over and over, when once is enough to elicit appropriate marks, judged against the relevant assessment criterion.

Most centres submitted the sample of work on time, but many failed to include authentication sheets. 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 was less than helpful. Some centres used their own assessment grids to record marks, which were often difficult and awkward to follow. Moderators complained of poor packaging of samples from some centres. Loose, unidentified pages, folders

containing manufacturers brochures, worthless in terms of credit, were all avoidable issues that added to the burden of moderation.

Teacher assessment is now good and the vast majority of marks were awarded honestly and consistently, although in a very few cases, it was impossible to discern how some marks were awarded or deserved.

Photographic evidence was usually good, but a wider range of images showing work in progress and demonstrating high quality skills would have been helpful to moderation

Assessment criterion (A)

As usual, all students were able to gather information from a range of sources that focused on the problem being investigated, but not all were able to demonstrate selectivity and relevance. The point of collecting research information is to inform the specification and design ideas, but many students failed to make more than passing reference to the information gathered throughout subsequent sections of the project folder. Appropriate research areas that could be useful to students include product analysis, market research, materials and component research etc., but all must relate closely to the needs of the identified problem under investigation and should contain technical information that can be used in the design and development of a design proposal.

Specification writing was improved, with more students understanding what is required in this section. The best examples of technical specifications used gathered research as a basis for identifying key technical points that were based on scientific and/or mathematical justification which allowed testing and evaluation to be realistic. Some students consulted with their peer group or a client to ensure that the specification points were appropriate to the problem in hand and that they met the identified needs. Many weaker specifications contained superficial and general points that could not be used as a guide to design and development.

Assessment criterion (B)

As with AS work, this section was often weak failing to reflect the assessment criteria statements. Students showed little flair in their designs or willingness to explore a range of ideas. As was the case last year, many students settled on a single design solution or simply added designs cosmetically rather than for true technical development.

Many students did use their product specification to evaluate design proposals against but this was sometimes superficial or brief, especially where weak specifications were in existence.

There was evidence of some good modelling, but there was usually little design development beyond specifying materials and processes. Development should reflect and illustrate change and a moving on of a design proposal to a final refined state suitable for manufacture. Many students simply used an initial idea and repeated it instead of developing it further.

Assessment criterion (C)

There was an improvement in dealing with this section and most students were able to organise and carry out discussions with other engineers/peers and record some feedback from their meetings. However, in many instances these meetings were misguided and were used simply to discuss projects rather than eliciting constructive, technical feedback to inform and influence the further development of the product design. This assessment criterion was often marked generously by teacher assessors who credited any meetings between students and peer group as appropriate.

Assessment criterion (D)

In this assessment section, most students were able to offer comprehensive planning for production, but only a minority achieved effective descriptions of relevant regulations and standards.

Plans for production were generally well done, outlining a sequence of events, use of processes and materials and referring to time and deadlines. The best examples of planning included quality control and health and safety issues.

In this assessment criterion, planning for manufacture should include reference to time management, consideration of commercial methods of production including sequencing for batch/mass production and quality control. Health and safety issues should also be considered.

An appreciation of the application of relevant standards and regulations to the production of students' work was not well done and many students offered no evidence in this assessment section. Examples of regulations and standards that could have been considered include ISO 9000/2000, which relates to quality management; ISO 9002, promoting quality standards such as RFT (right first time); OHSA 18001, which relates to health and safety at work; ISO 14000, which deals with environmental standards. There are also more specific standards to consider where appropriate, such as BABT – British Approvals Board for Telecommunications; BEAB – British Electrical Approvals Board and others.

Assessment criterion (E)

Many students were able to use this assessment section to demonstrate their synoptic abilities, bringing together the skills gathered over their course of study to produce, work that was sometimes outstanding. At the opposite end of the scale, lower level, less demanding work often demonstrated good quality skills, but did not meet the assessment criteria for higher marks because of the lack of challenge in the manufacturing task. Where this was the case, teacher assessors invariably awarded marks appropriately.

High quality photographic evidence is essential in conveying the quality and complexity of product manufacture, and most centres are adept at producing ranges of excellent images in support of the marks awarded. However, a number of centres failed to submit appropriate images and some submitted no photographic evidence of practical outcomes at all. Where this is the case, centres cannot expect to have their marks agreed.

Assessment criterion (F)

All students presented evidence of some testing and evaluation, which ranged from thorough and well described field tests carried out under realistic conditions, to superficial, subjective statements that were no more than words of self-congratulation. In the best examples of testing and evaluation, students evaluated their products against the specification and photographed evidence of their field trials. User or peer group involvement and feedback was also in evidence, which led to realistic suggestions and designs for modifications. However, a significant number of students produced superficial evaluative comments, which did not involve third-party comment, or discussion with the client and were not set against points of specification.

Overall, centres are congratulated on their efforts in preparing students effectively for this unit of study.

Statistics

6931 Engineering Materials, Processes and Techniques

Grade	Max. Mark	A	B	C	D	E
Raw Boundary Mark	90	71	63	55	47	39
Uniform Boundary Mark	100	80	70	60	50	40

6932 The Role of the Engineer

Grade	Max. Mark	A	B	C	D	E
Raw Boundary Mark	90	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	90	48	42	36	30	25
Uniform Boundary Mark	100	80	70	60	50	40

6934 Applied Engineering Systems

Grade	Max. Mark	A	B	C	D	E
Raw Boundary Mark	90	51	44	37	31	25
Uniform Boundary Mark	100	80	70	60	50	40

6935 The Engineering Environment

Grade	Max. Mark	A	B	C	D	E
Raw Boundary Mark	90	51	44	38	32	26
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	90	52	46	40	34	28
Uniform Boundary Mark	100	80	70	60	50	40

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