

Examiners' Report/ Principal Examiner Feedback

June 2011

GCSE

Application of Technology in Engineering
and Manufacturing

Unit 5EM03 Paper 3D

Engineering Fabrication

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Chief Examiner's Report

There were two qualifications examined in this series at GCSE level.

GCSE Engineering (Double Award) 2EG02 and

GCSE Manufacturing (Double Award) 2MN02

Unit 3: Application of Technology in Engineering and Manufacturing (5EM03)

The award of this unit was split into six sectors with an individual paper for each;

5EM03/3A Printing and Publishing Paper and Board

5EM03/3B Food & Drink, Biological & Chemical

5EM03/3C Textiles and Clothing

5EM03/3D Engineering and Fabrication

5EM03/3E Electrical and Electronic, Process Control, Computers,
Telecommunications

5EM03/3F Mechanical, Automotive

All six papers were harmonised for structure and difficulty.

Each paper had two sections. Questions in Section A related generally to information about the chosen sector. Section B illustrated a product from the chosen sector and questions were related to that product. The product was pre-released in September/October 2010 and acted as a focus for research in preparation for the exam. Again this year a Support Paper was available to help centres prepare for the exam. This paper was attached to the pre-release material so every centre had access to this. Candidates were able to take their own research notes into the examination, but these were not to be submitted with the examination paper for marking. A very few centres did submit this work which caused problems for the processing of their scripts. This action may cause a delay in the marking and therefore issuing of results so centres are strongly warned not to include the pre-release work when submitting scripts. The question paper within both sections was ramped in difficulty throughout although in some papers an unusual pattern emerged where higher achievers failed to gain "easy" marks.

All Principal Examiners' reports indicate that all the questions within the respective paper were accessible to their intended candidature, although all indicated that lower achievers often gave generic answers throughout the paper. A feature of this year, different to the predecessor qualification, was that some sector papers (mainly sectors 3B and 3E) had a significant number of blank spaces. Also most Principal Examiners' reports indicate that marks could be obtained from questions 13 but question 14 which involved assessment of Quality of Written Communication (QWC) was difficult for most.

Generally speaking those candidates who had had opportunities to study and research the target product answered well. It was clear in their responses that they understood the process of manufacturing/engineering when applied to their product and sector. Good candidates were also able to give variety in their responses across the range of questions. Some responses led the examining team to suspect that in some centres candidates were allowed to take in information from previous examination papers or mark schemes as often their answers were duplicates from these previous mark schemes. In these cases often the answer was not in the context of the question and the candidate was not able to score high marks and therefore were disadvantaged by having this information within their pre-release notes and sketches. Candidates are not allowed to have these documents in the examination room as part of their pre-release work.

In general terms a typical grade F candidate was able to identify products from a given sector, name and describe, with some exceptions in some sectors, the use of components/equipment etc and in nearly all cases link applications of technology to key areas of technology. In a range of other questions where explanations and descriptions were required often candidates were only able to give one word if not simple answers. Variations in answers throughout the paper were limited. Application of technology was also limited throughout their responses. Often no responses were suitable for the latter questions in the paper particularly when the question asked for explanations of a term such as 'systems and control' and 'automation'. They showed limited recall and application of knowledge and understanding.

In general terms a typical grade C candidate was able to gain a range of marks from the same areas and aspects of the paper as a grade F candidate, but with further detail in their responses to those questions demanding an explanation or description. They were able to explain benefits of using CAD and CAM. Their responses when explaining the implications of the use of information and data handling were limited. Good responses were given when explaining the aspects of the product through sketches and notes. Some were still unsure of the stages in manufacture, particularly what happens in some of the stages of manufacturing.

In general terms a typical grade A candidate was able to access marks for many aspects of the paper including most of those achieved by grade C candidates. Their explanations and descriptions were complete and had many references to the "real" manufacturing and application of technology of their product. Throughout the papers candidate responses evidenced a variety of applications of technology. Many candidates at this level understood what SMART materials are and knew all about the application of automation. Often their evaluations on the use and impact of modern materials and processes were well presented.

All of these points were considered during the awarding of the results.

Unit 5EM03_3D

Engineering Fabrication

General Comments

Overall, the two sections within this paper produced a good range of responses. Lower ability candidates often gave generic responses to questions, such as 'quick/fast/cheap' which gained limited marks. Some candidates based their responses on an incorrect context and therefore did not gain marks.

The more demanding questions, especially at the end of Section B, were difficult for many candidates and consequently a large proportion gave inappropriate responses. The introduction of questions that required a term to be defined has worked as an excellent differentiator.

It was extremely pleasing to see that the majority of candidates attempted all questions and empty spaces were kept to a minimum throughout the paper.

As this is a new examination paper, most candidates would benefit from being taught examination skills and techniques, as often they did not read the questions properly, and 'describe', 'explain' or 'evaluate' questions were answered using bullet points as opposed to the 'state, describe, explain' method. This was sometimes the case in Q14 where candidates are tested on QWC.

Section A

Question 1

The majority of candidates correctly identified the products belonging to the Engineering Fabrication sector in Q1(b) however a significant number of candidates failed to get both answers correct with the 'mobile phone' causing problems for candidates in the Engineering Fabrication sector.

Question 2

The majority of candidates correctly identified both components used in the manufacture of Engineering Fabrication products. However there were a number of candidates who were unable to identify the 'bearing'. Also many candidates were unable to describe the use of the 'pulley and belt system'. A number of candidates looked at the use of the 'gear' in Q2(a) and simply used this response as their answer which was correct. The majority of candidates were able explain the use of the 'solid rivet' with many responses centred around 'a permanent method of holding two pieces of material together'.

Question 3

A straightforward and generally well answered question. However, a significant element identified the term 'Computer aided manufacture' as belonging to the 'Information communications technology' Key area which is incorrect.

Question 4

Good responses to Q4(a) included products used in the pre-release materials for past papers or specimen assessment materials. This year, this question required two responses and it was pleasing to see that candidates had not responded with the excluded product, the shopping trolley, as the subject for the question. In Q4(b), it was pleasing to see many of the candidates providing a specific material for one of the named products. For Q4(b)(ii) a broad range of answers in the mark scheme meant that generally good marks were awarded as candidates were able to give detailed responses to the benefits of using the material named. This question, along with, Q4(c), was a very good differentiator within the paper. Candidates who scored well across the whole paper, generally gave very good responses to Smart materials. This is still an area that centres need to develop to allow candidates access to this type of question.

Question 5

The majority of candidates scored very well for Q5(a)(i) with answers such as 'modelling virtual products' and 'modifying existing designs'. It was very pleasing to see good responses to the benefits of CAM, with respect to the manufacturer, with the majority of candidates accessing both marks in Q5(b)(i). Again, Q5(b)(ii) proved to be another good differentiator with many of the candidates explaining the benefits of CAD and CAM to the manufacturer rather than the distributor. Typical incorrect responses related to 'reduction in labour costs' and 'easier to modify designs'.

Question 6

Q6(a) proved to be quite challenging for a number of candidates. This was the first question relating to defining an engineering term, 'System and control technology'. This was new to this series; however, there were similar questions in the Sample Assessment Material provided for centres. It was pleasing to see that although a number of candidates were unable to define the term, they were still able to provide good responses to the whole of Q6(b), with many candidates clearly identifying the benefits of using robotics in hazardous conditions.

Question 7

Centres are reminded that the paper is ramped in difficulty and the latter questions in each section are aimed at the more able candidates. This question required an ability to provide specific responses, by drawing upon specialist knowledge of information and data handling systems. Q7(a) - Many candidates scored well focussing responses around accurate sales information leading to instant feedback.

Q7(b) - Many candidates scored well with responses centring around automatic ordering of materials, parts and components ensuring continuous supply resulting in reduced lead times. Many candidates did not grasp the concept of 'implications' and provided responses that simply described a range of software used at each stage.

SECTION B – based upon the mass produced shopping trolley pre-release material

Question 8

The new paper created a greater opportunity for all candidates to display their knowledge and understanding of the pre-release product through sketching and notes relating to the functions of various parts of the shopping trolley. All three parts were well answered. Candidates were able to effectively explain, using notes and sketches, the function of the frame, coin lock and basket. The vast majority of candidates had clearly undertaken research based upon the pre-release material; those that provided incorrect responses often confused the frame with the basket. Many candidates realised this and simply swapped the names at the top of the paper. This however, caused problems when marking as responses were in the incorrect position. It was very pleasing to see that the vast majority of candidates were producing both notes and sketches to be able to access full marks.

Question 9

For Q9(a), a number of candidates were unable to correctly identify the missing stages in the list. Many tried to give 'quality control' as a stage. The correct sequence of stages is clearly outlined in the specification and centres should refer to it. Also a significant number of candidates failed to answer Q9(a)(ii), identifying the stage where the ideas for the coin lock would be developed. Q9(b)(i) was generally well answered; responses centred around 'where the correct manufacturing sequence is organised' or 'where the correct tools/equipment are identified' and many candidates gained at least 2 marks. Q9(b)(ii) was again generally well answered, with many candidates gaining at least 2 marks; most correct responses focused around 'the stage where the trolleys would be wrapped in batches and transported to the distributor'. Poor responses often related to the shopping trolleys being individually 'boxed' for transport.

Question 10

Q10(a)(i) was well answered, with 'steel' or 'mild steel' the most popular (correct) answers. Q10(b)(i) elicited a mixed response, which was surprising; answers that gained the full 3 marks were few, with many candidates stating manufacturing processes such as bending, injection moulding and drilling. Some candidates misread the question and used 'welding' as a process; which was the excluded process. For Q10(b)(ii), those candidates that had studied the pre-release material were able to offer detailed responses in relation to why spot welding is a suitable process used during the manufacture of shopping trolleys. The most popular answers centred on the advantages of 'focussed welding, making strong and accurate joints that is usually automated to speed up production'. Some candidates only gained 1 mark for generic responses such as 'quick and easy to do'. Poor answers explained how the process of spot welding was undertaken. For Q10(c), many responses focussed around materials being used that make the shopping trolley strong along with an aesthetically pleasing product.

Question 11

Q11(a) - The second definition question. This clearly differentiated the candidates with many candidates able to define the term 'automation'. With Q11(b)(i), many candidates responded with machining processes undertaken to manufacture the trolley but with no reference to the use of automation. They simply put responses such as 'cutting' or 'bending' with no further description. Q11(b)(ii) and Q11(b)(iii) were generally well answered, with candidates clearly able to identify the benefits of automation for both the manufacturer and consumer. Q11(c) had mixed responses. It was clear that some candidates were not familiar with 'mechanisation', although it can be found in the specification. This is something that needs to be addressed next year. However, many candidates were able to make the contrast with automation and score well here.

Question 12

Q12(a) was generally answered well by the majority of candidates. For Q12(a)(i), types of communication technology, with typical responses such as 'email' or 'mobile phone'. Where candidates responded well to Q12(a)(ii), answers focussed around a benefit of using the communications technology in the design stage such as 'allowing design information to be discussed in a real time using the mobile phone'. Many candidates simply described the benefits of the communications technology in general terms and failed to score marks. Q12(b) of this question centred around 'quality control'. This has often been a poorly answered question in past series. However, responses this year clearly indicated that centres are getting to grips with this aspect of engineering by providing a range of responses other than the traditional 'dimension checks'. Most popular responses focussed on wheel alignment and trolley manoeuvrability. Q12(b)(ii) also generated some very good responses from the majority of candidates. These were usually associated with machine efficiencies and manufacturing controls. Poor responses occurred when candidates misread the question and gave environmental hazards such as 'global warming'.

Question 13

The majority of candidates sitting the examination paper this year attempted this question. This is pleasing as it is good examination technique for candidates to attempt all questions, even if the response is an informed or 'educated' guess. Many responses discussing higher skill levels required and the reduction of labour as a result of automated machinery being used. Many candidates also coupled this with responses such as 'safer', 'cleaner' and 'quieter' working environment. Where candidates failed to score well, it was a result of not combining responses for both the workforce and the working environment.

Question 14

This question looked at QWC as well as issues of 'sustainable manufacture'. Where candidates scored well, there were coherent sentences produced relating to issues surrounding 'manufacturing efficiencies' and 'continuous production leading to increased energy consumption'. Many candidates also discussed issues relating to 'irresponsible dumping of trolleys'. Although the paper is ramped, it did give most candidates the opportunity to test the knowledge of modern engineering processes. However, many candidates used bullets points to respond to this question and therefore failed to score highly on QWC.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

<http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx>

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