

Examiners' Report/
Principal Examiner Feedback

Summer 2014

Pearson Edexcel GCSE in
Application of Technology in
Engineering and Manufacturing

Unit 5EM03 Paper 3D
Engineering Fabrication

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Engineering Fabrication

General Comments

Overall, the two sections within this paper produced a good range of responses.

Lower ability candidates are still giving responses to questions, such as 'accurate/quick/cheap' which gained limited marks. Some candidates continue to misread or misinterpret questions 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 majority of candidates continue to attempt all questions and empty spaces were again kept to a minimum throughout the paper. It appears that most centres have taken on board information from previous series examiners reports as there was a significant improvement in candidates abilities to respond to 'describe', 'explain' or 'discuss' questions without using bullet points. Centres are clearly teaching appropriate examination skills and techniques to minimise this.

Section A

Question 1

The majority of candidates correctly identified the products belonging to the Engineering Fabrication sector in both parts of this question.

Question 2

Candidates had the opportunity to use their knowledge and understanding to correctly identify and describe some tools this year. The majority of candidates were clearly able to identify both in part (a) however; some candidates identified the first tool as being a 'wrench' which was clearly incorrect. It was very pleasing to see candidates able to describe both tools in the second part of the question to access full marks.

Question 3

A straightforward and generally well answered question. However a number of candidates thought that 'composites' was linked to 'Information Communication Technology' where the correct Key Area was 'Modern Materials'.

Question 4

Good responses to part (a) included products used in the pre-release materials for past papers or specimen assessment materials. This question again required two responses and it was pleasing to see that candidates had not responded with the excluded product, the skateboard, as the subject for the question. In part (b), this proved more problematic. Some candidates did not identify a type of control technology but often used 'CAD' as a

response which was incorrect. This meant that there was no access to the second part of (b). Candidates need to read the question thoroughly to ensure that this crucial part is answered correctly. Candidates who scored well here produced appropriate explanations of control technologies for 'continuous operation', 'CAM' and 'assembly robots'. Many candidates were not familiar with the term 'material removal' as a type of process therefore scored limited marks for this question. It clearly states in the specification examples of material removal processes such as drilling, milling and turning. Candidates then struggled to describe such a process.

Question 5

Part (a) was generally answered well. Most learners provided responses associated with actions that can now be completed online rather than manually, such as 'The manufacturer is able to complete web-based activities such as promoting products without the need for expensive advertising campaigns and production of promotional material'. The majority of learners also scored quite well for part (b); however, a lot of repetition was seen in the answers to this question. Good responses stated three different benefits of the change for the manufacturer, with a description of why they are benefits, for example 'There is now less chance of human error as CAM is very good at repetition and following instructions' or 'It will now cost less to make lots of items once the CAM machinery has been set-up'; in contrast, poor responses were highly generic, for example, 'It's quicker' or 'It's easier', which were often repeated later in part (b). A small proportion of learners read the question as CAD and answered accordingly which was incorrect.

Question 6

Most learners gained 2 marks for part (a)(i); the large range of correct responses provided by learners included 'Mobile phone', 'Texting' and 'Video conferencing'. A good range of answers were also seen for Part (a)(ii), with the majority of learners gaining 2-3 marks for responses that focused on clarifying requirements, expediting information and arranging resources, such as 'The manufacturer could forward the designs as an attachment using email instead of sending a paper copy which would reduce the customer response time' and 'They could email the customer to ask for a reply with instructions, so they can then forward it quickly to the staff that are going to make the order'. Where learners gained lower marks for (a)(ii) they often gave responses that did not relate to the context in the question. There was a mixed response to Part (b)(i), with numerous smart materials stated (such as Shape Memory Alloys', 'Polymorph' etc) for 1 mark; however, many learners just stated 'aluminium' or 'plastic'. For (b)(ii), most learners provided good responses for 2 marks that were associated with the appearance or protection of the material, such as 'They make the material look more aesthetically pleasing and also they will stop it from corroding'. Incorrect responses for (b)(ii) often focused on the advantages of the material rather than the benefits of the finish.

Question 7

Centres are reminded that this examination paper is ramped in difficulty and the latter questions in each section are aimed at the more able learners; as a result, this question required an ability to provide specific

responses, by drawing upon specialist knowledge. Part (a) elicited a mixed response, as expected; good answers, for 3 marks, included 'They have made information on product sales more accurate as the manufacturer can get instant feedback. This means that they can see how many products will be needed (customer demand) and find out how much profit they will make from each type of product, so they can advertise those that are most profitable' or 'They contain detailed customer information, so the manufacturer can change the amount of products they make based on the trends being seen in sales and suitable advertising methods can be devised'. Less able learners often mentioned using the internet for advertising or promoting products, as they concentrated on the 'sales' aspect of the question, when what was actually required was a benefit of information and data handling systems (for product sales). Surprisingly, part (b) drew out a strong response from most learners, with many gaining 2 or 3 marks; popular answers focused around a benefit of: 1) easy access to data; 2) accurate, up to date information; 3) being able to monitor costs; and 4) ordering materials in a timely fashion (or a combination of the aforementioned), for example 'They mean supplies and materials can be ordered just in time to meet the production schedule as it is easier to forecast what will be needed and when so you don't need to hold as many stocks' (for 3 marks) and 'They can help to control waste due to monitoring of the process as there is fast access to data using queries, which means quality issues are easy to spot' (for 3 marks). Incorrect answers were often generic and lacking a production link, such as 'They are easy to look at when you are designing something'.

Section B – based upon the 'mass produced skateboard' pre-release material

Question 8

The paper continued to create a greater opportunity for all candidates to display their knowledge and understanding of the pre-release product through detailed sketching and notes relating to the functions of various parts of the skateboard. Most candidates were able to effectively explain, using notes and sketches, the function of the 'trucks', 'deck' and 'bearings'. This was a product that really seemed to suit many of the candidates as a vast majority of them had clearly undertaken research based upon the pre-release material. Some candidates are still producing notes only and this does not allow them access to full marks for each part of Q8.

Question 9

For part (a), nearly all candidates were able to correctly identify the missing stages in the list. Part (b) most candidates scored higher with a description of 'Design' as opposed to 'Marketing'. Responses for 'Design' centred around 'initial design concepts', 'the use of CAD to develop designs' and 'development of the design specification'. Whereas responses for 'Marketing' centred around market research activities such as 'gathering customer opinions through the use of surveys/questionnaires'.

For part (a)(i), the vast majority of learners were able to correctly add the missing main stages in the list ('Marketing' and 'Assembly and finishing') for 2 marks. Non-creditable responses often stated 'Planning' or 'Inspection'.

For (a)(ii), almost all learners correctly named the stage as 'Design'. Part (b) was generally well answered, with many learners gaining at least 2 marks. Responses normally centred on purchasing, storage or testing of materials and stock taking. Where learners gained lower marks it was invariably due to repetition in the answers, for example 'Purchasing materials' and 'Purchasing bought in components'. It was pleasing to note that answers for Part (c) were often contextualised, focusing specifically on what would happen at the production planning stage for the skateboard. Responses associated with getting materials, equipment and people to the right place at the right time were common. Poor responses often stated activities with production of the skateboard itself.

Question 10

Part (a)(i) proved quite challenging for most candidates and reward was given to the candidates that recognised a need for a steel that had been hardened or had a higher strength than mild steel or low carbon steel. Good examples included 'stainless steel' and 'hardened steel'. Part (b)(i) produced a better response than last series with popular correct answers such as 'injection moulding', 'die casting' and 'laminating'. For part (b)(ii), those candidates that had studied the pre-release material were able to offer detailed responses in relation to why sand casting is a suitable process used during the manufacture of the trucks. Popular answers centred around 'can mould many trucks at one time' and the 'ability to create the shape repeatedly'. Part (c) was answered well by learners, with most gaining 2 to 3 marks. The majority of responses centred on the recyclability, biodegradability and durability of modern materials and again it was pleasing to note that answers were often contextualised, focusing specifically on materials that are used for the skateboard, such as aluminium and polyurethane. Learners that gained lower marks often provided responses associated with lowering pollution or lessening the greenhouse effect without any link as to how the use of modern materials has contributed to these improvements.

Question 11

Part (a) and Part (b) were generally answered well by the majority of learners. For Part (a)(i), a wide range of answers were identified in the mark scheme, and hence a variety of responses were seen from 'Drawing using CAD' (for 1 mark) to 'Researching where to get materials' (for 1 mark). Incorrect responses were seen when candidates simply identified software used for designing such as 'Pro Desk Top' or simply stating 'CAD'. For Part (a)(ii), answers such as 'Using bar codes to monitor the amount of skateboards being dispatched' were popular, as were responses associated with generating/printing labelling/barcodes and/or raising invoices. For Part (b), many correct responses were associated with monitoring sales, matching stock to demand (leading to less waste) and route planning for vehicles. Part (c) elicited a mixed response, with most learners gaining only 1 to 2 marks. The majority of good responses centred on modifying ideas and the speed at which such ideas can then be generated, such as 'ICT means new designs for skateboards can be sent to the manufacturer more quickly as the design, development and production processes have become faster. CAD design ideas can be changed quickly and can easily be converted into virtual models' (4 marks). Poor responses were too generic

and lacked the detail required for a higher demand question, for example 'ICT makes for a better quality design'. Few learners gained 3 or 4 marks for Part (c) as a result of not expanding their answer into a fully developed explanation.

Question 12

Part (a) resulted in a range of responses of variable quality; popular and correct answers included 'The workers will need to know how to use (or maintain) the automation, so they will have to do more training' or 'The workers will be made redundant as the machines will be replacing their jobs'. For Part (b), the majority of learners were awarded 1 to 2 marks as a lot of repetition was evident. Correct and popular responses often focused on the working environment being safer, such as 'The machines now do most of the dangerous work so less accidents happen and people don't get hurt as much'; unfortunately, responses associated with production (rather than the working environment) were seen frequently (eg 'faster production') and answers such as this were not creditable. More able learners gave responses that were directly related to the working environment, such as 'Automation can be enclosed which means there is less noise and it's cleaner for the workers', with a second different response of a similar quality also evident, for all 4 marks. For Part (c), a good range of responses were seen, with many learners gaining at least 1 mark by providing an answer associated with increased noise pollution, higher energy costs or the time required for maintenance. Typical poor responses were generic and centred around the impact on the global environment.

Question 13

The majority of learners gained between 1 and 3 marks for this question, with answers associated with collection/reuse and improving energy efficiency seen most frequently. Learners that gained full marks for this question gave a contextualised and specific response that considered what a skateboard manufacturer could actually do with waste heat, such as 'The waste heat could be converted into useful energy which can be used to heat the factory and some water so they don't use as much electric. The heat could also be used in the manufacturing process to assist in the drying processes of skateboard lamination. Numerous learners provided responses that were associated with waste heat but unrealistic given the context, for example 'The waste heat will be used to generate steam which will turn a turbine and power all the manufacturing processes' or 'waste heat could be used to melt the aluminium for the sand casting process'. Weaker responses often stated 'Saving money' or 'Lowering costs' with no link to the use of waste heat, or were more applicable to the advantages to the global environment, such as 'Using waste heat means you can lower CO²'.

Question 14

Although the standard of response was mixed overall, the majority of learners attempted this final question, which was pleasing, and most gained some credit for their answer (generally between 1 and 4 marks). The latter questions in each section are written to challenge the most able learners; nevertheless, some excellent responses were seen, with several learners providing answers that were very specific to the question in hand, such as 'Just in time techniques are used to make sure the right amount of trucks

and wheels arrive at the right place when they are needed, so typically the manufacturer can give a supplier a set period of notice as to what they will need. This is useful as it reduces the amount of old materials used in production and means a manufacturer won't need to store materials for the skateboard. It also means that if there is a problem anywhere it needs to be sorted out quickly, because otherwise production can grind to a halt and one of the main reasons for going just in time is so that you can make more skateboards when there is a big demand. It should be noted that the 'quality of written response' is taken into account for this question, and therefore accurate spelling, punctuation and grammar were required for the highest marks (please refer to the mark scheme for further details). Some learners still insist on producing responses in bullet form which limits access to the higher marks.

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>

