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Principal Examiner Feedback

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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', 'quicker' and 'cheaper', 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 A and 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 centres have again taken on board information from previous series' examiners reports as there was further improvement in candidates' abilities to respond to 'describe', 'explain' or 'discuss' without using bullet points. Centres continue to build on teaching appropriate examination skills and techniques.

Section A

Question 1

The majority of candidates correctly identified the products belonging to the engineering fabrication sector in part (a) and part (b); however, a minority chose the response 'Production plan' for part (b), which was incorrect (the correct responses being 'Manhole cover' and 'Tin snips').

Question 2

Candidates had the opportunity to use their knowledge and understanding to correctly identify and describe some tools and equipment this year. A minority of candidates were able to identify both in part (a) however: most candidates only identified the first tool which was the 'centre punch'. The second (tap wrench) was often referred to as a 'tap' or 'die holder', which were clearly incorrect. It was very pleasing to see candidates able to describe the uses of both pieces of equipment 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 'ceramics' 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 bicycle hand pump, as the

subject for the question. In part (b), there was a considerable improvement in performance. Most candidates were able to correctly identify a material used in the chosen product. Typical responses included 'aluminium' and 'stainless steel'. Likewise, this allowed candidates to access the full range of marks for the benefits of using these materials for the consumer. Typical responses for aluminium included 'a lightweight material allowing the product to be carried easily'; and for stainless steel: 'corrosion resistant so the product is suitable for outdoors'. Part (c) was also answered reasonably well. Candidates who had been taught about smart materials were clearly able to respond well and access full marks. Typical materials chosen were Shape Memory Alloys and Polymorph.

Question 5

Part (a)(i) was generally answered well. Most candidates provided responses centred around researching and communicating with others, such as 'The internet is a way of finding out information and communicating with people around the world, by using email' (for 3 marks). The majority of candidates also scored well for part (a)(ii), with many responses focusing on the possible loss of important information due to hacking/viruses. Part (b)(i) was also answered well by most candidates, with 'Mobile phone' and 'Video conferencing' being the most popular responses; when a correct answer was given for (b)(i), the response for (b)(ii) normally gained 2 marks, for example [when 'Video conferencing' was given as a correct answer in (b)(i)] 'They don't have to waste time and money on travelling, as they can see and talk to them on a screen'.

Question 6

Part (a)(i) was not answered well by most candidates, as many responses were generic. For example, 'To manufacture parts' without any specific link as to how robots might be used during the stated activity. Consequently, part (a)(ii) also proved difficult for most candidates, with few gaining more than 2 marks (from the 4 marks available). When candidates did gain more than 2 marks, their responses normally focused on issues associated with set-up, training, maintenance and downtime. Several candidates provided a response based on reduced employment opportunities, which cannot be considered a disadvantage of using robotics for a manufacturer. Responses to (b) were also generally poor, and it was clear that many candidates did not have appropriate knowledge of the main features of a CIM system, but rather stated advantages of using the system. When candidates did gain marks (from the 4 available) their responses normally focused on linking together aspects of a manufacturing system and monitoring processes.

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 candidates; 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, but some good answers (for 4 marks) were seen, such as 'Production planning can be used to let the supplier know what materials are needed along with expected delivery times and so they can plan stock levels so they don't run out but don't buy too much. This helps the manufacturer and the supplier as they both know what is required in

plenty of time and can organise material delivery and make sure they have stayed in budget'. Less able candidates often just described the stages of production planning and materials supply and control in a discrete fashion. Part (b) prompted a strong response from a good number of candidates, with several gaining 2 marks for an answer such as 'It has made information on sales better as the manufacturer can get instant feedback. This means that they can see how many products will be needed and find out how much profit they will make from each type of product, so they can advertise them that are profitable'. Incorrect answers were often generic and lacking a link to marketing and selling products, such as 'To quickly find out what you need too'.

Section B – based upon the 'mass produced bicycle hand pump' 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 bicycle hand pump. Most candidates were able to effectively explain, using notes and sketches, the function of the 'adapter', 'handle' and 'piston'. 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)(i), the majority of candidates were able to correctly add the missing main stages in the flow chart ('Marketing' and 'Processing and production') for 2 marks. Responses that could not be rewarded often stated 'Quality control', or sometimes the incorrect stages were entered. For (a)(ii), almost all candidates correctly named the stage as 'Assembly and Finishing' (or appropriate variations thereof). Part (b) was generally well answered too, with many candidates gaining at least 2 marks. Responses normally centred on producing ideas, using CAD or modelling. Where candidates gained lower marks, it was due to repetition in their answers, for example 'Designing the handle of the pump' and 'Designing the body of the pump'. It was pleasing to note that answers for part (c) were often contextualised, focusing specifically on what would happen at the packaging and dispatch stage when manufacturing bicycle hand pump packaging; responses associated with bar coding, wrapping, boxing and transportation were evident and correct. Poor responses often described the stage with minimum detail, such as 'packing the product and dispatching it'.

Question 10

Part (a)(i) proved quite challenging for most candidates and reward was given to the candidates that recognised a non-ferrous metal such as 'brass' or 'aluminium' was preferred to that of steel due to the non-corrosive properties and ease of manufacture. Part (b)(i) produced a better response than last series with popular correct answers such as 'injection moulding', 'extrusion' and 'drilling'. For part (b)(ii), those candidates that had studied the pre-release material were able to offer detailed responses in relation to why CNC machining is a suitable process used during the manufacture of the threaded insert. Popular answers centred on 'the production of

consistent quality products and minimal waste production'. Part (c) was answered well by candidates, with most gaining 2 to 3 marks. The majority of responses centred on 'thermoplastic materials being easily shaped through injection moulding and the product being lightweight with aesthetically pleasing surface'. Again it was pleasing to note that answers were often contextualised, focusing specifically on materials that are used for the bicycle hand pump.

Question 11

Many candidates answered part (a)(i) by stating types of control technology rather than their use during the assembly and finishing stage, such as 'Robots' or 'Conveyors', and gained no marks as a result. Those candidates that did gain a mark normally referenced checking activities, for example 'Automatic quality checks of the finished bike pump'. Answers for (a)(ii) generally gained between 1 and 3 marks, with appropriate responses such as 'Conveyors are used to move the finished product to be packed' (for 2 marks) and 'Using robots to do assembly operations for the hand pump' (for another 2 marks); weaker responses to this question sometimes referred to 'CNC machining' or 'CAD', which were both incorrect responses. Part (b) generated a very mixed response, with candidates being awarded the full range of marks; in addition, a lot of repetition was seen in the answers to this question. Good responses stated three different benefits to the manufacturer of using computer controlled production, with an extension to each describing why they are benefits, for example 'faster production rates as machines are able to work 24/7' (for 2 marks) or 'less waste produced as the production processes are carefully controlled' (another 2 marks). In contrast, poor quality responses were highly generic, for example, 'It's quicker'/'It's easier' with no extension, and were often repeated later in part (b).

Question 12

Part (a)(i) resulted in a range of responses that were quite poor, and it was clear that most of the candidates were unfamiliar with the term 'lean manufacturing'. When candidates did gain a mark, the response was normally associated with reducing waste, such as 'Using less energy when making products'. Very few candidates mentioned anything associated with responsiveness, flexibility or the removal of non-value adding activities. This had an impact on the marks that candidates gained for the rest of Question 12, especially (a)(ii) and (b)(ii). 12(a)(ii) was poorly answered by most candidates as it was not applied to the distributor but rather to the manufacturer. Many of the responses gained for part (b) of this question were generic responses related to parts of the specification with respect to the workforce, the working environment and the global environment, and not necessarily directly linked to the impact of lean manufacturing.

Question 13

The majority of candidates gained between 1 and 2 marks for this question, with answers associated with 'recycling/re-using materials' and 'less waste going to landfill'. Candidates that gained full marks for this question gave a contextualised and specific response that considered how a bicycle pump manufacturer could process materials sustainably, such as 'sourcing of local

materials and using alternative forms of energy during the manufacturing processes’.

Question 14

Although the standard of response was mixed overall, the majority of candidates 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 candidates; nevertheless, some excellent responses were seen, with several candidates providing answers that were very specific to the question in hand, such as ‘products are made more accurately as the product consistency is high as there is less human error as there is better control of the process. Everything can be checked or monitored which means there is less waste. Also automation doesn’t get tired unlike humans who need a break. This all means the customer will be happier as they are getting a product that meets their specification’. 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. Some candidates still insist on producing responses in bullet form, which limits access to the higher marks.

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