

Examiner's Report/
Principal Examiner Feedback

Summer 2017

Pearson Edexcel GCSE in
Engineering/Manufacturing (5EM03)
Paper 3D: Engineering Fabrication

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General Comments

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

Lower ability learners are still giving responses to questions such as 'accurate', 'quicker' and 'cheaper' which gained limited marks. Some learners continue to misread or misinterpret questions and therefore did not gain marks. The more demanding questions, especially at the end of Section A and Section B, were difficult for some learners; however, there continues to be an improvement in the quality of most responses.

The majority of learners 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 learners 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 learners correctly identified the products belonging to the engineering fabrication sector in part (a) and part (b); however a minority chose the response 'Soldering iron' for part (a) and 'CCTV' for part (b) which were incorrect (the correct responses being 'Door handle' and 'Machine vice' for part (a) and 'Tank cutter' and 'Piano hinge' for part (b)).

Question (2)

Learners had the opportunity to use their knowledge and understanding to correctly identify and describe some tools and components this year. A minority of learners were able to identify both in part (a) however; most learners only identified the second component which was the 'spur gear'. The first (Socket Head Screw) was often referred to as a 'bolt' which was incorrect. Part (b) of this question also proved quite challenging. The first image clearly showed a 3 Ring Spanner that could be used to tighten or loosening nuts or bolts. Whilst many learners were able identify this use, many failed to expand on this by mentioning, for instance, references to mechanical advantage of using such a tool and therefore did not achieve the second mark. The Drill Bit was more accessible to learners and both marks were often awarded for responses such as 'used to create holes in materials' and 'drill bits come in a range of sizes to produce different size holes'.

Question (3)

A straightforward and generally well answered question. However a number of learners thought that 'Smart wire' was linked to 'Information and communications 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 learners had not responded with the excluded product, the bicycle bike stand, as the subject for the question. In the second part of part (a), there was a considerable improvement in performance.

Most learners were able to correctly identify two finishing processes used in the chosen product. Typical responses included 'dip coating' and 'painting'. Likewise, this allowed learners to access the full range of marks for the description of the finishing process. Typical responses for dip coating included 'The product is heated up and dipped into a polymer powder and allowed to cool to harden' and painting, 'paint is applied to the surface of the material which dries to form a protective coat'. Some learners failed to read the question correctly and simply gave the benefits of the finishing process and not a description. Part (b) was also answered reasonably well. Learners who had been taught about examples of quality control techniques were clearly able to respond well and access full marks. Typical types of quality control techniques included 'visual checks' and 'functional checks' with appropriate extensions such as 'to ensure there is no damage to the product' and 'to make sure the product operates as it should' respectively.

Question (5)

Part (a) was generally answered well. Most learners provided responses such as 'to improve product consistency' and 'to improve product accuracy' (for 2 marks). The majority of learners also scored well for part (b), with many responses focusing on the initial cost of CAM equipment and the need to train staff to use it. Part (c) proved to be a little more challenging and it was clear that most learners did not have an understanding of the functions/benefits of PLCs. Where learners did score some marks there were responses relating to the ability of PLCs to give continuous operations and the control of manufacturing devices. Some learners left this question blank which was surprising as this had been tested in previous series.

Question (6)

Part (a) (i) was answered well by the majority of learners. Typical responses included mobile phones, emails and video conferencing. Part (a) (ii) was also answered very well again learners were able to gain both marks for describing the term Wi-Fi. Typical responses focused on a wireless connection to the Internet or a method of connecting devices to allow ease of communication. Part (b) proved far more challenging. The majority of learners did not score well here and gave generic responses about speed and accuracy of manufacturing. Where learners had been taught about embedded computers, they scored marks with responses relating to them being 'a dedicated computer system to perform specific functions' and 'functions can be easily changed to suit manufacturing needs when required'.

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) was generally well answered by most learners. There was a popular 3 mark response such as 'Target market could be established through the use of questionnaires or surveys allowing instant feedback'. Less able learners often just described the benefits of using CAD to design products rather than information and data handling systems. Part (b) also produced some good responses for the explanation that information and data handling systems have for production planning. Most responses centred around the use of databases and spreadsheets to access stock records to match orders and reduce material shortages.

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

Question (8)

The paper continued to create a greater opportunity for all learners 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 bike stand. Most learners were able to effectively explain, using notes and sketches, the function of the 'clamp', 'maintenance tray' and 'footplate'. Some learners are still producing notes only and this does not allow them access to full marks for each part of Question 8.

Question (9)

For part (a) (i), the majority of learners were able to correctly add the missing main stages in the flow chart ('Production' and 'Assembly and finishing' 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 learners correctly named the stage as 'Design'. Part (b) was generally well answered too, with many learners gaining at least 2 marks. Responses normally centred on product advertising and product promotion along with establishing product costs. 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 bike stands; responses associated with boxing or securely wrapping parts of the bike stand, labelling of these parts and planning delivery routes.

Question (10)

Part (a) (i) proved accessible for most learners and reward was given to the learners that recognised a metal such as 'Aluminium' or 'Steel'. Some learners misread the question and gave a polymer such as 'ABS' instead of a metal. Part (b) (i) produced a better response than last series with popular correct answers such as 'extrusion', 'casting' and 'drilling'. For part (b)(ii), those learners that had studied the pre-release material were able to offer detailed responses in relation to why injection moulding is a suitable process used during the manufacture of the footplate of the bike stand. Popular answers centred on 'the

production of consistent quality products and minimal waste production'. Part (c) was answered well by learners, with most gaining 2 to 3 marks. The majority of responses centred on 'improved properties meaning products will last longer' and 'improved manufacturing processes leading to reduce costs'. Again it was pleasing to note that answers were often contextualised, focusing specifically on materials that are used for the bike stand.

Question (11)

Many learners gained 2 marks for part (a) with obvious but correct responses such as 'the use of systems to control production processes'.

Part (b) (i) proved to be a quite accessible. The majority of learners gained 4 marks on this question, for answers that focused on three examples of automation used during the production stage. There were typical responses such as conveyor systems to move parts to the next processes and 'use of robots to put parts together during production' or 'the use of PLCs to control production processes'.

In part (b) (ii), most learners gained at least 2 marks, with responses such as 'the purchase of this new equipment will mean high capital costs' and 'the cost of maintenance will increase as they require specialist engineers to maintain them'. Some learners misread the question and gave advantages which were incorrect.

In part (b) (iii), the majority of learners scored well. It is clear that learners know the benefits of applying automation to the consumer as answers focused on product consistency and faster delivery times. Occasionally, learners gave benefits for the manufacturer such as 'reduced number of staff' which was incorrect.

Question (12)

Part (a) (i) was answered very well by the majority of the learners. Typical correct responses for this question included 'healthier environment' and 'removing workers from hazardous places'. Similarly, part (a) (ii) was also answered well; most learners gained 3 or 4 marks with responses such as 'less production of waste as production is carefully controlled' (for 2 marks) and 'modern machines allow for continuous operation meaning faster production times' (for another 2 marks). For part (b), the majority of learners scored well here with responses that centred around 'use of alternate energy sources to reduce the use of finite resources' and 'sourcing of local material therefore less transportation reducing use of fossil fuels and less emissions'.

Question (13)

Learner responses to this question generally gained 2 to 3 marks. Popular answers focused around responses such as 'using search facilities on databases to allow sourcing and ordering of materials' or 'real time stocktaking to reduce waste in the system'. Some learners again focused on the use of CAD which would not be appropriate at the materials supply and control stage.

Question (14)

The standard of response was similar to the previous series. The majority of learners attempted this final question, which was pleasing, and most gained

credit for their answer (generally between 2 and 6 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 that related to monitoring and controlling energy consumption, such as 'companies use lighting systems that switch on or off when not in use and often these devices are low energy. Some companies generate their own energy sources from solar power to wind power. There is also smart devices are being used to monitor how much energy is being used on certain machines'. 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 learners still insist on producing responses in bullet form which limits access to the higher marks but the majority of responses indicated that learners are being shown appropriate techniques to answer this question.

Grade Boundaries

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

