GCE

Rewarding Learning

Chief Examiner's and Principal Moderator's Report

Technology and Design

Summer Series 2018

Foreword

This booklet outlines the performance of candidates in all aspects of CCEA's General Certificate of Education (GCE) in Technology and Design for this series.

CCEA hopes that the Chief Examiner's and/or Principal Moderator's report(s) will be viewed as a helpful and constructive medium to further support teachers and the learning process.

This booklet forms part of the suite of support materials for the specification. Further materials are available from the specification's microsite on our website at www.ccea.org.uk.

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GCE TECHNOLOGY AND DESIGN

Chief Examiner's Report

Assessment Unit AS 1 Core Paper

This was the second examination for the revised specification in Technology and Design. All questions in the examination paper proved accessible with no evidence of any questions eliciting a low response rate from candidates. A full range of marks were awarded and there was no evidence that the paper was too long for the time allocated.

In response to specific questions the following comments are relevant.

Q1 This question was answered generally well. Some candidates were not aware that the terms referred to in the question both relate to how well electricity and/or heat are conducted through a material, not just the fact that they are conducted. When selecting an application for the two terms candidates should specify specific products where it is clear that the property is required.

Q2 This question assessed knowledge of PET and PVC. Most candidates were aware of the properties and applications for PVC. A number of candidates appeared to be unaware of the properties and applications for PET.

Q3 This question was answered correctly by a large number of candidates, however some provided generic responses to the properties of beech and mahogany. In some cases, candidates were unable to distinguish between properties and working characteristics.

Q4 This question, dealing with injection moulding, was well answered by the majority of candidates.

Q5 In response to Part (a) of this question a number of candidates failed to provide a full statement distinguishing between thermochromic and photochromic materials. To obtain full marks the fact that colour change in both materials is brought about by a change in temperature and lighting for thermochromic and photochromic materials respectively had to be included in the response.

Responses to Part (b) displayed a lack of knowledge of graphene on the part of a significant number of candidates.

Q6 In response to this question a number of candidates referred to the advantages of using CAD as a design in general. The question asked for different ways in which virtual imaging and rapid prototyping assisted in the design and development of a product of choice. The best responses outlined in specific terms how these two forms of CAD assisted in the process and provided clear examples of their use.

Q7 There was a variable response to this question. In Part (a) candidates were asked to provide a solution which could be attached to the legs of the warning triangle but some provided answers which re-designed the legs themselves. Some also failed to appreciate that the solution requested had to be lightweight. In response to Part (b) some candidates did not provide an appropriate means of attaching the proposed design to the acrylic section of the warning triangle. It is important that candidates read the question carefully and provide a response which meets all of the specific requirements of the task set. Some candidates provide sketches which simply show their proposed solution from a different perspective rather than provide further detail of their response.

Assessment Unit AS 1 Paper 2

Option A Electronic and Microelectronic Control Systems

Q1 **(a)** This question was answered poorly by the majority of candidates. Only a small number realised that despite the reed switches being connected in parallel that the logical function produced was in fact AND.

(b) This question was answered well by a large number of candidates. It was important for candidates to realise that the closing of the door should close the reed switch.

(c) A surprising number of candidates were unable to provide the correct response to this question.

(d) This question was generally well answered. A number of candidates made reference to current rather than voltage.

(e) This question was well answered with a variety of means of resetting the circuit being acceptable. Some candidates failed to label their solution.

(f) This question was generally well answered.

(g) This question was well answered in a large number of cases although some candidates did not include a resistor in series with the capacitor.

(h) This question was well answered.

Q2 **(a)** Parts (i) and (ii) of this question were well answered. Some candidates found the calculation in Part (iii) challenging. Candidates are to be encouraged to set out their work in questions of this type in a clear manner so that credit can be awarded in those cases where a numerical error has resulted in an incorrect answer.

(b) This question dealing with operational amplifier was generally well answered. In response to Part (iii) the best answers gave a clear description of the output voltage in terms on the two input voltages.

(c) This question centred on mostly on logic functions and was well answered by a large number of candidates. Candidates must learn the truth table for each logic function named in the specification in order to be successful in this type of question. In response to Part (iv) and in order to be awarded both marks a detailed description of the use of a Darlington pair was required.

Option B Mechanical and Pneumatic Control Systems

Q3 **(a)** This question was answered correctly by almost all candidates.

(b) This question was not well answered by a significant number of candidates who were unable to draw the pneumatic symbol required. A number of candidates provided the internal configuration of the valve with arrows pointing in the wrong direction.

(c) This question required candidates to design a system in response to a specified problem. A number of possible solutions were awarded credit but in some cases candidates provided unrealistic proposals or left the question unanswered. Some candidates attempted to provide a purely pneumatic solution to the problem and failed to realise that the integration of mechanical and pneumatics was the best option.

(d) Surprisingly this question was not well answered by a significant number of candidates.

(e) This question was generally well answered. Candidates were asked in the question to clearly show their working out to enable method marks to be awarded where possible. Candidates are encouraged to follow this request.

(f) This question was generally well answered.

Q4 **(a)** This question was well answered by the majority of candidates.

(b) A large number of candidates provided the correct answer to this question however, a number appear unable to complete this type of basic calculation.

(c) This question provided a higher level of challenge than Part (b) as evidenced by the number of incorrect responses.

(d) This question dealing with a moments calculation was not well answered by a significant number of candidates.

(e) **(i)** This question was well answered by the majority of candidates. Part (ii) of this question required candidates to provide a pneumatic based solution to a set problem. Most candidates provided an appropriate solution but a surprising number could not provide the logic function required from the three valves.

Option C Product Design

Q5 This question was based on a car steering wheel tray.

(a) The response to the opening part of Question 5 (a) was very good with the vast majority of candidates able to explain what is meant by a survey.

(b) Part (b) was not so well answered. Some candidates seemed to 'mix up' the characteristics associated with a patent with those of trademarks. In addition, a number of candidates failed to provide a second meaningful characteristic associated with trademarks.

(c) Part (c) generated a mixed response from candidates. Some were able to provide two suitable characteristics associated with attribute analysis but a number of candidates seemed to be outlining characteristics associated with lateral thinking or thought showers.

(d) Part (d) was reasonably well answered. Candidates need to be reminded in questions of this nature that the response needs to be specific, in this case to British Standards, in order for candidates to be awarded full marks.

(e) Part (e) focused on the process of die cutting. This generated a very poor response from candidates. In fact in a number of cases candidates simple left the space blank with no attempt being made. From the candidates that did respond, it was very clear from the annotated sketch and in the explanation that they had a very limited understanding of the process.

(f) Part (f) was the final part to this question and was based on two 4 mark design tasks. In a number of cases candidates produced very small drawings and did not fully utilise the space provided on pages 17 and 18. Candidates need to be reminded that detailed annotated sketches are required to be able to access the top marks in these design based questions. In Part (i) many candidates could have benefited from including more detail to explain and show how a hinge arrangement would work, how it would facilitate storage and how it would be connected to each half of the tray. In Part (ii) many candidates did not include enough detail on how their design would enable the user to secure a paper napkin or in fact how their design would be connected to the front of the tray.

Q6 This question was based on a small selection of hand tools.

(a) Part (a) generated a disappointing response. Many candidates did not seem to understand the limitations of an engineering specification. As a result, in many cases the information provided was very vague or in some instances not related.

(b) Part (b) focused on the benefits of using 3D computer simulation for the hand tools. This part generated a mixed response. Many candidates provided two benefits but not all the benefits would have been derived from 3D computer simulation. In a number of situations, the benefits were more associated with the use of a CAD package rather than computer simulation.

(c) Part (c) was divided into two parts. Part (i) focused on the characteristics associated with concurrent engineering. This part generated a mixed response. Candidates who were familiar with concurrent engineering seemed to have little difficulty with providing two associated characteristics, whilst some candidates simply left the space blank. In Part (ii) many candidates were able to provide a main benefit to the company of adopting concurrent engineering.

(d) Part (d) focused on the characteristics associated with a flow process chart. Overall this was well answered with many candidates able to provide two main characteristics associated with a flow process chart. In a small number of cases candidates provided two characteristics which were very similar.

(e) Part (e) was divided into two parts. Part (i) focused on the purpose of quality control. This part overall generated a good response. A number of candidates however, explained what quality control was rather than outlining its purpose. Part (ii) focused on outlining two specific quality control checks which was well answered by candidates.

(f) Part (f) was well answered. Many candidates were able to provide two reasons why the company may want to use glass reinforced plastic for the handle of the tools. In a small number of cases candidates were very limited in their response, providing a one word answer for each, which did limit the marks they were awarded.

(g) Part (g) focused on formative and summative evaluation techniques. This part generated a mixed response. Many candidates were able to outline what summative evaluation techniques involved but a number had difficulty with formative and consequently this limited the marks they were awarded.

(h) Part (h) was the final part to this question and was based on one 4 mark design task for a handle. The response to the handle generated a wide range of design solutions but many lacked the detail and clarity to enable examiners to award full marks. Candidates in a number of cases had a button or switch on the external surface of the handle but did not sketch or annotate how it would release or engage the tool.

On a final note both the response to Question 5 (f) and Question 6 (h) could be improved upon if candidates ensured that they provided more appropriate detail, more clearly thought out realistic solutions and that they ensured that the sketches they produced clearly communicated their intended response.

Principal Moderator's Report

Assessment Unit AS 2 Coursework: Product Development

Overview

This is now the second year of the revised specification and centres have adhered to the use of moderation materials, procedures for assessment and administration. The majority of centres have also made full use of Candidate Record Sheets to justify through annotation the marks awarded per section. I would like to thank centres for the warm welcome and professionalism extended to the visiting moderation team during the assessment window.

The number and scale of adjustments are indicative of revised specifications' infancy. Centres are encouraged to make use of Agreement Trials, support events and visits throughout the academic year.

Support events, visits and Agreement Trials continue to provide invaluable CPD opportunities, assisting teachers in becoming familiar with appropriate product selection and standards within this revised specification. Attendance at Agreement Trials annually is of paramount importance and presents teachers with the valuable opportunity to review the work of candidates first hand, in an effort to support continued communication of standards and approaches to the delivery of this unit.

The method for submitting marks has now moved to the online moderation platform.

Investigation and Analysis

The content and nature of this section is largely evidenced across centres, with most building upon experiences in the legacy specification to enhance and meet requirements of the revised specification. Centres should continue to emphasise the importance of clearly identifying the product for re-design/development and justify the key areas for improvement.

In most cases products selected for analysis were appropriate; linked to similar products and referenced appropriately. Similar products are considered to be products which fulfil the same purpose.

Sustainability of design, and consideration for this in existing products has been evidenced by the majority of centres, with only a minority failing to recognise this significant change from legacy specification. Where this was completed to a high standard, moderators reported high level analysis beyond simply referring to recycling, giving consideration to dematerialisation, multi functionality, transportation and packaging requirements.

It is important that candidates use their analysis to inform the decisions made for product re-design/development in a manner that will be reflected in the forthcoming sections of design, development and making.

Re-Design Solutions and Development

Quality of design specification writing is still of concern. The best examples saw candidates draw upon their analysis and areas for re-design to produce a wide range of quantifiable/measurable/specific points, but unfortunately this was found to be in the minority of centres. The key points should be mindful of the chosen areas for development and completed to GCE level which, in turn should be reflected in the re-design and development of their chosen product. This is an area for improvement that centres should act upon

immediately.

As mentioned before, choice of product is imperative if the candidate is to explore a range of innovative re-design solutions leading to appropriate developments and ultimately the manufactured product. The best examples demonstrated innovative and sustainable design in a meaningful pathway that illustrated high quality design sequencing using a clear pathway to the final re-design solution. In many cases candidates are still producing "Idea 1, 2, 3 etc." before arriving at a final solution. This invariably inhibits the ability of candidates to explore and develop a range of re-designs in cyclical manner in the spirit of this revised specification. In a number of cases, work was presented that had little or no resemblance to the original product, appearing as a complete design and make task, and should be discouraged in centres.

Candidates displayed a range of graphic and CAD communication skills, with the best examples containing a range of how to effectively communicate the re-design and development process. A significant number of candidates are now making use of a key code for annotation which appears to help in the use of technical vocabulary and should be encouraged as an example of good practice. A number of centres also made good use of physical modelling materials with candidates displaying meaningful developments based upon their findings. In the minority of cases, modelling was used to great effect in the testing of mechanisms or moving parts with subsequent changes illustrated and discussed in the portfolio. To access top band marks candidates should be encouraged to think about the aspects they are developing and what they can learn from good quality modelling. This should be evidenced throughout the re-design and development section.

A number of centres are still awarding top marks for overly loquacious re-design and development sections. This should be discouraged in order to improve upon the cyclical nature of good quality product re-design.

In most cases the quality of working drawings and plans for manufacture presented have improved to included specific materials with realistic dimensions. This is to be encouraged with appropriate justification given to modifications that occurred during manufacture.

Making

Quality, innovative thinking and the arrival of an appropriately re-designed product should, inherently lead to a high-quality product manufacture. This should clearly reflect the innovative design nature of the revised specification. Candidates should reflect the non-linear nature of design by including changes or difficulties they had to overcome during the manufacture of their product re-design. Storyboards should be discouraged in favour of a more reflective approach based around the production plan whereby the candidate can record changes against their original plan.

Evidence of laser-cutting and 3D printing was found in the majority of centres with some evidence of traditional hand skills also on display. In a number of centres top band marks were awarded based upon the number of processes included, despite poor quality finishing and/or a lack of consideration for ergonomic, aesthetic and functional characteristics. Again, choice of product for re-design was crucial to the potential success of candidates in this section. Centres should remember that a high-quality outcome cannot be achieved whereby the final representation fails to be an improvement on the original design or lacks in quality of finish.

Centres are reminded that candidates should complete manufacture within their own school or college and attention is drawn to section '7.2 Setting the tasks' of the specification:

'Teachers should give guidance in the planning and realisation of each internal assessment task to ensure that:

- tasks do not contravene Health and Safety at Work legislation; and

- the candidate's school or college can facilitate the design and realisation of the task.'

Care should be taken to ensure candidates do not complete work for which they cannot receive credit.

Testing and Evaluation

High level thinking and meaningful evaluation are invariably linked to the quality of specification produced. In the majority of cases this often led to superficial comments based loosely on generic testing, which failed to contemplate the key aspects of the re-design, as set out in section one. Future modifications often appeared as an 'add-on' in order to fulfil the requirements of the subject specification. More consideration, based upon measurable/ quantifiable testing, should be given to improvements that the candidates would make as a result of their findings. This would support the deeper thinking required at GCE level when evaluating empirically the final product. Best examples of this were found in a minority of centres where the candidates included detailed sketches and/or CAD drawings to illustrate their thoughts, linking these directly to the findings of their evaluation exercises.

This section concludes candidates work and is an opportunity for them to demonstrate knowledge and understanding of key technical aspects to their re-design product. Often this section appears hurried which results in a poor standard of work that is not indicative of the subject specification at GCE level. A simple reflection, based upon an ambiguous design specification was frequently observed by visiting moderators, a practice which should be immediately addressed in centre if candidates are to achieve top mark band in this section.

Chief Examiner's Report

Assessment Unit A2 1 Systems and Control or Product Design

This was the first series where candidates were expected to answer questions in the space provided on the examination paper. Overall candidates seemed to cope very well with this change in format. Most candidates attempted all of the questions within their chosen option, indicating that the paper was of an appropriate length. The standard of the candidate's answers in general ranged from weak to excellent.

Option A Electronic and Microelectronic Control Systems

Q1 **(a)** Question 1 (a) was based on a voltage divider consisting of a thermistor and fixed resistor.

(i) Part (a)(i) required candidates to explain the relationship between the resistance of the thermistor and the output voltage of the voltage divider. Most candidates attained full marks for this part of the question.

(ii) For Part (a)(ii) most candidates correctly sketched a curved graph on the axes. However, many of the curves were not the correct general shape and so were awarded only 1 mark.

(iii) Part 1 (a)(iii) required a basic voltage divider calculation to be performed and a pleasing number of responses achieved full marks.

(iv) For Part (a)(iv) candidates were asked to state one main advantage of replacing the fixed resistor in the voltage divider with a variable type. In general the answers referred to altering the sensitivity or threshold of the divider circuit. Candidates who stated that the variable resistor changed

the resistance of the thermistor were not awarded a mark.

(b) **(i)** Part (b)(i) was answered well by the majority of candidates but many responses did not show any method or working out. Candidates should be encouraged to show how they arrived at their answer as they may be awarded a mark for a partially correct calculation.

(ii) Part (b)(ii) of this question required candidates to explain with the aid of a an annotated circuit diagram a means of generating a 10 Hertz clock pulse. The majority of candidates either suggested a 555 astable or a PIC based circuit. Where an astable circuit was suggested candidates were expected to indicate how the frequency is achieved (calculations were not required) Where a PIC based circuit was suggested an appropriate flow chart was expected.

(c) Question 1 (c) was based on a 7 segment decoder and display. The question was divided into four parts.

(i) For Part (i) candidates were asked to complete a logic truth table for the displayed numeral '5' and the majority of candidates successfully completed this.

(ii) For Part (ii) candidates were required to explain what is meant by the term 'common cathode.' Responses to this question were generally weak with many candidates unable to articulate an explanation worth 2 marks.

(iii) For Part (iii) candidates were asked to calculate the value for a protective resistor. The main errors in the responses to this question related to the calculation of the voltage across the resistor. Candidates were awarded partial marks for method.

(iv) Part (iv) of this question related to power dissipated in one segment of the display. In general this question was well answered but many candidates did not obtain the correct unit of milliwatts.

(d) For the extended writing question, Part (d), 9 marks were awarded for a well-structured discussion of the main safety issues associated with the production and testing of electronic system in a school context. Most candidates did write sufficient text to a good standard of spelling punctuation and grammar. However marks were not awarded where candidates referred to general workshop safety hazards that did not relate specifically to the production of electronic systems. Candidates should be advised not to use bullet points when answering questions where the quality of written communication is being assessed.

(e) In Question 1 (e) candidates were asked to design a PIC based control system to allow a user to set and display a temperature. Additionally the system was required to operate a refrigerator pump to maintain the selected temperature. Many candidates produced practical and accurate circuit diagrams. The most common error was in the design of an appropriate multipole input switch and the design of a driver circuit for the coolant pump. There were some excellent flow charts presented which made good use of decisions and appropriate sub routines. Some candidates adopted 'parallel programming' and providing the flow charts achieved the specified outcome they were awarded full marks.

Q2 **(a)** **(i)** Question 2 (a) featured a reflective optical switch with Part (i) requiring candidates to draw the circuit symbols for the emitter and receiver for this type of switch. Most candidates produced accurate symbols.

(ii) Part 2 (a)(ii) produced some good explanations of the one main advantage of using infrared light in optical switches. A significant number of

responses referred to the 'efficiency' or 'effectiveness' of infrared light without appropriate explanation.

(iii) Part 2 (a)(iii) was well answered with a pleasing number of circuit diagrams showing how a logic high voltage could be produced using an optical switch. Only candidates who clearly indicated where the logic voltage would be connected were awarded full marks.

(b) (i) Question 2 (b)(i) required candidates to complete a truth table for a wind direction system. This was well answered with the majority of candidates achieved full marks.

(ii) In Part 2 (b)(ii) written logic expressions for the North and South directions were required and in general these were correct.

(iii) Part (iii) of this question seemed to cause difficulty for some candidates as many did not use correct gate symbols or were unable to draw a single circuit as requested.

(c) (i) Question 2 (c)(i) was focused on a PIC based solution for the wind direction system where they were asked to explain an advantage of using a PIC instead of a logic gate based circuit. Responses that focused on the programming advantages of a PIC were not awarded any marks as this was not relevant to the application. The main advantage was the reduction in number of chips required to fulfil the logic function.

(ii) Part (ii) assessed candidates ability to design a flow chart using the minimum number of commands to control 4 LEDs used for the wind direction system. This question was well answered by the majority of candidates. The most common mistakes were the omission of the time delay and the failure to turn off one LED before turning on another.

(d) Question 2 (d) was based on the use of Gray Code for an encoded disk.

(i) For Part (i) candidates were asked to state the advantage of Gray code. Many candidates described the main feature of Gray code rather than the advantage and so were unable to access the mark for this question.

(ii) Part (ii) required an incomplete encoded disk to be completed by shading appropriate segments. There were 4 marks available and marks were awarded for partially correct responses.

(e) (i) Part (e) was a design question where candidates were firstly asked to calculate the resistance of a strain gauge for Part (i) and then design a system based on an op amp to display wind speed. The calculation was completed successfully by the majority of candidates and a number of the circuit designs were successfully completed and awarded full marks. Where candidates had incorrectly calculated the strain gauge resistance for Part (i) they were not disadvantaged by bringing this calculation forward in order to determine the values for the resistors used in the differential op amp. A number of responses lacked accuracy in drawing connections for power supplies for the op amp and bar array driver. Again marks were awarded for partially correct responses.

Option B Mechanical and Pneumatic Control Systems

Q3 (a) (i) Question 3 was based on the theme of a mobile crane. Part (a)(i) was generally well answered with many candidates correctly outlining two main

procedures used to minimise risks associated with pneumatic systems.

(ii) Similarly for Part (a)(ii) the majority of responses were awarded 3 marks for calculating the vertical height the load was lifted.

(iii) By contrast Question (a)(iii) was not well answered. While most candidates seemed able to calculate the power required they were unable to correctly apply a 25% loss to the calculation.

(iv) Part (iv) of this question was generally well answered with the majority of candidates correctly calculating the output torque from the transmission shaft.

(b) **(i)** Part (b)(i) required an annotated sketch of a ball and socket joint. Most candidates gained at least 2 out of the 3 available marks, however, a number of candidates sketched transmission couplings rather than joints.

(ii) Part (ii) required an annotated sketch of a Garter seal with an explanation of why it would be selected in preference to an O-ring seal for the drive shaft of a gearbox. While there were some excellent sketches of Garter seals the explanations for choice were generally weak.

(c) Part (c) required candidates to complete a cylinder sequential circuit. As in previous examinations this question produced excellent responses with many candidates attaining between 8 and 11 marks. The most common errors were in relation to the 2 Start valves (which were to be momentarily operated) and the resetting of the group changeover. As in previous examinations many candidates are now labelling the air supplies to each of the 3 port valves rather than drawing the piping to these valves. This practice is to be commended as it greatly reduces the time needed to complete the question.

(d) **(i)** Part (d)(i) was the first extended design question and required candidates to design an electro-pneumatic/mechanical solution to enable activation of robotic grip arms. Most candidates were able to complete the electro-pneumatic element of the design but few candidates were able to successfully utilise an appropriate linkage to move the grips through the specified angles.

(e) **(ii)** For Part (e)(ii) another pneumatic/mechanical design was required to operate a platform. Again the pneumatic element was generally better attempted than the mechanical part. A number of candidates did not attempt to draw any solution to the mechanical part. Where the designs were conceptually feasible they were awarded a proportion of the available marks

Q4 **(a)** **(i)** Most candidates were able to correctly compare the forces and speed of pneumatic systems to the forces and speed of hydraulic systems.

(ii) Part (a) (ii) was well answered with most candidates correctly explaining the main purpose of a vacuum lifting cup and providing a suitable application. Some candidates tended to focus on a description of how vacuum cups worked rather the purpose.

(iii) For Part (a)(iii) an annotated sketch for a diaphragm clutch was required. There were a number of excellent responses with the key parts clearly annotated however a significant number of responses lacked the detail required for full marks.

(iv) Part (a)(iv) was an air consumption calculation where candidates were required to use the data provided to determine the air consumption for the

negative stroke of a double acting cylinder. Many candidates attained full marks and marks were awarded for partially correct answers or answers where a correct method was attempted. Most candidates clearly laid out their method so marks could be allocated for each stage of the calculation.

(v) The work done calculation for Part (a)(v) was well executed by most candidates with some candidates adding 30% rather than subtracting.

(b) Part (b) required the construction of a cam profile on the pro forma provided. It should be noted that candidates were given free choice as to where to position the centre of the roller follower when constructing the profile. The responses to this question were generally very good with most candidates attaining either 5 or 6 marks. Some profiles were poorly drawn below the roller followers and a few candidates constructed the profile in clockwise rotation.

(c) Part (c) of Question 4 was used to assess the quality of written communication. Candidates were required to discuss three characteristics of drum brakes and two characteristics of disc brakes. The responses in general lacked accuracy in technical detail which meant that few candidates were awarded full marks. Many candidates described where the brakes were used rather than the specific characteristics.

While the question clearly stated that the answers should exclude references to cost a significant number of responses contained reference to cost.

(d) **(i)** Parts (d)(i) and (ii) were worth 6 marks and 5 marks respectively. Part (d)(i) produced very few appropriate mechanisms to maintain the parallel motion of the car park barrier. There were some overly complicated bearing arrangements suggested and some candidates did not attempt this question.

(ii) For Part (d)(ii) some candidates did not attempt to produce a solution, however, some basic ratchet and pawl designs linked to a rack and pinion attained full marks. Candidates are reminded that a full mark solution does not need to be extremely complicated.

Option C Product Design

Q5 **(a)** Question 5 was based on a shopping trolley. Part (a) was well answered with the majority of candidates able to provide a full explanation of what is meant by incremental products.

(b) Part (b) required candidates to explain what is meant by a life-cycle assessment. Overall this generated quite a good response. A number of candidates outlined the products life-cycle, introduction, growth, maturity and decline rather than addressing the environmental aspect associated with the life- cycle assessment.

(c) **(i)** Part (c) concentrated on sustainability. Part (c)(i) generated a disappointing response. A number of candidates seemed to ignore the responsibility aspect to the question. Some candidates just provided two main reasons for selecting a metal for the trolley frame.

(ii) Part (c)(ii) was answered quite well with many candidates referring to the environmental benefits to using recycled content when selecting a metal. A number of candidates found a difficulty in providing a third main reason why consideration should be given to the recycled content when selecting a metal.

(d) **(i)** Part (d)(i) was worth 2 marks. The response to this part of the question was quite disappointing. Many candidates did not describe how ICT could

be used to assist in the implementation of quality control but simply gave an example of a quality control check.

(ii) Part (d)(ii) was also worth 2 marks. This part generated an equally disappointing response. Many candidates seemed to be unsure of what quality assurance involves and consequently failed to describe how ICT could be used to assist in its implementation.

(e) **(i)** Part (e)(i) focused on two main benefits of 3D scanning. This generated a mixed response. It was clear from the scripts that some candidates had good knowledge of 3D scanning, whilst others had little or no knowledge of what 3D scanning involved.

(ii) Part (ii) was worth 4 marks and focused on the benefits of QRM. A number of candidates were able to provide one meaningful benefit of adopting QRM, but many failed to provide a second explanation of a suitable benefit which could be used to persuade the company to adopt this approach.

(f) Part (f) of Question 5 was used to assess the quality of written communication. Candidates were required to any three of the 6R's using practical examples. This question was generally well answered with most candidates scoring in the mid to top band marks. A number of candidates did not explain how each of their three chosen R's had been specifically incorporated into the design of their selected practical examples. In a small number of cases candidates did not provide enough information to assist them to move out of the bottom band of marks.

(g) Part (g) focusing on the design of a bracket to secure a scanner to the hand rail of a shopping trolley. This part provided a wide range of responses. A number of candidates are re-drawing parts that are not required (e.g. the trolley and the entire scanner) or drawing several views of the design from different angle without any more detail or information. As a final comment it should be noted that this part of the question accounts for 10 marks and appropriate time and effort should be afforded by all candidates to ensure sufficient detail is provided in their response.

Q6 **(a)** Question 6 focused on road safety cones. Part (a) the introductory part to this question, was generally well answered with the majority of candidates able to provide two main reasons why products are redesigned.

(b) Part (b) (i),(ii) and (iii) focused on the characteristics associated with market penetration, product development and diversification. Overall this generated quite a mixed response. Some candidates were able to provide one main characteristic associated with market penetration, product development and diversification. Many candidates did not provide a second correct characteristic associated with each.

(c) This part of the question was reasonably well answered with a number of candidates able to provide two main differences between the main characteristics of introduction and the main characteristics of growth. In some responses candidates failed to explain two main differences between Introduction and Growth but instead described the characteristics of each.

(d) Part (d)(i),(ii) and (iii) focused on pricing methods. This generated quite a mixed response from those candidates who simply left this question unanswered to those who provided a very detailed explanation of cost-plus, contribution pricing and perceived value pricing. A number of candidates did not clearly communicate their understanding of the main characteristics associated with contribution pricing.

(e) Part (e) Generated a good response with the majority of candidates able to

provide an explanation of how the environmental impact for two different products has been reduced by the influence of good design.

(f) Part (f) Generated a reasonable response. Whilst the majority of candidates were able to provide two specific examples not all were able to explain how the national government had influenced the design of products. In addition some candidates gave examples of initiatives that the national government has set up to reduce the impact on the environment.

(g) Part (g)(i) and (ii) generated a mixed response. Candidates showed a varying degree of understanding of the terms used in this question. The link between the product and the moral and social factors was often vague or in some cases unrelated.

(h) Part (h)(i) and (ii) Both parts provided a wide range of responses. Many candidates produced sketches which lacked the depth and quality required to gain top marks at A2.

(i) In Part (i) some candidates ignored the need for the design to ensure that the sign could not rotate when fixed in position.

(ii) In Part (ii) a number of candidates did not explain how their design took account of the need for large scale production. In addition many of the comments outlined for Question 5(g) apply to the responses made for Question 6 (h)(i) and (ii). Candidates should be reminded that the use of colour is not required. On a final note candidates should be instructed to only complete answers to both questions in either Section A, B or C.

Principal Moderator's Report

Assessment Unit A2 2 Coursework: Product System Design and Manufacture

Overview

Centres should be congratulated for their continued hard work through the correct procedures in the completion of paperwork according to set schedules. Most centres completed revised CRS forms to match the Revised Specification, but it is important to note that this practice should be continued going forward.

When completing CRS, centres and teachers are encouraged to make commentary on specific aspects of the candidates work for that aspect of their submission. Simple regurgitation of specification criteria does little to exemplify the justification for marks being awarded.

Internal standardisation is an integral part of the moderation process and should be applied consistently across each class and throughout the cohort. Centres are reminded that the standard expected, and assessment criteria are similar across both Product Design and System Design options.

The number and scale of adjustments are indicative of the revised specifications' infancy. The importance of selecting an appropriate problem with scope for innovative development cannot be underestimated. Centres are encouraged to make use of Agreement Trials, support events and visits throughout the academic year.

Support events, visits and Agreement Trials continue to provide invaluable CPD opportunities, assisting teachers in becoming familiar with appropriate product selection

and standards within this revised specification. Attendance at Agreement Trials annually is of paramount importance and presents teachers with the valuable opportunity to review the work of candidates first hand, in an effort to support continued communication of standards and approaches to the delivery of this unit.

Identifying a Problem, Client or User Needs and Design Specification

The importance of selecting an appropriate problem with sufficient scope for development and providing extensive opportunities for innovation must not be undervalued at this stage of the project work.

Problem identification analysis and design specification continue to be an area for improvement. Analysis should be critical and focused upon the information gained from client(s) illustrating the problem encountered and stipulate the candidate's intentions.

Design specifications continue to be an area that requires improvement. Measurable, quantifiable and relevant points that draw upon the analysis conducted will enable candidates to explore a range of innovative design solutions going forward. Detailed specification points will also inform the design and development process and allow for the thorough testing of a completed product.

Initial Ideas, Selection of Ideas for Development

Quality design thinking, and innovation must be evident throughout this section of work. Candidates should draw upon their analysis and specification to generate a rich array of potential design solutions. Too often this can be excessively annotated which is not in keeping with the assessment objectives. Best examples began with a large range of ideas, utilising graphic skills developed from AS, which could then be refined through development. In some cases, candidates explored a limited range of potential solutions in significant detail which invariably limited their ability to develop this further in the portfolio.

Candidates should be encouraged to evaluate their proposals as they progress through this section of work before coming to conclusions and deciding upon ideas that will be suitable for development. The selection of a proposed solution for development should be made explicit.

Development

In some cases, the design pathway can often be abandoned at this stage due to preconceived ideas and/or the over development of initial ideas. The Revised Specification rewards candidates who follow a design and development pathway. A premediated design proposal or outcome will inevitably limit innovation and ultimately limit the marks that can be awarded.

A range of modelling techniques should be evident throughout the development process, making use of CAD packages and physical models to afford candidates with the opportunity of making informed decisions. Modelling should be undertaken to test features of the system or product with suitable annotation provided. It is encouraging to see that large swathes of generic information about manufacturing techniques are becoming less frequent in candidate work. Centres are reminded that this adds nothing to development pathway and attracts zero credit.

Numerical analysis should be infused throughout this section. Some candidates choose to conduct this when the final proposal has been reached but to access the top mark band candidates must be encouraged to produced numeric analysis as part of the development pathway, formulating conclusions and making decisions based upon the evidence provided.

Planning for manufacture and working drawings continue to improve. The best examples

show clear consideration for each component part. Plans should be written in future tense. High band work continues to demonstrate high level planning with problems during manufacture addressed appropriately. Invariably plans will change due to manufacturing constraints or difficulties but these should be logged and diverge from the final development greatly. Centres are reminded that working drawings should contain realistic measurement data and contain sufficient information for third party manufacture.

Making

CAM continues to be a popular method of manufacture which enables candidates to realise some innovative and complex design solutions. Some candidates still appear to be driving the design process towards specific CAM process which can limit innovation at times. Centres should be more encouraging of alternatives to CAM processes which are already present in the school workshop.

Centres are reminded that work deemed to be worthy of the top mark band should be highly functional and should be capable of demonstrating this during moderation. Power and air supplies should be readily available for visiting moderators. Increasing the use of video excerpts have been included to demonstrate a working system which assists during the moderation process. Such videography should not be considered in lieu of a fully functioning product during moderation, but as a way to justify marks awarded, or as part of a product testing exercise.

Testing and Evaluation

Quality of work in this section is often reflective of the design specification. Candidates with relevant, measurable and quantifiable specifications often access the top mark band for evaluative exercises. Use of video evidence has become more widespread which aids in the justification of marks awarded. Centres should encourage this practice as it highlights how well the final outcome solves the client problem, but also assists candidates in the identification of further modifications.

Centres are encouraged to build upon AS work through the provision of adequate time and portfolio allocation to discuss further modifications. This should not be overly verbose, but should instead, contain an array of CAD, modelling and annotation which is based upon the results of tests.

Contact details

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