GCE

Rewarding Learning

Chief Examiner's and Principal Moderator's Report

Technology and Design

Summer Series 2019

Foreword

This booklet outlines the performance of candidates in all aspects of this specification for the Summer 2019 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 section on our website at www.ccea.org.uk.

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GCE TECHNOLOGY AND DESIGN

Chief Examiner's Report

Candidates taking this examination had to sit first the compulsory Design and Materials paper, followed by selecting and completing two questions from one of the three available options.

In Paper 1 (STE11), there were 586 candidates, in total, who sat this compulsory one-hour Design and Materials option. In Paper 2 there were 187 candidates who responded to the Electronic and Microelectronic Control Systems, 104 opted for the Mechanical and Pneumatic Control Systems, with the remaining 295 candidates choosing to respond to the Product Design. In the AS2: Coursework: Product Development, there were a total of 586 candidates who entered this unit.

Assessment Unit AS 1 Core Unit

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.

Q1 **(a)** A significant number of candidates failed to provide a clear explanation of the term design brief in response to this question. The most common error was providing details of a design specification rather than a design brief.

(b) This question was not answered well by a number of candidates, who were clearly unaware of the meaning of the term design development work, although this is referred to in the specification.

Q2 **(a)** This question was generally answered well although some candidates were not able to distinguish between properties and characteristics of pine.

(b) This question was answered well by a large number of candidates.

(c) In general, this question was answered well although a surprising number of candidates confused the purpose of stains and oils, as a finish on floor boards.

Q3 **(a)** The majority of candidates were able to state the difference between ferrous and non-ferrous metals.

(b) This question was generally well answered, although some candidates confused material properties with characteristics as in Question 2(a).

(c) This question was generally well answered.

Q4 **(a)** This part of the question was generally well answered.

(b) The standard of response to this question was surprisingly erratic with a significant number of candidates failing to provide a sufficiently detailed sketch of the rotational moulding process. The specification lists a number of processes, which candidates are expected to be aware of and teachers are to be encouraged to ensure that these are all covered in class.

Q5 **(a)** This question elicited a wide range of responses with some candidates clearly unaware of the nature of solid modelling.

(b) This question was well answered by a large number of candidates.

(c) This question was not well answered in a significant number of cases. In these instances, candidates failed to explain the integration of computers into the manufacturing process as a means of assisting with stock control.

Q6 This question was generally well answered. Candidates are aware of risks in the working environment and the methods used to minimise these. Some candidates provided examples of activities which might not have been universally regarded as being clearly machine-based or hand manufacturing processes. The best responses made this distinction in an unambiguous manner and provided a response showing a high level of spelling, punctuation and grammar.

Q7 **(a)** There was a variable response to this question. Some candidates provided responses which did not take sufficient notice of the requirement to use the minimal amount of materials. In general candidates did not provide a full explanation of why their proposed design would be considered as cost effective to produce. In some cases, batch production was provided as an explanation, without sufficient detail outlining why this was the case.

(b) This question was generally well answered, although some candidates, whilst having an appropriate solution in mind, did not provide a sufficiently detailed and annotated sketch which clearly communicated their idea. Some candidates mistakenly thought that the attachment had to be on the bracket proposed in response to Part (a).

Option A Electronic and Microelectronic Control Systems

All questions in the section of the 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.

Q1 **(a)** Both parts of this question required candidates to perform calculations on circuit theory involving resistance values and power dissipation. Both parts were answered well by a significant number of candidates. It was encouraging to see that almost all candidates showed the working out of their answers. This enabled markers to award marks for method in those case where the final answers were incorrect.

(b) This question required candidates to provide a logical solution to a problem in terms of a truth table and a logic circuit. Both parts were answered well although some candidates failed to draw the correct logic circuit for the logic conditions identified in Part (i). In those cases where the incorrect truth table was provided as a response carry forward marks were awarded for the subsequent logic circuit. A number of candidates drew logic circuits which would fulfil the requirements of the incorrect truth table, but which would have provided a logic 1 at the output for other combinations of inputs than those in the truth table. Part (iii) of this question involving the connection of a micro switch to a logic circuit was generally well answered although some candidates drew solutions which left the input 'floating' when un- connected.

(c) This question dealt with transistor current gain and the term Ic(max) and was well answered by a large number of candidates.

Q2 **(a)** Parts (i) and (ii) of this question were generally well answered. The calculation of the time constant in Part (iii) provided a challenge for some candidates either through a mis-calculation of the answer or the use of an incorrect formula for the time constant itself. Part (iv) was generally well answered.

(b) This question dealing with the 555 timer was generally well answered. However, in response to Part (i) a number of candidates were unable to clearly explain the purpose of the discharge pin on the 555 timer. A significant number of candidates were unable to complete Part (ii) correctly even though the connections required are for a standard application of the 555t timer. Part (iii)

was well answered but Part (iv) produced a wide range of responses for the waveform required. Part (v) dealing with safety issues and procedures was generally well answered.

Option B Mechanical and Pneumatic Control Systems

All questions in this section of the 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.

Q3 **(a)** This question was answered correctly by a large number of candidates.

(b) This question was generally well answered although a significant number of candidates did not annotate their response as required by the question.

(c) This question required candidates to design a system in response to a specified problem. The question was well answered in terms of the delay in time after valve A had been activated but a number of candidates did not include a component to enable speed control of the outstroke of the double acting cylinder.

(d) The majority of candidates were able to draw the logic required for B OR C OR D in response to this question. However, it was very noticeable that a large number of candidates were unable to draw a solution, which utilised the NOT function with valve E.

(e) This question required an annotated sketch and was generally well answered.

(f) This question was generally well answered by the majority of candidates.

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.

(c) This question provided a higher level of challenge than Part (b) and this was evident in the number of incorrect responses. In response to Parts (b) and (c) candidates are encouraged to set out their working of their answer, so that credit can be given in those cases where the method is correct, even though the final answer is incorrect.

(d) This question required candidates to design a suitable system to solve a mechanical/pneumatic problem. Candidates are to be congratulated on the variety of responses to the question, a large number of which provided a satisfactory solution to the problem. However, some candidates did provide overly elaborate solutions to the problem.

(e) This pneumatic design question was well answered by the majority of candidates.

Option C Product Design

All questions in this unit proved accessible and there was no evidence that the paper was too long for the time allocated. A full range of marks were awarded, and candidates seemed to utilise the space well for both questions, but a few candidates need to be reminded that they should only make a response to questions in this section.

Q5 Question 5 was based on a handlebar coffee cup holder. The response to this opening part of Question 5 was very good with the vast majority of candidates able to state two specific characteristics associated with thought showers.

(b) Part (b) was subdivided into two parts. In Part (i) a high percentage of candidates were able to state two specific properties associated with CFRP.

Some candidates provided properties associated with CFRP which were not particularly relevant for the holder. In a small number of cases candidates provided properties which were very vague. In Part (ii) most candidates correctly identified cost as a main reason why CFRP may not be a suitable material for the holder.

(c) Part (c) generated a very good response. The vast majority of candidates were able to provide a clear and correct distinction between employee and consumer safety.

(d) This part of Question 5 was generally well answered, although quite a few candidates were confused between mass production and continuous production. In a small number of cases some candidates were unable to provide a second characteristic associated with mass production.

(e) This question generated a mixed response. Some candidates were able to correctly outline three different characteristics associated with a registered design. A number of candidates however repeated a version of the same response in terms of the designer 'owning the design'. In a small number of responses candidates seemed to get a little confused with the characteristics associated with a patent whilst some provided vague statements.

(f) This part of the question generated a reasonably good response. The vast majority of candidates were able to explain what was meant by a product review. In a small number of cases candidates produced a limited explanation and consequently were awarded one mark.

(g) This final part to Question 5 was based on a six-mark design task. Many candidates did not clearly show how their design could be easily and quickly removed from the handlebars and many ignored the need for the annotated sketch to be an isometric. Candidates need to be reminded that a clearly annotated sketch is required to enable the examiners to understand the response and mark positively. In a small number of cases candidates produced designs which were not appropriate as a holder.

Q6 **(a)** This question generated a somewhat disappointing response. A large number of candidates outlined criteria which would have been relevant to a general design specification but not relevant to a manufacturing specification. In a small number of cases candidates did not provide an outline of a second specific criteria that a designer would need to include.

(b) This question also generated a disappointing response. Whilst virtually all candidates seemed to be aware of the process, few were able to adequately describe laser cutting with the use of a good quality annotated sketch. Candidates need to be made aware that a five mark question requires more than a very basic sketch with one or two few parts labelled.

(c) This part generated a good response. The vast majority of candidates were able to provide an outline of what is meant by a work order.

(d) Generated a mixed response. A good number of candidates were able to outline that the product must be correctly described on its packaging, but few were able to provide a second main requirement. Several candidates outlined general aspects of the Trades Description Act but did not reference them to the packaging of the gas lighter company.

(e) This question was divided into two parts with both parts generating a disappointing response. In Part (i) many candidates did not state the social change, which made it difficult for the examiners to follow the logic of the

response. In several cases candidates seemed to select a random product, which had very little influence either by social change or cultural change. In a small number of cases candidates seemed to think that they needed to discuss the gas lighter in terms of social and cultural change.

(f) This is the final part to this question and to the section. The vast majority of candidates were able to design a cover for the end of the lighter, but a number did not provide a means of preventing it from getting lost. In a number of cases the sketches for the designs were difficult to understand, which makes it difficult for the examiners to be positive when awarding marks.

On a final note, it would appear that candidates need to spend more time practicing these design-based questions to improve their design solutions and how to clearly communication their design thinking to the examining team, in order to improve the marks for this style of question.

Principal Moderator's Report

Assessment Unit AS 2 Coursework: Product Development

The revised specification has now been operating for three years with the majority of centres making good 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. The introduction of the eCRS has been relatively smooth with the majority of centres presenting correct material for the moderation process to be conducted. I would like to thank centres for the warm welcome and professionalism extended to the visiting moderation team during the assessment window.

Centres are encouraged to make use of agreement trials, support events and materials throughout the academic year.

Support materials 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.

Investigation and Analysis

Requirements of the subject specification in the nature and content of material required are largely being met across most centres. In examples, achieving top mark band scores, candidates were found to clearly identify an appropriate product for re-development with succinct discussion on areas for improvement.

In the majority of cases similar products selected were appropriate and referenced correctly. It is important that any material used for research is referenced accordingly in line with JCQ regulations. Similar products are considered to be products that fulfil the same purpose.

Moderators reported that where high level analysis occurred, the candidates conducted a thorough investigation using a range of key headings. When discussing sustainability, candidates who accessed the top mark bracket went beyond simply referring to the recycling potential of materials. In these cases, high level discussion of dematerialisation, functionality, transportation and packaging occurred.

It is important that candidates use their analysis to make informed decisions about the key aspects for re-design and development that will be reflected in further sections, and into the final product.

In some centres, moderators reported varying numbers of products being analysed by candidates. Centres are reminded that the specification requires a broad range of existing similar products, with the amplification considering FOUR to be a broad range.

Re-Design Solutions and Development

Moderators reported this section to be of concern when conducting a review of centre marking, with a significant number of centres awarding marks for work that did not meet the standards expected at this level.

The foundation of this section is based upon a detailed specification and in a large number of centres moderators reported that candidates still fail to produce a wide

range of quantifiable/measurable/specific points that will inform their re-design. Each specification point or area should be mindful of the analysis conducted and the key areas for improvement that the candidate has identified previously. In the best examples, candidates used the specification as a bridge to connect their research with informed product re-design and could utilise this to conduct thorough testing.

Moderators reported an increased use of modelling by the majority of candidates. In the best examples, candidates used this to inform design decisions, which were recorded in depth across the portfolio work. Unfortunately, some centres are justifying the awarding of top marks to candidates who have produced a number of physical models, but it is essential that these inform the development process and are fully reflected upon. In some cases, modelling is still limited to the production of various handle shapes to test ergonomic features, but the candidate fails to model or test other important features of their design developments.

CAD is used extensively with some excellent work reported by the moderation team. In the best examples, candidates used CAD to illustrate complex design decisions and link these effectively to CAM processes such as 3D printing or laser cutting. Candidates still rely heavily on CAD with its introduction early in the re-design process. Candidates achieving the top mark bracket should display a range of graphic communication skills, particularly at the beginning of this section, as this is a means to creatively convey initial thoughts speedily. Good, clear design graphics should be encouraged as these will benefit the candidate in this section but also aid in the preparation for design-based questions in the terminal examination.

Moderators have, again, reported that in a number of centres top marks are being awarded to work that is overly verbose and does not follow the cyclical nature of the design process. Centres are reminded that to achieve a mark in the top bracket candidates must demonstrate this cyclical approach in their re-design and development portfolio work.

Whilst working drawings continue to improve, there are still a number of concerns to report in this area, with some centres justifying top marks for work that does not include all key measurements or have unrealistic dimensions and/or a lack of detailed cutting list(s). Centres are reminded that third angle projection should be used for this work. In the best examples candidates included detailed justification for changes that resulted 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.

In a number of centres the moderator felt that they could not support the marks being awarded for work in this section due to a lack of creativity and innovation seemingly being curtailed in favour of simpler manufacturing techniques or limited time constraints.

Centres are reminded that to achieve the top mark band awarding in this section the candidate does not necessarily need to increase the number of process or materials, rather he/she, should be selecting these appropriately for the function and purpose of the final product. In some cases, moderators reported that centres had awarded higher marks for larger products despite a lack of innovative design or complex manufacture techniques being displayed.

In the best examples, candidates displayed a range of skills in the in the manufacture and finish of a product that was clearly influenced by the cyclical nature of the re-design and development process – innovative design was realised in the final manufactured outcome.

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

Quality of specification writing and a meaningful evaluative exercise on the final product are intrinsically linked. Moderators reported difficulty in agreeing with centre marks when specifications lacked quantifiable/measurable points as this often led to superficial comments in this section.

More consideration in this area would invariably lead to the deeper thinking required at this level when evaluating final products. Future modifications in a number of cases were found to be merely "bolt-on" parts in order to meet the requirements of the subject specification. In the best examples, candidates linked their findings during evaluative exercises with detailed drawings and CAD representations of changes they would make to support and justify commentaries.

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.

Candidates taking this examination had to select and complete two questions from one of the three available options. In this two hour paper (ATE11) there was 187 candidates who responded to the Electronic and Microelectronic Control Systems, 104 opted for the Mechanical and Pneumatic Control Systems and 295 candidates choosing to respond to the Product Design. In the A2 2: Coursework: Product Systems Design and Manufacture students had to complete one task, producing a practical outcome with a design folder. There were a total of 586 candidates who entered for this unit.

Chief Examiner's Report

Assessment Unit A2 1 Option A: Electronic and Microelectronic Control Systems

The majority of candidates attempted all of the questions within this option. The standard of the candidates' answers spanned the full range from very limited responses to excellent.

This was the second series where candidates were expected to answer questions in the space provided on the examination paper. In general candidates placed their responses in the spaces provided. We would ask centres to instruct candidates not to attach unused pro formas or blank answer booklets to their examination paper.

Q1 **(a)** Was based on a voltage divider consisting of an LDR and a variable resistor and Part (a)(i) required candidates to explain the relationship between the resistance of the LDR and change in light levels. Most candidates attained full marks for this question.

(a) **(ii)** Most candidates correctly sketched a curved graph on the axes however many of the curves were not drawn in the correct direction and so candidates were awarded only 1 mark. Part 1 (a)(iii) required a basic voltage divider calculation to be applied to an adjusted voltage divider. A good number of responses achieved full marks. Partial responses were awarded partial marks.

(b) **(i)** Was poorly answered by the majority of candidates as many responses did not accurately show the correct symbol for a Schmitt trigger. Schmitt triggers can be constructed using a variety of components, however, candidates who inserted the symbols for these alternative components did not attain the mark

(ii) Part (ii) of this question required candidates to explain the purpose of a Schmitt trigger. Most candidates simply stated an application for the trigger and were awarded partial marks.

(c) Was based on an environmental control system. The question was divided into two parts. For Part (i) candidates were asked to add lines and arrows to complete the diagram. The majority of candidates successfully completed this. For Part (ii) candidates were required to explain what is meant by the term 'open loop control' in the context of electronic control. Responses to this question were generally weak with many candidates unable to articulate an explanation worth 2 marks.

(d) **(i)** required candidates to complete a truth table for a hard-wired logic circuit. The majority of candidates achieved full marks for this part. For Part 1 (d)(ii) a Karnaugh map was required. In general, the maps were drawn accurately, however a significant number of candidates were unable to correctly group the expressions accurately and therefore arrived at incorrect minimized expressions. Part (iii) of this question was well answered by most candidates.

(e) For the extended writing part marks were awarded for a well-structured discussion of three specific issues to be considered when designing driver circuits for DC motors. Most candidates did write sufficient text with a good standard of spelling punctuation and grammar. However, marks were not awarded where candidates referred to general driver circuits. Candidates who made

comparisons between DC and stepper motors were unable to attain marks.

(f) Candidates were asked to design a PIC based control system to check the voltage from a temperature sensor and facilitate the control of two high voltage heaters. Additionally, the system was required to operate a status LED at a flash rate of 2 Hertz.

Most candidates produced practical and accurate circuit diagrams with the most common errors in the connection of relays and heaters. There were some excellent flow charts presented which made good use of decisions and appropriate sub routines. Many candidates were unable to successfully integrate the 30 second check loop with the status LED flash rate.

Q2 **(a)** Candidates were asked to show how a variable resistor could be connected to a power supply in order to obtain a variable voltage. Most candidates produced accurate circuit diagrams to achieve this.

(b) Centered on an amplifier connected to an LCD display. Part (i) required candidates to state one main advantage of an LCD compared to an LED type display. Few candidates offered a response worthy of a mark as they incorrectly stated that LED type displays cannot show letters and other characters. Centres are reminded that dot matrix LED displays are capable of showing a range of characters.

(ii) Required candidates to design a suitable non-inverting amplifier with appropriate resistor values for 5 marks. Some candidates were awarded full marks, but the majority of responses were awarded partial marks. The main errors were the omission of the dual power supply and the incorrect calculation of the resistor values.

(c) Was based on an industrial process with the question being divided into four parts. For Part (i) candidates were required to draw a practical arrangement for a slotted optical switch. This was answered very well by most candidates. For Part (ii) candidates were asked to complete a graph to show an output pulse form the slotted switch. Most candidates sketched a pulse that was too wide or sketched multiple pulses for one revolution. For Part (iii) most candidates produced accurate circuit diagram form the symbols provided. Partial marks were awarded for a pull up resistor if the candidate clearly indicated the output point on the circuit. Part (iv) produced some good responses however a significant number of answers referred to ambient light. Since there was no indication that the industrial process outlined was occurring in ambient light conditions no mark was awarded.

(d) was based on a Zener diode. For Part (i) candidates were asked to explain the principle of operation of the diode. Many candidates simply repeated the already stated fact that it can be used as a voltage regulator and so were unable to access the marks for this question. Part (ii) required a calculation of the value of a series resistor. This was correctly achieved by the majority of candidates.

(e) Consisted of two parts with Part (i) requiring candidates to draw a series of clock pulses with annotation. Most responses were well drawn but many candidates omitted the annotation to explain the term ‘negative edge triggered’. For Part (ii) candidates were asked to complete a circuit diagram for a system to display flowrate on a seven-segment display. In general this was well executed, however, full marks could only be awarded where the power supplies were correctly completed.

(f) Candidates were asked to design a PIC based system to control a driver and associated stepper motor. The circuit diagrams for this were generally accurate

and well-drawn. Some candidates opted to utilize SPST switches for the input selection. Full marks could not be awarded as the use of latched switches would not be a practical fulfilment the required specification. There were some excellent flow charts presented which made good use of decisions and sub routines, however, many candidates were unable to successfully return the stepper motor arm to the central position following activation.

Option B Mechanical and Pneumatic Control Systems

The majority of candidates attempted all of the questions within this option. The standard of the candidates' answers spanned the full range from very limited to excellent. This was the second series where candidates were expected to answer questions in the space provided on the examination paper and proformas. In general candidates placed their responses in the spaces provided and on the appropriate proformas. We would ask centres to instruct candidates not to attach unused proformas or blank answer booklets to their examination paper.

Q3 (a) (i) Was generally well answered with most candidates correctly outlining two main safety risks and associated procedures used to minimise the risk when using mechanical systems. Part (ii) required the construction of a performance/displacement diagram. The responses to this question were generally good with most candidates attaining either 2 or 3 marks. Some of the construction methods for the uniform acceleration and simple harmonic motion lacked the accuracy required.

(b) (i) Required the production of an annotated sketch of a CV joint. Most candidates gained at least 2 out of the 3 available marks, however, a number of candidates sketched universal joints or standard couplings. An additional 2 marks were available for an explanation of why a CV joint would be used in preference to a universal joint for a chosen application. Most candidates did not achieve the marks available.

(ii) Required candidates to describe the main function of a gasket. While there were some excellent descriptions, the majority of responses were too vague or generic to attain full marks. Part (iii) required candidates to explain the difference between simple and compound pulley systems. Most candidates correctly stated the key difference with reference to the number of pulley wheels on any given shaft.

(iv) Was a velocity ratio calculation where most candidates attained full marks. Where candidates used a correct method but made a computation error 1 mark was awarded. For Part (v) an efficiency calculation was required. A significant number of responses did not use appropriate values for the answer to this question.

(c) Was used to assess the quality of written communication. Candidates were required to discuss two main characteristics of a cone clutch and two main characteristics of a centrifugal clutch. Centres should advise candidates that where a candidate discusses subsidiary characteristics then marks cannot be awarded. The responses to this question in general lacked technical accuracy, which meant that few candidates were awarded full marks. Many candidates did not select appropriate applications for the justification of using a centrifugal clutch.

(d) Parts (i) and (ii) were stretch and challenge type questions with each being worth 5 marks. In Part (i) candidates produced a good range of appropriate mechanisms to lock an industrial trolley when a push bar is released. Most

responses, however, did not include the technical accuracy to attain 5 marks.

(ii) some candidates did not attempt to produce an appropriate lifting mechanism, however, most did correctly show the piping to the pneumatic valves.

Q4 **(a)** **(i)** A surprising number of candidates were unable to correctly outline the main difference between an open loop and a closed loop system. Many responses focused on manual intervention rather than the presence of feedback. In addition, candidates were asked to outline a specific application of a closed loop system. Most candidates provided generic or non-specific examples which could not be awarded the mark available.

(ii) Was well answered with most candidates correctly producing an annotated sketch of a lifting pulley system with a mechanical advantage of 3. Marks were awarded for partially correct responses.

(iii) For Part (iii) an annotated sketch, outlining the main features of a taper bearing 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. A specific application for a taper bearing was awarded 1 mark but again many candidates simply suggested generic applications.

(iv) Was an air consumption calculation where candidates were required to use the data provided to determine the air consumption 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) For Part (v) of this question candidates were required to calculate the required force for a single cylinder that could replace three identical cylinders. This question relied on the successful application of the data provided and many candidates attained full marks.

(b) In Part (i) of this question candidates were asked to explain the operation of differential air operated NOT valve. Very few candidates were able to attain the 2 marks available for this question.

(ii) For Part (ii) candidates were required to explain how speed control is achieved in both directions. Most responses to this question were correct and were awarded 2 marks.

(c) This question produced excellent responses with many candidates attaining between 8 and 10 marks. The most common errors were in relation to the location of the time delay and the piping of the group changeover valves. As in previous examinations many candidates are labeling the air supplies to each of the 3 port valves rather than drawing the piping to these valves. This practice is commended to centres as it greatly reduces time required for candidates to complete the piping diagrams.

(d) Parts(i) and (ii) were worth 6 marks and 4 marks respectively. Part (i) produced a small number of full mark responses. While the pneumatic circuit was well designed, very few candidates were able to produce appropriate mechanisms to move the cylinder to set angles. For Part (ii) A significant number of candidates did not attempt to produce a solution. However, some appropriate toggle clamp designs were noted although very few candidates produced an operational circuit to fulfil the requirements of the question.

Option C Product Design

The majority of candidates attempted both of the questions within this option. The standard of the candidates' answers spanned the full range from very limited to excellent. This was the second series where candidates were expected to answer questions in the space provided on the examination paper and proformas. In general candidates placed their responses in the spaces provided and on the appropriate proformas. We would ask centres to instruct candidates not to attach unused proformas or blank answer booklets to their examination paper.

Q5 **(a)** The response to this opening part of Question 5 was satisfactory with the majority of candidates distinguished between needs and demands but not in the context of describing the role of the markets.

(b) Was subdivided into two parts. In Part (i) a high percentage of candidates had a basic understanding of what is meant by an environmental audit. In Part (ii) the majority of candidates were able to give one viable reason why it would be beneficial for the company to have complied with an environmental audit.

(c) Generated a good response. Many candidates were able to provide a good explanation of how designers had specifically managed to reduce material use for two different product examples. In a small number of cases some candidates provided a very limited outline rather than an explanation.

(d) was subdivided into three parts and required candidates to provide two characteristics associated with fashion innovators, opinion leaders and laggards. The characteristics for all three types of consumers was generally well answered. A small number of candidates seemed to get mixed up between fashion innovators and opinion leaders.

(e) This question focused on the benefits of CAD, CAM and CNC. This generated a reasonably good response with many candidates able to provide three distinctive benefits for using CAD. A number of candidates seemed to be unsure of the difference between CAM and CNC and consequently tended to provide vague generic statements which covering both CAM and CNC. The quality of written communication for this question was overall quite good but some candidates need to ensure that there is a sufficient amount of text, in order for the quality of written communication to be assessed.

(f) Overall generated a good response. Many candidates were able to provide an explanation of an appropriate pricing strategy for the introductory stage and the decline for a named product of the candidate's choice. A few common concerns were that some candidates did not name a product or state the name of the pricing strategy that they were attempting to explain.

(g) generated a disappointing response. Many candidates failed to provide two specific characteristics which describe the influence of Apple in terms of product design but instead described products or features produced by apple that are common to many mobile phone manufacturers.

(h) This question generated a somewhat mixed response. Many candidates did not break down this question and ensure that their response fulfilled each statement. In addition, candidates should try to include additional annotated 2D and 3D sketches to help explain their design ideas to the examining team. In too many responses large amounts of text were included instead of detailed annotated sketches.

Q6 **(a)** This was generally well answered with candidates providing a clear

understanding of what innovation in the market is. A small number of candidates provided a very limited explanation.

(b) Whilst the majority of candidates had a basic understanding of environmentally friendly plastics, many of the answers were superficial. Some candidates did not provide properties that would make it suitable for packaging

(c) generated a very good response. In Part (i) the vast majority of candidates were able to provide a good explanation why basic products offer the longest life cycles. Part (ii) was equally well answered but a small number of candidates focused their response on the introduction stage rather than the characteristics which give rise to the shape of the graph for a fad product.

(d) This question was divided into two parts with both parts generating a reasonably good response. In Part (i) many candidates were able to provide two different ways in which product designers and manufacturers could influence the disposal of products.

Part(ii) was not as well answered as Part (i). Whilst a number of candidates did provide meaningful ways in which product designers can influence pollution control, a number of candidates re-worded their responses from Part (i).

(e) generated a mixed response. Some candidates provided clear benefits associated with a flexible manufacturing system, but many found it difficult to provide three main benefits. A number of candidates tended to repeat themselves by referring to a single benefit in a number of different ways.

(f) generated a mixed response. Either candidates scored full marks or zero marks in this question. It was evident in the responses that some centres had provided candidates with a clear understanding of how international and regional differences have influenced the design of products and this resulted in some very detailed, accurate responses. Unfortunately, other candidates were unsure and provided responses not worthy of credit.

(g) This part of the question was subdivided into two parts and generated quite a range of responses. In Part (i), many candidates were able to provide at least one clear advantage and one clear disadvantage associated with the use of sales promotion, however in a number of cases candidates' second advantage and disadvantage was very similar to their first and not distinctly different enough to warrant credit. In Part (ii) candidates responded quite well, although in some cases they did not give two clear advantages associated with the use of personal selling.

(h) This part of the question was also subdivided into two parts and generated quite a poor response. In Part (i) many candidates failed to identify an appropriate specific example and explain clearly how the use of new technology has impacted upon environmental concerns. Part (ii) was equally disappointing with many candidates unable to identify and explain an environmentally friendly manufacturing process and how this would impact upon environmental concerns.

(I) This question generated a somewhat similar response to Question 5(h). Many candidates did not unpack the requirements of both parts of this question and ensure that their response fulfilled each part. In Part (i) many candidates ignored the need to specify text size and style and justify their selection. In Part (ii), candidates need to include additional annotated 2D and 3D sketches to help explain their design concepts.

Principal Moderator's Report

Assessment Unit A2 2 Coursework: Product-system design and manufacture

Centres should be congratulated for their continued hard work through the correct procedures in the completion of paperwork according to set schedules. Changing to eCRS appeared to cause few administration issues, with moderators reporting that the vast majority of centres presented all appropriate material. Centres are also thanked for the warm welcome they have extended to the moderating team and demonstration of professionalism encountered during the moderation window.

When completing eCRS, 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 importance of selecting an appropriate problem with scope for innovative development cannot be underestimated.

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

In general, this section appears to be well embedded with a significant number of candidates achieving top mark band for their work. 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.

Analysis of existing products continues to be structured and conducted appropriately by the majority of candidates. Problem identification analysis and design specification continue to be an area for improvement.

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. The 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.

Moderators reported that some candidates presented a wide range of innovative ideas, housings and systems/sub-systems that were clearly focused upon the needs of their client. This is to be encouraged and where candidates demonstrate this high level thinking top band marks should be awarded. Unfortunately, in some cases, moderators reported on work that had received a mark in this band but did not illustrate innovative design and/or high-level system or sub-systems. Some portfolios still carry a heavy weighting of annotation which should be discouraged.

In product design portfolio work descriptions and diagrams of industrial processes, such as injection moulding, should be actively discouraged. In the same vein, systems folders should not merely describe components that could be used, but rather, should be discussing how the candidate will utilise that component to solve a problem or aspect of their problem.

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 explicit.

Development

Moderators, in a number of cases, are still finding it difficult to agree with centre marks that have been awarded in this section. The design pathway can often be abandoned at this stage due to preconceived ideas and/or the over development of initial ideas. Often the final design, housing design and/or system demonstrate a lack of development with the final solution appearing early in this section. 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. Use of CAD is actively encouraged across the majority of centres with some complex designs evident in a number of cases. Unfortunately, some moderators still report that, a number of candidates, are using the same CAD drawing repetitively rather than producing a number of parts or features that can be used to communicate functionality.

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 produce 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 not diverge from the final development. Centres are reminded that working drawings should contain realistic measurement data and contain sufficient information for third party manufacture.

Making

In a significant number of centres, where a moderator could not agree with centre marks it was the making section that often caused issues. It is important that each candidate carries through the innovation demonstrated in previous sections to produce a product that is highly functional and of A2 standard. In some cases centres had awarded work top mark band, when the system was not fully functional or product lacked innovation.

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. At A2 level it would be expected that work worthy of top marks should be finished to a high standard and contain several processes that demonstrate the candidates working knowledge of material properties.

Centres are reminded that work deemed to be worthy of the top mark band should be highly functional and should be capable of demonstration 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

This section is often hurried by the candidate due to time constraints and as a result can lack the detail required at this level. 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. In the best examples system improvements, as a result of the product testing, were considered in conjunction with potential housing modifications – this practice should be actively encouraged.

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