

GCE



Chief Examiner's and
Principal Moderator's Report
Digital Technology

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 DIGITAL TECHNOLOGY

Chief Examiner's Report

Introduction

It is important to stress, yet again, to centres that the GCE Digital Technology specification is more demanding than the specification it replaces, the GCE in Information and Communication Technology. This is reflected in the major shift in assessment objectives, with a reduced weighting of Assessment Objective 1 and an increased weighting of Assessment Objective 2. Furthermore, there is a substantial weighting of Assessment Objective 3, a level of assessment at which candidates were not previously assessed in depth. The GCE Digital Technology specification is more demanding in another key respect - the content has been comprehensively revised and includes both learning objectives and content of a more technical nature.

In this examination series, there was clear evidence that even more centres than previously had properly prepared their candidates for the new specification, and had taken on board the feedback in the previous Chief Examiner Reports and in the Exemplification of Standards materials, in particular with regard to the assessment of AO3. However, too many candidates still responded in the examination questions as if these were assessing the previous GCE ICT specification, with the result that the overall level of response again fell somewhat short of the expected standard in a number of respects.

The performance of candidates on individual questions on the three examination papers is described below but, as was stated in the last Chief Examiner Report, centres are urged to read previous Chief Examiner's Reports for GCE ICT which highlighted the two ongoing issues which are even more relevant for this GCE Digital Technology. As has been stressed before, many candidates have difficulty in addressing the exact question being asked. The second key point is that candidates must be familiar with Digital Technology terminology to properly understand the questions being posed, and they must use appropriate Digital Technology terminology in their responses.

Assessment Unit AS 1 Approaches to System Development

Q1 Most candidates had difficulty in Part (a) in explaining the two terms accurately and succinctly, although candidates achieved higher marks for explaining the term 'user interface' than for explaining the term 'process'. Some excellent responses were produced in Part (b)(i) but many candidates were completely unfamiliar with the term 'source code'. The overall level of response to Part (b)(ii) was good with many candidates accurately describing three other responsibilities of programmers. Common weaknesses included ignoring the fact that writing source code was part of the question stem, and that the question referred specifically to systems development which excludes software maintenance. It should be noted that 'producing systems documentation' is not the responsibility of a programmer, although programmers will be responsible for documenting code. The overall level of response to Part (c) was very good although a number of candidates focussed their responses on perceived advantages and/or disadvantages of each fact-funding method to no avail. In contrast, the overall level of response to Part (d) was very disappointing and few even partially correct DFDs were apparent. It must be stressed again that candidates must use the DFD notation described on page 41 of the specification, with the correct symbols for data sources/destinations, processes and data stores, and with all dataflows showing the direction with appropriate labels.

- Q2** Most candidates were familiar in Part (a) with the two stages in system development but many struggled to explain the purpose of each stage as was required. The overall level of response to Part (b) was very high although a worrying number of candidates were not familiar with the use of storyboarding in system design. Both Parts (c)(i) and (ii) produced a poor response as most candidates seemed to be unfamiliar with the concepts of suitability and usability of a computer system. The overall level of response to Part (c)(iii) was very good and most candidates could distinguish clearly between the two types of testing. The majority of candidates correctly identified and described adaptive maintenance in Part (d)(i). Although most candidates could identify two components of technical documentation in Part (ii), very few could identify how these will be used during the maintenance stage.
- Q3** Most candidates struggled to explain why RAD is an incremental approach in Part (a)(i). While some excellent responses were noted to Part (ii), suggesting that centres were applying the lessons learned from the previous series, the overall level of response was disappointing due to the fact that the majority of candidates failed to address the issue of user involvement for the two approaches to software development. Candidates were better at describing the waterfall model, with very few describing the Agile approach using the appropriate terminology. The question also assessed quality of written communication. To achieve the highest band candidates were required to describe both approaches clearly and concisely, and to compare them with respect to user involvement, using appropriate terminology with a high standard of presentation, spelling, punctuation and grammar. The same was true of Part (b). Candidates were required to describe how the company's data will be recovered. To do so, candidates were expected to first describe each method of backup clearly and succinctly, and then describe the subsequent recovery method. In general, many candidates could describe the backup methods but few candidates were familiar with the subsequent data recovery stage. As this question also assessed quality of written communication, to achieve the highest band candidates were required to describe the backup and recovery methods clearly and concisely, using appropriate terminology with a high standard of presentation, spelling, punctuation and grammar.
- Q4** The three questions in Part (a) split the candidature almost exactly in two. Candidates who were properly familiar with the process of translation could answer all three parts to a high standard, but for the remainder of candidates, translation remained an almost completely alien concept. The overall level of response to Part (b) was good, but many candidates struggled to describe the three data types accurately and succinctly. While most candidates were familiar with flowcharts in Part (c), many struggled to complete the flowchart as was required. Common mistakes included the failure to label the control paths correctly or at all, the inclusion of a process in the blank decision box, and the introduction of a loop. Candidates who produced the required changes to the flow chart generally achieved maximum marks in Part (d).
- Q5** There was clear evidence that many centres had taken on board the relevant feedback from previous papers and the overall level of response to Parts (a) and (c) was subsequently good. This was not the case in Part (b) where only a small number of candidates demonstrated that they had any practical knowledge of the basic object-oriented programming skills required. It is important to stress that the requirement in the specification for candidates to be familiar with basic object-oriented programming terminology, was a deliberate one to allow centres to introduce some practical activities when delivering this module.

Assessment Unit AS 2 Fundamentals of Digital Technology

- Q1** Most candidates were familiar with the calculation required in Part (a) and many excellent responses were apparent. It is important to stress that to achieve maximum marks in this type of question, candidates must provide basic annotation to accompany their calculations, for example by stating that 2 gigabytes equal 2048 bytes. Most candidates could perform the required calculations in Part (b). It should be stressed that candidates should be performing the conversion in an analogous manner to that implemented in hardware e.g. inversion and the addition of a 1 to the LSB. Most candidates could perform the required conversion in Part (c) but many ignored the fact that in the two's complement system a number is either positive or negative so the decimal equivalent must always be signed. In this case, the correct answer was +127, not 127. The overall level of response to Parts (d) and (e) mirrored the performance in the three previous parts. Many excellent responses were noted to Part (f), a clear indication that many centres were applying the lessons learned from the previous series. As this question also assessed quality of written communication, to achieve the highest band candidates were required to produce an accurate explanation of ASCII and Unicode and an evaluation, using appropriate terminology with a high standard of presentation, spelling, punctuation and grammar.
- Q2** The overall level of response to Part (a) was very good with most candidates referring to the shaded cell as was required, although candidates were generally less successful in explaining knowledge, generally as well as in the context of the given table. Most candidates could explain how verification can detect errors in Part (b)(i) but many struggled to produce a concise and accurate explanation of a transposition error in Part (ii). Phrases such as 'entered in the wrong order' or 'mixed up' are totally inappropriate at this level. Again, most candidates were familiar with the three data validation methods in Part (c) but many struggled to describe each without simply repeating the name of the validation method. The overall level of response to Part (d) was good but it was disappointing to see that a significant number of candidates could not perform this straightforward calculation, and the layout of the work of many candidate's left a lot to be desired.
- Q3** Most candidates struggled to properly describe the role of the critical hardware elements in Part (a). The widespread evidence of guessing was a matter of concern. The majority of candidates could name the three buses in Part (b) but very few could go on and describe them in appropriate detail. In Part (c), candidates were better at addressing the issue of speed with respect to cache memory, although many candidates referred incorrectly to the use of caching in Internet browsers. Only a small number of candidates were familiar with dual or quad core processors or RISC/CISC. While some excellent responses were noted to Part (d), suggesting that centres were applying the lessons learned from the previous series, the overall level of response was disappointing due to the fact that the majority of candidates failed to focus on the two types device specifically from the point of view of their use for data storage as was required. Consequently, many candidates provided inaccurate descriptions of both devices, frequently addressing irrelevant issues such as cost, and many responses lacked the relevant Digital Technology terminology. The question also assessed quality of written communication. To achieve the highest band candidates were required to describe both types of device clearly and concisely, and to compare each with respect to data storage, all the while using appropriate terminology with a high standard of presentation, spelling, punctuation and grammar.

- Q4** Most candidates could identify at least three suitable input devices in Part (a)(i) but candidates frequently failed to correctly identify the device. 'Scanners' and 'card readers' were commonly mentioned. In Part (ii), many candidates confused feedback with output and the overall level of response was disappointing. The overall level of response to Part (b) was also disappointing as many candidates were content to describe batch processing in detail without referring to its possible use for a payroll system or a stock control application as was required. While some excellent responses were noted to Part (c), further evidence that centres were applying the lessons learned from the previous series regarding the QWC questions, the overall level of response was poor. Candidates were required to describe the two file formats and to evaluate their suitability specifically for use with an image in a webpage. As this question also assessed quality of written communication, to achieve the highest band candidates were required to describe each format clearly and concisely, and to evaluate their use in a webpage, using appropriate terminology with a high standard of presentation, spelling, punctuation and grammar.
- Q5** In Part (a), many candidates found it difficult to explain the two web technology terms using appropriate Digital Technology terminology. Many were content to expand URL without explanation, or to describe the format of an IP address. The overall level of response to Part (b) was disappointing as the question exposed the fact that many candidates were unfamiliar with either organisation. As a result, only a small number of candidates could focus their responses on the different standards supported by the two organisations. The overall level of response to Part (c) was also disappointing as the question exposed the fact that many candidates were almost completely unfamiliar with HTML. It is important to stress that the requirement in the specification for candidates to be familiar with HTML, and CSS, was a deliberate one to allow centres to introduce some practical activities when delivering this module. In Part (d), candidates were required to examine the CSS contained in the HTML code and explain its purpose. Only a small number of candidates could do this accurately.

Assessment Unit A2 1 Information Systems

- Q1** In Part (a), candidates were most familiar with the use of a network card, less familiar with the use of a wireless access point, and even less familiar with the use of a MAC address. It is important to note that the question concerned how each of the three resources is used in a network, a point completely ignored or missed by a significant number of candidates who limited their responses to describing the main features of each resource. The overall standard of response to Part (b) was good and some excellent accurate and concise answers were provided. Centres should note, however, that a statement such as ‘a MAN covers an area larger than a LAN but smaller than a WAN’ may be useful in providing candidates with a very general view of the scale of these networks during delivery of the topic, but it does not adequately demonstrate in an examination that a candidate can distinguish between a LAN and a WAN and will not be given credit. Rather, candidates are expected to be more explicit in describing the scale of each network, as well as referring to a difference in the technology used. The overall standard of response to Part (c) was very good and some excellent accurate and concise descriptions were provided. While some excellent responses were noted to Part (d), suggesting that some centres were applying the lessons learned from the previous series, the overall level of response was disappointing due to the fact that the majority of candidates failed to focus on the two types of network topology specifically from the point of view of data security as was required. Consequently, many candidates provided inaccurate descriptions of both topologies, frequently addressing irrelevant issues such as the impact of cable failure or the addition of new nodes, and many responses lacked the relevant DT terminology. The question also assessed quality of written communication. To achieve the highest band candidates were required to describe both topologies clearly and concisely, and to evaluate each with respect to data security, all the while using appropriate terminology with a high standard of presentation, spelling, punctuation and grammar. The overall standard of response to Part (e) was very good – most candidates could identify at least three OSI model layers. The overall standard of response to Part (f) was very poor because most candidates failed to compare both transmission media from the point of view of bandwidth. Few candidates understood the term bandwidth. Many candidates produced weak descriptions of each media, accompanied by their supposed advantages and/or disadvantages.
- Q2** The general standard of ER diagram produced for Part (a) was very good and many completely accurate diagrams were produced. However, it must be stressed again that candidates must use the notation described on page 42 of the specification. The majority of candidates could perform most, if not all, of the normalisation required in Part (b), but the number of candidates who produced completely inaccurate attempts, or who did not attempt the normalisation at all, was a cause for concern. Centres are reminded that, following the practice established in the previous specifications, to be awarded credit each entity must be given an appropriate name, all its attributes must be listed, and the key field(s) clearly identified using the # symbol or by underlining. In this case, as was the case last year, candidates were expected to recognise and explicitly state that the data was already in 3NF. The overall level of response to Part (c) was good and most candidates could identify at least four elements contained in a typical data dictionary. At this level, candidates are expected to be able to produce accurate and concise definitions or explanations of common DT terms but the overall level of response to Part (d) was poor as most candidates struggled to explain these two fundamental database terms. This weakness was also apparent in Part (e) although candidates were more comfortable with the term entity than the term referential integrity. Many centres produced candidates well versed in the use of SQL and these candidates scored very highly in Parts (f) and (g). However, SQL appeared

to a complete mystery to the remaining candidates and much guessing was apparent. It is important to stress that the requirement in the specification for candidates to be able to use SQL was a deliberate one to allow centres to introduce practical activities when delivering this module.

- Q3** Accurate and concise explanations of artificial intelligence were infrequent in Part (a), but the responses to Part (b) were generally good and the majority of candidates demonstrated appropriately familiarity with the Turing test. The overall standard of response in Part (c) was disappointing. While many candidates were familiar with heuristics, the required detail was frequently missing, and the general understanding of the work of the knowledge engineer was disappointing. While some excellent responses were noted to Part (d), again suggesting that some centres were applying the lessons learned from the previous series, the overall level of response was poor. Many candidates did focus their response on this specific use of an expert system to achieve the lower bands, but most candidates failed to properly evaluate this specific application. Many responses identifying advantages and/or disadvantages of expert systems in general, many of these debatable, were noted. As this question also assessed quality of written communication, to achieve the highest band candidates were required to describe this application clearly and concisely, and to evaluate it, using appropriate terminology with a high standard of presentation, spelling, punctuation and grammar. The overall level of response in Part (e) was good as most candidates did focus on the use of robots to spray paint cars. It is important to note, however, that a worrying number of responses were utterly trivial referring to robots not needing a break/rest/holiday or not requiring payment.
- Q4** The overall level of response to Part (a) was good and many accurate explanations were given. A common error was the use of the phrase 'large sets of data' instead of the correct phrase 'large data sets'. Part (b) was intended as a discriminating question and so it proved to be. The threats arise from the scale of data mining, anonymous by its very nature but most candidates referred to the illegal or unintended use of confidential banking details. The overall level of response to Part (c) was good but a common weakness was an inability to use the terminology used in the Act. Loose paraphrasing is not acceptable at this level, and candidates are expected to refer explicitly to personal data rather than data. The overall level of response to Part (d) was disappointing. The specification requires candidates to understand how legislation such as the Data Protection Act impacts an organisation and this question required them to discuss its consequences for a bank - practical considerations were required. The majority of candidates simply regurgitated provisions of the Act. The overall level of response to Part (e) was also disappointing. Email is one of the cloud computing services identified in the specification and candidates were required to express two advantages using appropriate cloud computing terminology. Most candidates failed to do so.
- Q5** The overall level of response to Part (a) was uneven. Surprisingly, few candidates could clearly articulate how parity bits can detect a transmission error, and it was clear that very few candidates were aware that the choice of odd parity or even parity is a protocol issue, not an arbitrary decision by 'the user'. In fact, throughout this entire question there was little evidence than candidates understood that these three methods are not the responsibility of 'the user'. Checksums and echo checking were better understood than parity bits even if many candidates made them the responsibility of humans. A general failing in Part (b) was that candidates ignored the phrase 'ensures that data is kept secure' and many general descriptions were given. Encryption was the most clearly understood of the three methods. Few candidates described https as a protocol. Very few candidates were familiar with the use of digital certificates.

Q6 The overall level of response to Part (a) was poor. In many respects this was not surprising as online censorship and automated decision making are two topics which did not feature in the previous ICT specifications. The question concerned the main ethical considerations of each, as reflected in the learning outcomes in the specification, and this proved difficult for many candidates. While some excellent responses were noted to Part (b), again suggesting that some centres were applying the lessons learned from the previous series regarding the QWC questions, the overall level of response was poor. Candidates were required to construct their responses around the Copyright, Designs and Patents Act – many failed to identify the correct Act, or any Act, those that did frequently used very loose paraphrasing when discussing its provisions – and then to evaluate the statement about copying software not being stealing. As this question also assessed quality of written communication, to achieve the highest band candidates were required to describe this legislation clearly and concisely, and to evaluate the statement, using appropriate terminology with a high standard of presentation, spelling, punctuation and grammar.

Principal Moderator's Report

Assessment Unit A2 2 Application Development

Overview

This was the second year where candidates carried out a problem solving exercise based on a pre-released Case Study. The Case Study used this year aimed at providing more scope for problem solving. The evidence of the solutions indicated that it worked as intended in that candidates focussed on a particular pathway. Some candidates focused on a member booking system while others focused on a product ordering and invoicing system. Centres should be encouraged to follow the guidance given in the specification which clearly states that this task is a 60-hour assignment and carries a 20% weighting of the A level award.

In terms of the application of the assessment criteria most centres applied the criteria accurately and awarded marks within the agreed standards set by the moderation team. Centres should note the reporting back of marking on the TAC 6 report is also useful in preparation for assessing the next cohort. In the TAC 6 some centres were advised to attend forthcoming Agreement Trials to assist with the application of the assessment criteria for the 2020 cohort. Apart from attending Agreement Trials, centres that are not marking to the agreed standards should be encouraged to submit sample work to the Portfolio Clinic in March 2020. The use of this clinic is proving to be a positive experience for centres in ensuring that the application of the assessment criteria is accurate in the summer series. Teachers should also be encouraged to add comments in the textboxes provided justifying the mark awarded to each assessment criteria.

Administration is excellent in the majority of centres with candidate solutions clearly labelled in electronic folders referenced by candidate number identifying the top and bottom candidates on their electronic submission. Centres should continue to submit two documents in each candidate folder - one should be the documentation whilst the other should be the database solution. Teacher annotation on candidate solutions continues to be helpful to the moderation team. Submission of password protected databases is not required and can often cause issues during moderation.

Analysis

Candidates who were able to clearly identify and document their user requirements produced high quality overall solutions. A few centres provided evidence of fact finding

such as using interviews and questionnaires. This is not a requirement for this task and does not form part of the assessment criteria. Instead, candidates should be encouraged to investigate similar type applications to City Sport, to help identify and produce a relevant set of user requirements. Candidates who only produced a limited number of requirements found it more difficult producing a detailed design of their solution. Gantt charts were of a high quality across many centres. A small number of candidates failed to add in timings to the Gantt charts making these charts meaningless. The Gantt chart should also assist candidates in distinguishing between essential and non-essential user requirements as it allows candidates time to reflect on what is possible over a 60-hour time period. The inclusion and appropriate use of data flow diagrams (DFD) at level 0 and level 1 also helped candidates to focus on the main processes required in the design stage.

Design

The inclusion of detailed storyboards and the use of other structured diagrams greatly assisted candidates in breaking the design of the solution into a number of manageable components, leading to a more detailed and coherent system specification. All centres used a relational database solution. It should be noted in future submissions that candidates need to fully explain each stage of database normalisation in terms of why they are using this technique and a running commentary on how the entities are forming as they are produced through the three stages of normalisation. Candidates should also include ER diagrams that match the outcomes of the normalised solution. It was pleasing to see well designed data structures with consideration given to data types and data validation. There was excellent evidence of both form and report design. Candidates are also using form driven interfaces including interactive buttons, whilst others are using the more conventional switchboard approach. Candidates need to include appropriate evidence in query design including the use of algorithms and reference to user requirements in the Analysis section. For candidates to achieve marks in the highest band, highly structured algorithms to illustrate relevant components of the design need to be included. Candidates need to ensure that the Testing plan created in this section clearly matches the user requirements identified. There were some excellent examples of detailed test plans linked to user requirements.

Application Development

It was pleasing to see evidence of excellent relational database solutions produced by many centres. The better candidates were able to produce a more effective solution when they focussed only on implementing the user requirements documented in the Analysis stage. Centres should also discourage candidates from implementing user requirements that were not planned such as queries and reports included that were not explicitly documented in the user requirements section. In the Implementation Strategy, candidates were able to select and justify the most appropriate changeover method for their solution. The majority of candidates were able to produce results of tests planned and annotate these accordingly alongside the plan. There was also clear evidence of corrective action taken as a result of testing in most centres.

Documentation and Evaluation

The standard of electronic user guides continues to be excellent in the majority of centres. Candidates included well presented user guides with appropriate detail, including a troubleshooting/FAQ's section. Evaluations were generally of high quality including detailed descriptions of what the solution achieved, together with evaluating each of the user requirements. Some candidates were able to refer to the phasing in of non-essential requirements over time and making reference to software maintenance after the system has been implemented.

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