OCR
RECOGNISING ACHIEVEMENT

GCE

Computing

Advanced GCE **A2 H447**

Advanced Subsidiary GCE **AS H047**

Examiners' Reports

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HX47/R/11

Oxford Cambridge and RSA Examinations

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This report on the Examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

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EXAMINERS' REPORTS

Chief Examiner Report

The session worked very well with candidates beginning to understand better what is expected of them in this qualification. This is an academic subject and there is a standard of understanding which the candidates need to demonstrate in order to be able to perform well in the assessments. The vast majority of candidates do demonstrate an appropriate level of understanding and some scripts and projects are a pleasure to mark or moderate. There are, however, a number of candidates who are entered at each session who are simply unprepared for the work that they are going to be required to do.

F451 Computer Fundamentals

General Comments

The paper proved accessible to all candidates giving a good range of marks. There were marks available to all candidates while still maintaining some challenging material for more able candidates. Each question elicited the full range of marks from at least some in the cohort, although the distribution of the marks from 0 to maximum was different according to the difficulty of the subject matter.

Some of the presentation was disappointing with some handwriting being almost unintelligible. Despite this the examining team believe they have been able to interpret all answers and give credit as appropriate to the knowledge demonstrated rather than to the presentation.

There was no evidence of any candidate having suffered from any time issues.

Comments on Individual Questions

Question 1

(a) **(i)** Well answered. The main problems were candidates who reworded the question along the lines of 'A device to input data' and those who ignored the computer completely.

(ii) The same comments apply here.

(b) Many candidates used inappropriate devices like a thermometer or a heat sensor. Others took the powers of the sensor further and ignored the need for a processor in favour of the sensor making the decisions and controlling the heating. Some ignored the word 'automatic' and decided to assume that the user would carry out the actions so that the results were to be output to a screen so that the user could see the temperature.

Question 2

(a) Most scored well here although there were a lot of cases of simplex/duplex being wrongly defined. Those that correctly identified the two types of data transmission often used the word 'data' instead of bit or byte or 'group of bits'. There were a few candidates who tried to describe packet and circuit switching.

(b) There were many reasonable responses to this question which was intended to be more difficult than others. The main problem was interpretation of the word application. Many assumed that this meant a word processor.

Question 3

(a) Well answered by most although there were still a disappointing number of candidates that insisted on a keyboard and mouse.

(b) A lot of networks with different types being suggested. This did not mean that the candidate lost access to all the marks as examiners went on to accept the justifications if it was apparent what communication media was being justified.

(c) HCIs have always caused candidates problems and this question was no exception. The menu based interface was actually well answered, but the forms based interface proved far more problematic with few candidates getting past the use of text boxes for data input.

Question 4

(a) Many candidates were unable to distinguish between the definition of a character set and the representation of the character set. Because of this the facts were stated in the wrong context leading to loss of marks.

(b) There is still some confusion between verification and validation though most candidates answered verification well. The difference between the two types of validation check was less well documented.

(c) This question discriminated across the range very well. There were two parts to each of archive and backing up. The first was an explanation of why it was important for the car insurance firm and the other was the need for a procedure which the firm could follow to carry them out. The reasons for carrying out the two procedures were generally well done but many did not distinguish between the two treating them in the same way.

Question 5

(a) Most candidates were able to score full marks here.
(b) There were some very good responses here though some candidates could not see further than viruses while others simply described the Data Protection Act.

Question 6

(a) Some very good answers. Unfortunately some looked no further than 'system life cycle' and based their whole response around testing and/or implementation.

(b) There are plenty of mark points available here, but most candidates got no further than saying that it was an attempt to show the stages in order.

(c) Few candidates were able to explain why evaluation is important to both sides of the original agreement, fewer still were able to suggest what the evaluation would consist of for each of the participants.

(d) Good coherent answers.

Question 7

(a) The purposes of these registers was not well described. The CIR was often attributed with executing instructions while the accumulator carried out all the arithmetic and the MDR was, from some candidates, suggested to hold everything in the processor. Examiners thought that this was a particularly poorly understood part of the paper and that most candidates were simply guessing according to the titles of the registers.

(b) Most candidates were able to name the buses but poorly expressed their uses. For example, the data bus was commonly thought to hold all the data for a program.

Question 8

(a) Well answered.

(b) There were a number of different interpretations of the meaning of the question but those who understood the need for a protocol scored well. This was one of the harder questions on the paper and it attracted a significant proportion of scripts offering no response.

(c) This question became a good discriminator with most being able to score 1 or 2 marks but very few attracting all 5 marks. This topic used to be very poorly answered by almost all candidates but the improvement in candidates' understanding must be testament to the effort that has been put into the teaching of the topic.

Question 9

(a) A good discriminator across the whole ability range with almost all candidates being able to score well on the multi-tasking probably because they are familiar through using it, while the multi-access proved far more challenging.

(b) Again, this question was made easier because file handling is something that all the candidates are used to doing. It was surprising that so few candidates were able to score well. The definition of a utility program was poorly expressed by many while there was a distinct laziness about the way that the answer to ii was expressed. Answers like 'store their files in files' were common.

F452 Programming Techniques and Logical Methods

General Comments

In this session some improvements have been noted in the quality of the candidates' responses to items which have been commented on previously and centres should be commended for taking note of the feedback we have provided to improve the preparation of their candidates for this examination. In particular, the omission rate of questions has gone down significantly suggesting, not only that candidates have enough time to complete the paper, but also that they have a more complete understanding of the specification and are prepared to attempt an answer than they have in the past. Also, the general quality of the responses to the longer questions – both the quality of written communication (1f) and especially the pseudocode algorithm (2g) – has improved and will, we hope, continue to improve.

The candidates' technical abilities and logic were very well tested in this paper, and it was pleasing to see many of them rise to the challenge. The main area for improvement across the board is in the candidates' abilities to express their answers in a technically accurate way. This reduces the quality of their explanation often resulting in the candidate losing marks. While candidates should practise in order to improve their skills, a simple way to ensure that they can provide standard definitions in a technically accurate manner is just to learn them. The comments on individual questions highlight particular cases where candidates who may otherwise have an adequate technical understanding may have failed to gain all the marks due to insufficient clarity.

Comments on Individual Questions:

Question 1

(a) As usual with questions on user interface design, this question was generally well answered. However, centres should note that although this is relatively easy, it is still a skill which candidates need to learn and that there are certain principles that they should know and apply. As the qualification matures, we would have expected more candidates to gain full marks on this question than actually did. Candidates should consider the particular application in the question when answering. For example, this question required candidates to design a user interface for a touch screen device and candidates needed to consider a suitable means of input for a touch screen. (This may require some annotation to explain how a touch screen is being used. Where possible, annotation should be around the design rather than on the interface itself). Also, few candidates considered issues such as the fact that identifying a type of ladybird should involve *naming* it as well as giving a description and the fact that there may be more than one result for a given set of input criteria. Weaker candidate failed to gain marks for even more basic considerations such as providing a title, using the space on the screen sensibly or providing a means to initiate the search after the input criteria are entered.

(b) Answers to this question were disappointing. A majority of candidates answered *IF InputSpotColour = "Red" OR "Black"* and only gained 1 mark. This is a common error among novice programmers, but one would expect that candidates who have had the programming experience required to support preparation for this examination would not be making this error. A few candidates also made an error in understanding the logic of the question, interpreting "a ladybird which can have either red or black spots" as "either a ladybird which can have red spots or a ladybird which can have black spots"

(c) & (d) Answers to parts c and d were intended to be slightly more challenging than part b, and performed as expected with a wide range of marks differentiating between stronger and weaker candidates. Candidates needed to create two separate conditions for the minimum and maximum values, and combine them correctly using logical operators. Again, many candidates made mistakes with the use of the operators writing, for example, *IF InputSpots >= MinSpots AND <= maxspots.* Many candidates also failed to appreciate that the "range from MinSpots to MaxSpots" does include the end values, as does "within 1 mm of average length". It was pleasing to see some ingenious and original solutions from the more able candidates. Often, this involved writing an IF statement which determines that a value is not within the specified range, and then state that all other values are valid (candidates who do take this approach must be sure that they have answered the question and actually stated under which conditions the value is valid). As always, candidates were given credit (or partial credit where appropriate) for any working solutions for any valid approaches even if it was not the most common approach given in the mark scheme.

(e) Most candidates showed an understanding of what nesting is, but fewer than expected gained full marks. Candidates should be trained to consider the number of marks in each question and make sufficient points in their answers to accrue these marks. They also need to learn basic definitions as this would avoid them needing to define terms in their own words which can sometimes produce vague responses such as "nesting is putting a statement within a statement".

(f) There appears to be a general increase in the standard of answers to the quality of written language question this year. Most candidates answered directly and made a clear attempt to structure their response in a logical way. There were, unfortunately, relatively few marks in the high mark band, with most students achieving a medium level response. This was mainly due to insufficient detail in describing what happens during beta testing and in discussing the disadvantages of using beta versions. Also, most candidates were able to discuss beta testing in general, but did not demonstrate their understanding by applying their knowledge to this program as would be expected in a high level answer. This goes beyond referring to the name of the programmer and could include, for example, a consideration that the programmer may have tested the program on a specific phone or on emulators but that beta testers can test on actual devices, and the fact that the program could be made to send bug reports automatically using the phone's internet connection or SMS.

Question 2

(a) This was generally well answered although there was a sizeable minority who were not familiar with the term RAD and either answered with the obvious guess "writing the program quickly" or confused this with top-down design. Of those candidates who answered correctly, most earned at least 3 of the 4 marks available.

(b) The answers for part (i) were rather disappointing. Most candidates were expected to obtain at least two marks for a complete definition of a procedure and gain further marks by explaining how it is used. Many candidates had not learned a definition and so struggled to get these marks with vague statements. In part (ii) however, most candidates were able to identify procedures within the code given.

(c) Again, learning some standard definitions and facts would have enabled most students to perform better in part (i) of this question. In part (ii) almost all candidates identified GetWhetherReceiptNeeded as a function.

(d) It was pleasing to see significantly more candidates answering a question on parameter correctly and not referring to the normal English meaning of the word . There were still a few candidates who answered that a parameter is 'the values between which a value must be in order to be valid', or some other form of restriction.

(e) While it seemed clear that many candidates had a good concept of what a keyword is in part (i), some struggled to find precise terms to define it, giving vague answers such as "a keyword is a word which has a purpose". Once again providing candidates with definitions of key terms is a good way to prepare them for questions such as these. In part (ii) the intention was to get candidates to apply the definition of a syntax error (which it is expected that most of them know) to this particular case. Unfortunately, many candidates did not explicitly state that using a reserved word is against the rules of the language (the response being sought) presumably because they considered this to already be covered by the term "reserved". These candidates were, however, able to gain an extra mark for part (i) where the concept of keywords being reserved was tested.

(f) This question was generally well answered. Most candidates correctly identified the error in the pseudocode provided and a good number of these could explain the implications, although some candidates had difficulty with expressing these clearly. A majority of candidates correctly identified this error as a logic error.

(g) The quality of responses for the pseudocode was good in general, and this was pleasing to see. Fewer candidates completely omitted the question than we have seen for similar questions in previous sessions, suggesting that centres have taken on board our advice that even the most complicated algorithm questions have something for the weaker candidates to do. However, across the whole ability range, too many candidates missed out some of the easier marks for outputting messages to the user, or even for inputting the amount to withdraw or the user's choice.

Question 3

(a) Both parts of this question were generally poorly answered. Some candidates gained a mark in part (i) for stating that an indexed sequential file is ordered according to a key field, but few went on to demonstrate a convincing understanding of how such a file would be indexed. Typically they suggested that the index stores the location of every record, essentially providing direct access to each record. In part (ii) candidates who obtained marks identified quicker access to records as an advantage, and in some cases were able to expand this further. Some candidates were vague in their answers and mentioned "easier" access which is not necessarily the same as quicker. Very few candidates realised the need for sequential access to all the records in this scenario, and consequently only a handful got full marks.

(b) A majority of candidates answered this question correctly, explaining the fact that a telephone number is not a numeric value and that the characters, including the leading 0, are important. Among those who did not understand the issue, many suggested that a 16-bit integer is not large enough to represent an 11 character number and that a larger integer type (say int-32) would be needed. This is a good opportunity to remind candidates and centres that in the specification we use the terms "integer" and "real" in their most general sense, although these may have specific meanings in some languages (eg "integer" being a 16-bit signed integer). On the other hand, in the candidates' responses we accept all recognisable names of data types (e.g. byte, int-32, long for integer and float, single, double for real.)

(c) This question was generally well answered with most candidates gaining 5 or 6 marks out of the 6 available.

(d) This question was also very well answered. Where candidates did not gain full marks, they generally forgot to add an extra allowance for overheads.

(e) Most candidates showed an awareness of the fact that the contents of the file in a previous game would affect the outcome of subsequent games and provide examples of these, although some struggled to explain this in general terms beyond the examples. Some of the examples given by candidates suggested an inadequate analysis of the scenario, for example where candidates suggested that playing more games would increase the size of the file, or that players who had been eliminated would have had their records removed from the file and need to be reinstated. This inadequate analysis also explains the many incorrect answers that were seen in part (ii) where candidates needed to complete the algorithm for initialising the player file.

(f) The flow chart question was very well answered. Candidates who did not gain full marks usually either forgot to label the arrows from the decision box, causing the logic of their algorithm to be too vague to follow, or were vague about some of the processes stating, for example "player is eliminated" rather than "player's record.eliminated is set to true". In this example, "player is eliminated" more closely describes the result of the player giving the wrong answer than what needs to be done in the algorithm and was therefore too vague for credit.

Question 4

(a) This question was generally well answered, with most candidates being able to define iteration (this was one definition they appeared, on the whole, to have learned) and quite a few of the candidates correctly went on to apply that definition to the procedure given.

(b) This was generally well answered with a good number of candidates scoring 5 or 6 marks out of 6. A minority of candidates appeared not to have studied trace tables prior to the examination. It also emerged that some candidates had learnt to complete trace tables, changing only one value per line. For these candidates the number of lines provided on the question paper was not enough. Many of them added additional lines or went on to continuation paper when they ran out of lines. However, a few candidates just ended their answers when the lines ran out. Not completing the trace shows an insufficient understanding of the purpose of the exercise.

(c) The definition of a recursive algorithm in part (i) was well answered showing that this was another definition that had been learnt. However, very few candidates went on to produce a recursive algorithm in part (ii). About a quarter of the candidates omitted the question completely. Centres should remind candidates that there is an attempt to include marks across the ability range in all large algorithm questions. In this case, up to two marks were available for using good documentation techniques in the code for the chosen programming language – irrespective of the algorithm produced. Only the most able candidates were expected to produce a fully correct recursive algorithm.

F453 Advanced Computing Theory

General Comments

It was pleasing to see that many candidates had prepared carefully for the examination. They showed a good understanding of topics & were able to use technical terms. In contrast, there were a number of candidates who would have been better advised not to have taken the examination during this session as they were clearly unprepared for many of the topics or for the level of difficulty.

The incorrect use of technical terms made it very difficult to award marks to some candidates for some of the questions. For example, the terms "memory" and "hard disk" were frequently confused in answers to Question 1. Another recurring problem was that of candidates using the words in the question as the main part of their answer. An example of this was in Question 7(a) where syntax diagrams were frequently described as "diagrams to show syntax".
Topics are clearly listed in the Specification and candidates are expected to have studied these topics adequately. Further details are indicated in the next section.

Comments on Individual Questions

Question 1

(a) The majority of candidates wrote about the bootstrap loader rather than the boot file. Few realised it provides personal settings.

(b) As already mentioned in the general points, there was considerable confusion between "memory" and "hard disk". The distinction is vital to the understanding of virtual memory, so many candidates lost marks here.

(c) As in (b), there was some confusion. Weaker candidates wrote that the FAT was used in memory management. Very few candidates appreciated it was used by the operating system, though many were able to describe the FAT reasonably well.

Question 2

(a) This was answered well, though a minority confused source code with object code.

(b) This was answered well. The most common misconception was thinking that logical errors are detected during one of the stages of compilation.

(c) Some excellent answers were seen. Centres are strongly advised to encourage candidates to plan answers to such questions in order to include a range of relevant points. Candidates who did this were almost always able to score marks for a High Level response. A few confused the order in which the linker & loader are used, and a small minority thought that library routines were some form of backup or archive.

Question 3

(a) A small but significant proportion thought this referred to virtual memory. Many wrote out as much as they could remember about the whole cycle rather than selecting the relevant points. Common mistake were to write that the PC "holds the next instruction", or that the PC increments "when a new task is started".

(b) This was not very well understood by many candidates, or they failed to make themselves clear. Many wrote that instructions were completed in a single cycle, or that writing programs was slow as the instructions are more difficult.

Question 4

(a) It was pleasing to see some excellent answers here. A few candidates clearly did not understand the concept.

(b) Many candidates gave inadequate answers. A few failed to do any calculation, and instead just listed the steps required to convert any number to binary. Some started the calculation and decided to add extra bits to the mantissa. This question illustrated the need for good examination technique: there were 4 marks available, so a single statement that the number "cannot be stored accurately" could not possibly be a complete answer.

Question 5

(a) While candidates may have studied a bubble sort, this is not on the specification for this unit and so cannot be examined. The whole point of an insertion sort is to insert numbers, not to swap them. There were two other problems. Candidates were asked to "describe how" an insertion sort is used, so lists of numbers did not answer the question. In contrast, some candidates gave only a generic description and failed to use the set of numbers provided.

(b) A quick sort does not divide the numbers into just two sets, though many gave this as their answer.

(c) The majority gave acceptable answers here, though a minority showed a complete lack of understanding of a stack data structure and attempted to remove an item from the middle.

Question 6

(a), (b) The majority of candidates gained good marks here.

(c) State diagrams are clearly included in the specification (in section 3.3.6.e). While a candidate may fail to recognise a diagram, or forget its correct name, it is clearly not sensible to guess a name which is not a type of UML diagram. Also, those who answered "class diagram" should have stopped to think, as the diagram looked nothing like those named in parts (a) and (b) of the same question.

Question 7

(a) Candidates should learn the definitions and have sufficient understanding to adapt them where appropriate. Using the word "syntax" in the answer to (i) was not acceptable. Most gave the correct answer to (ii). Part (iii) was done well by a few candidates, but many made simple mistakes and did not know the correct notation to use. While it is possible to show the definition on a single diagram, it was much easier to follow the instructions given to "draw a complete set of syntax diagrams…". A few candidates ignored syntax diagrams completely and gave BNF definitions instead.

(b) Some good answers were seen here.

Question 8

(a) Most candidates gained marks here, though poor use of technical terms was apparent in some answers.

(b) Many candidates confused the terms operand and opcode.

(c) Many candidates seemed to have some knowledge about this, but poor English limited their answers. Those who gave simple, clear examples usually scored high marks.

Question 9

Many candidates scored high marks here.

Question 10

(a) Some excellent answers were seen, but a number of candidates were unable to give more than a single consequence of the many-many relationship.

(b) There were many very disappointing answers seen in (ii). Many candidates attempted to answer the question "define the terms primary and foreign keys". Generic answers alone were unacceptable: the question asked specifically about Student and PersonalTutor, and candidates were expected to show they could apply their knowledge.

(c) There was considerable confusion over the term secondary key. Many thought it was a composite key, or an alternative primary key. A few explained it correctly but failed to give an example, or gave a meaningless example such as "Surname". The question specified "give an example of the use of a secondary key…" so candidates should have realised that naming an attribute was insufficient.

(d) Few complete answers were seen. Many candidates gave vague answers and were unable to identify features of a report definition. Some candidates seemed to confuse the term with views of data, or with the data dictionary.

F454 Computing Project

There were some very interesting projects for the moderation team to look at this year with some excellent programming evident from many candidates.

The vast majority of the centres applied the assessment criteria accurately and realistically.

The key issues that prompted the moderators to consider adjustments to the work were:

Investigation:
Often the investigations were limited to basic, poorly structured transcribed interviews with little evidence of end user participation in the process. Candidates need to look beyond the simple interview and research the area in which the problem exists, looking at existing solutions to similar problems, and the background to the problem. Often alternatives failed to provide the rationale for the chosen approach to solving the problem simply identifying alternatives, a database or a spreadsheet or a paper based solution. Candidates at this level should be able to provide a meaningful rationale for their chosen approach based on the results of their investigation, research and analysis of the problem area. This section is worth almost 14% of the marks and needs to be treated in far more detail than is evident in some of the projects.

Design:
In a number of cases the algorithms provided were superficial top level algorithms that failed to describe the data processing within the solution. Moderators were often left in doubt about the validity of the set of algorithms provided and whether they actually described a solution to the problem. The test strategy should also set the tone for the development and testing sections describing the data to be used at each stage. A number of candidates merely described alpha, beta and acceptance testing in generic terms plus a post development test table. Once again, at this level, candidates should provide the rationale behind their choice of test data for each stage of the development and testing process.

Development and Testing:
The specification requires candidates to show the development process with testing at each stage. Many candidates simply provided a block of code followed by a test table with limited evidence of testing at any stage. The purpose of testing, especially during development is to try and break the code before adding the next coded segment. In many cases the test tables were completed with purely functional elements with little or no evidence beyond 'it worked', this is not sufficient.

Documentation:
Candidates are generally providing on screen help but not so commonly providing evidence of this for the moderator. On screen help is the major element for the documentation mark and must be evidenced.

Evaluation:
The evaluation should cover each of the objectives and provide references to the evidence from testing and user testing and feedback to show how well these have been achieved. The response to the end user feedback follows on from this evaluation and is not based on the end user saying, 'it works' but on the detail in their feedback and how the candidate views this and would deal with it if continuing with the project. This once again leads nicely into the final section of the evaluation.

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