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Cambridge Diploma in Computing – Modules

COMPUTER SYSTEMS, COMMUNICATIONS AND SOFTWARE

General comments

Once again, the Examining Team was most impressed by the way that the candidates managed to overcome the problems with language. Cases where language evidently caused difficulty for an individual candidate to express their ideas were few and far between and when they did arise the Examiners did all they could to alleviate any problems while still applying the mark scheme rigorously. Examiners are delighted to report that there were no adverse comments about the paper or the content on the discussion group, nor was there any evidence of candidates being penalised because of misunderstandings in the wording of the questions. This is what Examiners strive for when designing question papers, not to make them easier, but to make them 'more accessible', in other words that the candidates' understanding of the question and the Examiners' understanding of the question are the same.

There were no issues of misunderstanding of rubric or of candidates running out of time. The time allowed for the paper is intentionally generous because Examiners are testing the candidates' ability in computing not their ability to write quickly. Credit must also go to teachers who have tutored the candidates well and it is obvious that the candidates know what to expect when they sit down to do one of these papers.

The full spread of marks was awarded, both across the whole paper with marks as high as 88 and as low as 02, and also within each question with each question having example scripts demonstrating a spread from 0 to the maximum mark for the question. Examiners reported a discernible improvement in responses to definition type questions, but a weakness when the definitions needed to be applied. There is something here for Centres to be concentrating on for future sessions.

Comments on specific questions

Question 1

This was intended to be the nice starter question to get candidates settled in their work and it worked very well. Most candidates scored well with the only significant problems being the definition of operating system, software and the terms on-line and off-line. The acceptable responses are listed in the published mark scheme for this and for all other questions, and the attention of Centres is brought to that document. It is worth mentioning the problem caused by on- and off-line processing. This is an example of a type of question where whole Centres are stating the wrong thing while every candidate from other Centres will pick up the two marks. The problem is that the question becomes a discriminator between Centres rather than the intention which is to discriminate between the abilities of candidates. It would be advisable for candidates to check the reference books that they are using to ensure that what they are learning is acceptable in the examination.

Question 2

Another question where the answers were very much Centre based. Most candidates managed to score well, but there are still Centres where the whole cohort suggests word processor and spreadsheet as the two examples of utility software. Can the report reiterate what has been said in previous reports, that proprietary brand names are not acceptable in an examination paper, candidates must confine themselves to the software type. In particular, 'Scandisk' and 'Winzip' fall into this category and candidates from some Centres were using these in their answers. The candidates could still score a mark for the description, but not for the name. Another problem was that candidates sometimes said the same thing twice: "A formatter that formats a disk", "compression software compresses a file". The description needs to add something that has not already been said.

Question 3

(a)   Well understood in the main, but with some misconceptions creeping in. Again, problems in some Centres where candidates simply did not recognise the terms. It would be nice to see the idea of the output being the important part of black box testing. There was plenty of "normal, extreme, .." which was alright, but the basic point is "Does it give the right answer?"

(b)   A very good discriminator question. Few were able to explain what a logic error was, the normal answer simply being a rewording of the question along the lines of "An error in the logic." This is a shame because the best answer is very simple, the algorithm on which the code is based is faulty. The arithmetic error is simply an instruction to do impossible arithmetic, not 'inappropriate' arithmetic, this is a logic error and includes using a + when it should be a -.

(c)   A very good discriminator with only the better candidates being able to see past the simple errors in the modules which the question said did not exist.

Question 4

An excellent discriminator question right across the ability range with plenty of full marks and a lot of candidates around the half marks range. Major problems for most were being able to define a character set and using a data type of 'numeric' in part **(b)** which is never going to be acceptable.

Question 5

A well structured question that had plenty of marks for the weaker candidates, particularly in part **(a)**, while proving challenging to middle range candidates in the description of transfer of data in part **(b)**, and a final justification which only the very best candidates could do. The main problems in part **(b)** remain as in previous reports on similar questions. Candidates find difficulty in understanding the interrupt and where it is generated and they seem to think that primary memory is in control of the operation, otherwise this proved a very good question.

Question 6

(a)   Generally well answered although some candidates went into great detail about data protection legislation which did not answer the question.

(b)   An opportunity for candidates to really express themselves in their answers and some did, providing up to 2 sides of A4 on their essay. The Examiners have no problem with this and for some weaker candidates it is a worthwhile exercise because it gives them a sense of achievement to have done a really good question. However, this question is answerable in six lines. Nice bullet points are the way to answer questions like these for most candidates and Centres are advised to provide practice for their candidates so they get used to this way of answering. Some candidates believe that they have to write perfect sentences or essays, please make them aware that this is unnecessary as there are no marks for language, the only way that their use of language will penalise them is if the Examiner cannot work out what they mean to say. The biggest error here was candidates suggesting comfortable chairs. This is not an acceptable answer as chairs like those are designed for relaxing not for work.

Question 7

This question did not work very well as almost all candidates scored 2 marks for taking the picture and loading it into the computer but did not go on to discuss manipulating the image or attaching it to the employee record in some way.

Question 8

A question that worked really well providing a full range of marks. The only downside was the fact that some Centres had obviously not covered this work and their candidates were unable to score. Examiners are aware that the content of the syllabus is great, but trying to guess what will be on the paper so that sections can be left out of the teaching is a very dangerous practice.

Question 9

Another question that worked really well, with even the weakest candidate able to score some marks, but only the better candidates scoring full marks. Some element of Centre differences here with this topic obviously not covered in some Centres.

Question 10

This was intended to be the difficult question at the end of the paper which would tax even the best candidates, and so it proved. An impressive proportion of candidates were able to discuss levels of management information, often in far more detail than was required. Many of the better candidates found the discussion of output formats a pleasing exercise, and many others managed to pick up some marks for mention of graphical and textual outputs.

STRUCTURED PRACTICAL TASKS

> **Paper 5217**
> **Core**

General comments

Nearly all candidates presented well organised scripts that clearly showed their solutions to the tasks. There were far fewer candidates who treated the tasks as projects this time. However, candidates still do not use meaningful names for variables and there was a distinct lack of annotation.

Most Centres remembered to send a copy of the MS1 with the candidates' work. The individual mark sheets should be attached to each candidate's work and not separated from it as happened in some cases. This made the Moderator's job quite difficult in some cases, particularly when there were a large number of candidates. It also helps the Moderator if the teacher, in order to show where marks have been awarded, annotates the scripts. It is also found that this leads to much more accurate marking.

The Moderators still feel that too many candidates are receiving too much help although plagiarism did appear to be less this time. However, cases of malpractice remain disturbingly high.

Although the marking was better this year, there were still some Centres that did not use the marking grid correctly. When marking the tasks, a tick should be placed next to each mark point for which the candidate has supplied evidence that the work has been done correctly. Then the ticks for each part of a task should be counted. This is the mark to be awarded unless it exceeds the maximum, in which case the maximum allowed for that part of the task should be awarded. Teachers should not proportion the marks nor should any fractional marks be awarded. Neither should teachers add their own mark points to the mark scheme.

Comments on specific tasks

Task 1

Generally this was well done by most candidates.

(a)   Too few Centres appeared to have taught candidates the need to do more than repeat the field name when asked to give the purpose of attributes. Also, Gender (when included as an attribute) was set as text of unlimited length. This should be character or text with a fixed length of 1. Attribute names should be meaningful.

(b)   This was better done than in previous examination sessions. However, in a few cases, it was difficult to see what data was held in the tables.

(c)   Some candidates failed to produce a Student Book table but Centres still awarded the marks. Testing a database properly is quite difficult and time needs to be spent explaining how this should be done. Mark schemes for this and previous examinations could be used to do this.

(d)   Candidates often did not understand what should be included in a report. Many candidates failed to put a heading in the report and many did not list all the details of the students who had borrowed a particular book. Little use of drop down lists was made for data input.

(e)   Similar to **(d)**.

Task 2

Most candidates got this right and were justifiably given full marks. A small number of Centres ignored the mark scheme and included the first six lines, credited lines that contained errors or gave marks for lines that were not included by the candidate.

Task 3

The standard of the solutions to this task varied from Centre to Centre. The object of the task was to develop a prototype for a calculator. Hence candidates were expected to use buttons to enter the Roman numbers as would happen on a normal calculator. Also, the task only specified converting Roman numbers to Arabic, not vice versa. The specification also stated that as each Roman numeral is entered, both the display of the Roman numeral *and* of the Arabic equivalent should be updated. In many cases this did not happen; the user had to click a button labelled 'Convert' for this to happen. It is very important that candidates read the specification very carefully if they are to receive high marks.

(a) Many candidates produced a very poor interface. It was clear that more time needs to be spent on interface design.

(b) As in previous examinations, coding was often very poor. Controls on the interface should be given meaningful names. Trying to follow a code that uses names such as Button1, Button2, Button3 and so on is almost impossible. Again, candidates should use meaningful names for variables. Also, annotation was very poor. Centres often gave 2 marks for any annotation. This is not acceptable. Candidates need to understand that a properly annotated program should be such that, if all the code is removed, another programmer can recreate it from the annotation that is left. Candidates should create algorithms and these should form the basis of their annotation. Also, annotation should appear before the code explaining what needs to be done, not after it stating what has been done.

(c)(i) This was usually provided and nearly all candidates stated the name of the programming language used (usually Visual Basic).

(ii) Test plans were often poor in layout with an expected output column that often just said accepted or rejected.

(iii) Test data did not always follow the test plan. Some candidates were not aware of the difference between the plan and actual testing.

FURTHER SYSTEMS AND SOFTWARE

| Paper 5218 |
| Core |

General comments

The paper seemed to work well giving a good spread of marks across the ability range. The exception was at the lower end of the mark continuum where there are still too many candidates who are entered for this paper without the preparation to answer sensibly. A mark of single figures in an Diploma in Computing paper, taken after two years of, presumably, hard work is simply not good enough. The candidates for whom this is true cannot enjoy the experience of sitting the paper and the Examiners find the marking of their papers a dispiriting exercise.

Happily the experience outlined above was not normal and most candidates were able to find areas that they could score on. The questions were intended to be structured as to the level of candidate that they were aimed at, and so it proved to be. There were no questions in this paper that proved to be badly worded or ambiguous, the Examiners reporting that all questions were fair. **Question 9** was very poorly attempted, but that had more to do with the fact that it was a part of the syllabus that has not been tested in this way before than it being an unfair question or one that was not on the syllabus.

There was no evidence of time trouble for any candidates, although the opposite seemed to be true in some cases. Candidates who can produce in excess of 20 pages of A4 in a 2 hour examination are not doing themselves any favours as exhaustion sets in in the latter stages and their performance is very poor in the second half of the paper. Centres are reminded that the paper is only of 2 hour duration.

The standard of presentation continues to amaze the Examining Team and the candidates, for whom English will almost universally be a second language, must be congratulated at this double difficulty. At every Examiner meeting we remind ourselves of this fact and that we must try to take this into account when trying to understand what candidates are trying to convey, but it is becoming an unnecessary exercise as standards are so high. There are exceptions, but in these cases the Examiners do make every effort to interpret the meaning that the candidate was trying to convey.

Comments on specific questions

Question 1

(a)   The concepts are straightforward, but perhaps the description is a little bit more complex. Everyone knows what a primary key is but putting it into words is not that simple. Very few candidates knew what a secondary key was, Centres have their attention drawn to the published mark scheme for the full set of acceptable responses to this and all other questions on the paper.

(b)(i)   Most candidates missed the point of the question, being perfectly happy to describe the rights that students should not have, rather than discuss the access rights that different people need in order to carry out their duties.

(ii)   A good discriminator question. Most managed to talk about passwords but only the better candidates discussed encryption or physical protection.

Question 2

A well answered question, although it did give scope for a large amount of vague type answers. Centres are reminded that bulleted answers are to be encouraged, they keep the candidate's mind on the question rather than on the English necessary to write an essay. Some of the candidates' views of life were interesting, many believed that promotion was out of the question if you worked from home and that you had to take a pay cut because everyone would know that you did not do very much work if not watched over. The most worrying view of home working though was from the candidate who likened it to house arrest!

Question 3

(a) Intended to be aimed at more able candidates and so it proved. Though it was heartening to see the number who understood the concept well, some going into far more detail than expected by the mark scheme.

(b) Generally well answered. The quality of the answers was very much dependent on the Centre, leading the Examiners to the conclusion that some Centres do not teach the whole syllabus but make an assessment of what they think will be on the paper. While accepting that the syllabus is long, this is a very dangerous practice and is not encouraged. Few candidates were aware that one of the tasks of the accumulator is to handle input and output from the accumulator.

Question 4

Disappointingly poor results here, even from the better candidates. Some were so disappointed at not getting 'lexical analysis' that they decided to answer it anyway and consequently scored no marks. Few were able to get past the stage of syntax errors and surprisingly few even mentioned error reporting.

Question 5

Three parts to the question but the report will take them all together. There is work to be done here as most candidates could not get past 'round robin' and a mistaken assumption that the question wanted a description of high level and low level scheduling. The answers were actually fairly mundane and are listed in the mark scheme. There was evidence of a problem in the understanding of the question due to a misinterpretation of the English, but the Examiners took that into account as much as they could when marking the answers.

Question 6

(a)(b) This was meant to be the banker question which the vast majority would score really well on, and in previous sessions that is exactly what has happened. But not this time. The problem was that the two numbers were to be stored in 2's complement. They were positive numbers so the fact that they were to be stored in 2's complement made no difference whatever. Almost every candidate gave the negative answers instead of the positive ones, -102 and -117 instead of +102 and +117. The reason for working in 2's complement was that when the values are added together in part **(b)** the positive values suddenly turn into a negative answer. The mark scheme was even changed so that if the mistake was made in **(a)** the candidate could still pick up the marks in **(b)**, but few did.

(c) Very poor, and disappointing because this was another question that the Examiners imagined would be well answered. Too many answered in terms of a queue rather than a stack and those that purported to use a stack seemed to be set on trying to read a value half way down the stack, which rather defeats the purpose of the structure in the first place.

Work definitely needs to be done on these aspects of the syllabus in many Centres in order to get rid of some of the misconceptions.

Question 7

This was a well answered question. Many candidates scored 3 in part **(a)**, failing to define the easiest option: a single ALPHA. Part **(b)** proved to be a bit more difficult but most were able to define a non zero digit and better candidates were able to score full marks. This was another excellent discriminator question at all levels.

Question 8

Most candidates could score marks here, though only the more able scored 7 or 8 marks. The least well understood was the concept of switches, though this is strange because it is really the easiest of the terms to understand. A number of candidates suggested that switches were used to turn the computer on and off, not a good answer, but few were able to come up with anything better.

Question 9

Some Centres had obviously taught this topic and the candidates did well on the question. However, the vast majority of candidates had no idea of what was required, a pity because the concepts are not difficult and Gant charts are often used by candidates to illustrate their project work.

PROGRAMMING PROJECT

> **Paper 5219**
> **Core**

General comments

This report provides general feedback on the overall quality of project work for the Diploma in Computing candidates. In addition, all Centres receive specific feedback from their Moderator in the form of a short report that is returned after moderation. This reporting provides an ongoing dialogue with Centres giving valuable pointers to the perceived strengths and weaknesses of the projects moderated.

The projects submitted covered a wide variety of topics with candidates showing evidence of researching a problem beyond their school or college life. Most projects were still developed using database management software such as Access. Again, Centres are reminded that the programming project must involve the use of an object-oriented programming language and may also involve the choosing and installing of hardware. Centres are also reminded that candidates need to identify opportunities to develop and deploy a limited set (5-6) of library elements in their solution. The requirements are clearly set out in the syllabus. The guidance on marking projects can also act as a useful checklist setting out the expected contents of each section.

The selection of an appropriate problem by the candidate is extremely important, as the analysis, design and implementation of a computerised system should always involve consultation with a user, ideally a 'third party' user throughout the development of the system.

Project reports and presentation

The presentation of most of the reports was to a very high standard, with reports word-processed and properly bound. However, the use of proofreading and a spell checker is to be recommended. In addition, candidates should ensure that only material essential to the report is included so that there is only one volume of work submitted per candidate. Candidates are reminded that the submission of magnetic or optical media is not required and the Moderators do not consider it.

It is recommended that the structure of the report follows that of the mark scheme, this gives a clear outline as to contents for the candidates to consider and also aids the assessment by teachers and moderation of the work.

The use and development of library elements, set out in the separate sections required in the report, is essential to the object-oriented approach required for this component. It was pleasing to note that this session some Centres had ensured that their candidates had made good use of library elements and followed this approach.

Project assessment and marking

In some cases the standard of teacher assessment was close to the agreed CIE standard. However, most assessment was generous particularly where evidence of user involvement and the identification and production of library elements were not evident in the candidate's report.

Centres must use the mark scheme set out in the syllabus and include a detailed breakdown of the marks awarded section by section together with a commentary as to why marks fit the criteria. This greatly aids the moderation of the projects allowing Moderators to identify why marks have been awarded. Moderators cannot make informed comment as to the accuracy of the Centres' marking of each section without this breakdown of marks.

Comments on individual sections

The comments set out below identify areas where candidates' work is to be praised or areas of concern and are not a guide to the required contents of each section.

(a)   Definition investigation and analysis

   (i)   Definition – nature of the problem

        Most candidates could describe the organisation and methods used but only the best candidates identified the origins and form of the data.

   (ii)   Investigation and analysis

        Candidates should clearly document user involvement and agreed outcomes. Better candidates clearly showed evidence of observation, interviews and investigation of documents currently in use. A detailed requirements specification based on the results of the candidate's investigation should be produced.

        Also alternative approaches need to be discussed in depth and applied to the candidate's proposed system in order to obtain high marks.

(b)   Design of the library elements

        This section was not present in the majority of reports. It should include the following elements:

   (i)   Nature of the solution – A clear set of objectives with a detailed and complete design specification, which is logically correct. There are also detailed written descriptions of all processes/sections and a clear, complete definition of any data structures. The specification is sufficient for someone to pick up and develop appropriate library elements. The library elements have been designed to be reusable and easily configured.

   (ii)   Intended benefits of the library elements have been identified and explained.

   (iii)   Limits of the scope of the library elements.

(c)   Software development, testing and implementation of the library elements

        This section was not present in the majority of reports.

   (i)   Development and Testing of the library elements – the Examiner must be left in no doubt the library elements actually work in the target environment. Candidates should provide program listings in the form of printouts. Data structures should be illustrated as part of the listings where appropriate, detailing their purpose. There should be a full set of printouts showing input and output as well as data structures. All hardcopy should be fully annotated and cross-referenced. A full test plan, with evidence of each test run should be present in the report, together with the expected output for each library element. The test plan should cover as many different paths through the system as is feasible, including valid, invalid and extreme cases.

   (ii)   Appropriateness of structure and exploitation of available facilities used in the production of the library elements – some discussion of the suitability of methods used for the particular system should be included. Some recognition and discussion of the problems encountered and actions taken when appropriate should also be included. A log of such problems should be kept.

(d)   Documentation of the library elements

        This section was not present in the majority of reports. As many programmers work as part of a programming team, the documentation for the library elements is intended to allow the candidate to demonstrate their ability to work as a part of such a team.

(i) Technical – Much of the documentation will have been produced as a by-product of design and development work and also as part of writing up the report to date. However, a technical guide is a stand-alone document produced to facilitate easy maintenance and upgrade of a system. The contents of the guide should, where relevant, include the following: record, file and data structures used; database modelling and organisation including relationships, screens, reports and menus; data dictionary; data flow (or navigation paths); annotated program listings; detailed flowcharts; details of the algorithms and formulae used. Candidates should include a guide to the interface to the library routines – parameters, public and private data structures, formats etc. All parts of the guide should be fully annotated since this is important for subsequent development of the system. The specifications of the hardware and software on which the system can be implemented should be included.

(ii) Clear guidance, as friendly as possible, should be given to allow the incorporation of the library elements in other solutions. Details of the public interface should be provided for each of the library elements. Some mention here of the relationship between the elements and the data they deal with may be relevant. The user guide should be well presented with an index and, where necessary, a glossary of the terms used.

(e) **Design of the main solution**

(i) **Nature of the solution**

The requirements specification set out in the analysis needs to be discussed with the user and a set of achievable, measurable objectives agreed with the user. These objectives will then form the basis for the project evaluation.

Only examples of screen layout design and output formats should be included. Many candidates only considered the screen layouts and neglected the reporting aspect of their system. Candidates need to fully document their proposed data structures and provide a detailed description of the processes to be implemented.

(ii) **Intended benefits**

Candidates need to clearly identify the merits of the intended system.

(iii) **Limits of the scope of solution**

Candidates need to discuss the limitations of the intended system and estimate the size of the files required.

(f) **Software development, testing and implementation of the main solution**

(i) **Development and testing**

Evidence of testing needs to be supported by a well designed test plan that includes the identification of appropriate test data, including valid, invalid and extreme cases, and expected results.

(ii) **Implementation**

Not all candidates included an implementation plan. This should contain details of user testing, user training and system changeover that have been discussed and agreed with the user. These details need to be clearly related to the candidate's own project not discussed in general terms.

Evidence of user testing is essential if high marks are to be awarded for this section. Better candidates included photographs of the user testing the new system, printouts of the testing together with signed comments from the user and/or a letter from the user commenting on the tests and their results.

(iii) **Appropriateness of structure and exploitation of available facilities**

Candidates should discuss the suitability of both hardware and software at this stage. Few candidates kept a log of any problems encountered together with details of how these problems were overcome. Any system developer encounters problems; these problems need to be noted together with the corrective action taken.

(g) **Documentation of the main solution**

(i) **Technical**

Very few candidates produced a stand-alone technical guide including the following: record, file and data structures used; database modelling and organisation including relationships, screens, reports and menus; data dictionary; data flow (or navigation paths); annotated program listings; detailed flowcharts; details of the algorithms and formulae used. Candidates need to annotate all parts of this guide since this is important for subsequent development of the system. The specifications of the hardware and software on which the system can be implemented should also have been included.

(ii) **User**

For full marks the candidate needs to include an index and a glossary, the guide needs to be complete including details of backup routines and common errors. Also good on-screen help should exist where this is a sensible option.

(h) **Evaluation**

Many candidates did not consider the user's satisfaction with the system developed and then evaluate the response. Unless this evaluation is completed in detail high marks cannot be awarded. The syllabus clearly sets out the required contents of this section.

(i) **Discussion of the degree of success in meeting the original objectives**

Very few candidates considered each objective in turn and indicated how the project met the objective or explained why the objective was not met. Even fewer candidates included use of user defined, typical test data as part of this discussion.

(ii) **Evaluate the users' response to the system**

Many candidates did not provide clearly recorded evidence from their end user and this is essential. Candidates need to obtain the user's response to how the system developed meets the agreed specification and evaluate this response as to the satisfaction with the system developed.

(iii) **Desirable extensions**

Most candidates identified the good and bad points; some candidates identified limitations and possible extensions but to obtain top marks the candidate needs to indicate how the extensions would be carried out.