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COMPUTING ADVANCED LEVEL

Paper 5216

Computer Systems, Communications and Software

General comments

Once again, comment must be made regarding the ability of such young people to express their, often complex, ideas in what for many is a second language. The Examiners have an undiminished admiration for this and thank the majority of candidates for the clear and concise way in which answers were presented. There were a number of candidates this session who decided not to answer the questions in the order of the question paper, but to answer them in a seemingly random, though probably more likely perceived difficulty, order. There is nothing wrong with doing this, indeed there are many good reasons for doing so, not least of which is the boost to the candidate's confidence when they know that they have answered a question correctly. However, candidates who wish to change the order of the questions must consider two things. The first is that the questions and parts of questions must be clearly labelled. There were a number of scripts where the Examiner was left to guess, according to their knowledge of the answers expected, what the question number was. While the Examiner will always try to decipher the script, this is a needless risk for the candidate to take. The second problem that the candidate should bear in mind is that the questions in the second part of the paper tend to be in a logical order and if they are attempted in a different order the candidate is going to be missing some of the information which the Examiner intended them to have.

Despite all the pleas to the contrary, the number of candidates who are using bulleted answers is going down. The Examiner is looking for computing knowledge and skill, not ability to produce excellent English. A glance at the published mark schemes for the examination papers for 9691 will show that they are in bulleted form, being the most sensible and clear way of expressing ideas. Please encourage this form of answer because it means that more of the candidate's energies are focused on the Computing.

Most candidates attempted all the questions. Those that did not almost certainly did not because of a lack of knowledge rather than a lack of time.

Comments on specific questions

Question 1

(a) There has always been a requirement that brand names should not be used in answers. There were too many who answer with, mainly Microsoft, brand names despite the accepted rule and that the question does ask for 'types of software'.

(b)(i) This was far better done than in the past, most candidates scoring very well.

(ii) When asked for an explanation of how a procedure could be implemented for producing back-ups was not so well done. This shows clearly the difference between straightforward bookwork as in **(i)** and the need to apply knowledge to a given situation which is much harder to do because it involves knowing the material and then making decisions as to relevance. When this is considered it is not unreasonable that this question should have proved more difficult.

(c) Most managed to provide sensible responses for the first two, but did persist in using back-up or archive for a use of a CD-ROM. The clue had been given in the question in that a CD-RW was in **(ii)** but most still suggested that a CD-ROM could be written to. For a comprehensive list of the answers that were allowed for this and all other questions on the paper, please refer to the published mark scheme.

Question 2

Some good responses here, however, there are far too many candidates who believe that on-line and off-line refer to networks, more specifically, the internet. The expected answers in part **(b)** were batch and off-line, however, candidates who argued that the machine used by workers to input their details was on-line to a computer in the accounts department which was collecting the data, were credited.

Question 3

There were some very good answers here. Some of the example applications were far too general, but the majority of responses showed a good degree of understanding from the candidates.

Question 4

(a) Generally well answered. There were some candidates who offered interpreter and compiler diagnostics as different tools, or who thought that, but most were able to score well here.

(b) Well explained and illustrated, some candidates providing some quite articulate pieces of code to illustrate their points.

Question 5

(a) Some candidates had covered this relatively easy topic and scored well, but most had evidently not met the concept before seeing the paper.

(b) Candidates have a general misconception that messages sent via circuit switching are not split into packets and that consequently they do not need to be reassembled at the receiving end. They are, and they do. What they do not need is to be reordered because they will still be in the correct order while those messages sent via a packet switching method will arrive out of order.

Question 6

Generally the responses were worth one mark each. Responses worth more than a single mark were comparatively rare. Centres' attention is drawn to the published mark scheme for a list of the expected responses.

Question 7

(a) The question clearly stated '…the data….'. Too many candidates did not read this, instead they were content to latch on to the idea of systems analysis, giving long answers about information collection or even about feasibility studies.

(b) A very good example of a question where most candidates scored two marks for stating two restrictions, but failed to expand upon the responses in order to earn the other two marks. Candidates must understand that the Examiner can only award marks if the candidate has stated something. Candidates who answer in bullet points can very easily see how many points they have made and can compare that with the number of marks available for the question.

Question 8

A well answered question, though there are a lot of candidates who can only mention negative aspects like job loss and, depressingly, seem unable to see the positive aspects like increasing skills of the workforce.

Question 9

Another question where many candidates were able to score well, but found difficulty in getting past the standard three marks. Some work with candidates about the key words like *describe* and the expectation of the Examiner for each of the key words would not come amiss.

Question 10

The main problem with this question was a misunderstanding of the words 'factors' and 'features' in each of **(a)** and **(b)**. Factors are external influences, while features are part of the solution. It is unfortunate that such similar sounding words need to be used, but they do have distinct meanings and both elements must be examined.

Question 11

A standard question which was made slightly harder because there was no requirement in the question which specified how many statements needed to be made. There was an element of examination technique here to be able to link the mark allocation with the number of points offered in the answer, an easy task for those who were using bulleted answers. The second part of the question should have been answered in context, very few did this, satisfying themselves with an explanation of the meaning of generic software.

Question 12

Candidates found this to be one of the hardest questions on the paper. There was a small proportion of scripts with a sensible explanation of condition driven, but very few that could offer a sensible explanation of strategic level.

Paper 5217

Structured Practical Tasks

General comments

In this final session for this paper Centres submitted work that met the standards required by the Moderators. The work was well presented and followed the required structure with very few candidates turning the tasks into mini projects. The marking by Centres was generally accurate this session. However, few Centres had annotated their candidates' work. This would be useful in the replacement project by showing Moderators where marking points had been found. Moderators prefer notes on the work so that they can understand how marks have been awarded.

Once again it was good to see less plagiarism this session and a wide range of solutions from Centres.

The mark scheme had been generally applied effectively with Centres now used to having more marking points in some sections than there were marks.

Centres are thanked for their hard work and for the high standards they have maintained over the life of this paper.

Comments on specific questions

Question 1

This question followed on previous years where candidates were to construct a simple database and produce the data entry forms and a report. Most candidates scored high marks.

(a) Most candidates scored well in this section though some failed to give any description of the fields they had used. Very few candidates added extra fields that were not part of the task.

(b) This section was well answered and candidates gave sufficient evidence to justify the marks awarded.

(c) Most candidates scored high marks in this query and provided sufficient evidence to convince the Examiner that the query worked correctly.

(d) Again most candidates produced a report but a small proportion failed to follow the requirements of the question.

Question 2

Most candidates earned good marks in this section. There were a small number who gave more than a sequence of line numbers and these are to be thanked.

Question 3

(a) There were various solutions offered to this task. Some were more sophisticated than others and provided the Moderators with interesting solutions. This section was easy for the candidates and most scored full marks.

(b)(c) These two sections were straightforward in the requirement but Centres awarded full marks even though the variable names were not 'meaningful' nor the code annotated. Other Centres offered excellent solutions.

(d) Again some Centres were too generous in awarding full marks.

(e) Most candidates made an attempt at testing their solution to the task. Centres were correct in how they had marked this section.

Paper 5218

Further Systems and Software

General comments

The paper seemed to be a fair assessment of the abilities of the candidates, providing a good mixture of questions based solely on the knowledge of the candidates and others where the candidates had to apply the knowledge that they possessed to a situation. This type of question is more difficult because it is so easy for a candidate to write down factual information which is correct but, because it is not relevant to the particular situation, is necessarily wrong. The candidate has demonstrated a lack of skill of being able to discriminate between sensible responses and ones that are simply not appropriate. Candidates in many cases would benefit from practice at attempting such questions in order to develop these skills of discrimination.

There was evidence of a small number of candidates who were rushed over their answers to the last two questions. This difficulty did not affect the vast majority and was invariably a result of spending a disproportionate amount of time on the first questions. Candidates for whom this caused a problem were demonstrating a failure of their examination technique which is a central part of all examinations and candidates would be well advised to ensure that time is given over to basic examination technique to stop being penalised in future.

Bullet pointed answers are much in evidence. This is very sensible as it helps candidates to organise answers and to ensure that they have not missed important points when they come to presenting their answers. Many candidates are answering questions in a different order to the way that the questions are presented on the question paper. There is nothing wrong with this, either. It is very sensible to answer a question that you find relatively easy first so that you build up a little confidence. These are stressful experiences for the majority of candidates and anything that helps them overcome some of the stress so that they perform to their true abilities must be a good thing. However, there are two points that must be made. Firstly, some candidates are jumping about from question to question and also within questions. The questions are intended to be progressive in nature and parts of questions will rely heavily on previous parts to those questions, consequently a candidate who tampers with the order is likely to lose some of the coherence of the paper. Secondly, many candidates are not content with simple bulleting of answers but have decided to use numbering or lettering (in many cases both) of the bullets. This would not normally cause a problem, but when combined with a scatter approach of questions and parts of questions answered in any order it can become difficult, if not impossible, to follow just which question is being answered. The Examiners are all very experienced and will do their best to track down responses and be as fair to the candidates as possible, but there is a limit to how much they can be expected to do.

Once again the standard of written communication was exceptional, with very few scripts causing any problems of this sort for the Examiners. Written communication may have been excellent, but in the time honoured tradition of teachers the world over, it has to be said to the majority of candidates "Read the question". This was very poor this session and places which illustrate the problem particularly have been highlighted through the rest of this report.

Comments on specific questions

Question 1

The two parts of this question were meant to form a nice easy start to the paper. Unfortunately, the candidates seemed to have different ideas. This is simple book work. Starting with a definition, it only goes as far as wanting three advantages for a database solution. The Examiners thought that this should be accessible to any candidate at this level, however, it proved much harder than intended. The responses which were expected are available in the published mark scheme, and the attention of Centres is directed to that mark scheme for this and for all the questions on the paper.

There was an element of not answering the question here as many candidates tried to say why a flat file was not relational, rather than saying what it was, while in part **(b)** they then went on to describe a relational database rather than give advantages.

Question 2

Again, the intention was to provide another nice, unthreatening question at the start of the paper in order to settle candidates down. Unfortunately, the vast majority of candidates did not know these simple definitions. In some cases this was widespread leading the Examiners to think that some are being selective in their syllabus coverage. This is a very dangerous practice and leads not only to problems in the examination, but also in the structure of the course which is meant to be taken as a whole.

Question 3

As stated above, the major failing was not reading the question. The question stated clearly "…for the vehicle to be able to move safely". Nowhere did it mention lines being painted on the floor for them to be followed (this was a question from a previous session which candidates had obviously discussed in class). It did not ask for a description of how the cleaning was to be carried out, though some of the responses which described in detail the arms of the robot which would need hands in order to hold a broom were dispiriting to mark. The concept of the map was not well understood by some candidates who suggested an output device would be a torch to allow the robot to see the map and an input device would be a camera to read the map. There were another group of candidates whose answers were along the lines of a worker using a radio control device to move the robot around the factory, the difficulty suggested was that the robot might sometimes be out of sight of the worker.

Question 4

Some excellent answers. The answers that were not excellent sometimes gave a very generalised answer based around the words 'fetch', 'decode' and 'execute'. Others were able to score well, up to the decode phase but either ignored the fact that other things went on after that, or gave an answer based around a jump instruction 'JUMP 300' which was a question from a past paper which had obviously been used as practice. Once again "Answer the question".

Question 5

As this question paper comes at the end of the exam session candidates taking the paper should be able to provide standard definitions without getting confused. Too many defined an interrupt as something sent to a user. The final outcome of the interrupt might be a message to a user telling them that the printer is out of paper, but that is not the interrupt. Too many of these candidates are satisfied with less than adequate reporting. The concepts of lnkers and loaders are fairly well understood, not just because of the words linker and loader, there were no marks for such simplistic answers, but many candidates were able to explain them well.

Question 6

(a)(b) Some good responses here from candidates who obviously understood the concepts. However, there were many more who were unable to provide sensible answers. A candidate at this level, when asked to provide an example of a static data structure should not give a response of 'a library'.

(c) Some candidates had obviously covered this work well and they were able to benefit from that, however, the perception from the Examiners was that some had simply not covered this area of the syllabus at all, which is a very dangerous course of action.

Question 7

(a) Most candidates could score on 'encryption' but few were able to offer a sensible explanation of 'message authentication'.

(b) The question stated "to distribute data on a network", most answers started by stating that partitioning was dividing up the hard drive and went on to talk about duplication being backing up data files. These two types of distributed network should be known along with a third type: indexing.

Question 8

A few very good scripts, though many were unable to discuss the ideas of Gantt charts in any convincing manner while an encouraging proportion of candidates were able to gain marks by describing the use of PERT. Too many candidates had not met the software and were unable to offer anything more than databases and word processors.

Question 9

This was a very good discriminator question which produced marks which covered the whole marks allocation and invariably matched the candidate's success or otherwise over the rest of the paper. Commonly, the candidates failed to realise that the representative would still be involved. Many had the whole design and drawing process being carried out by the customer, many imaginatively suggested solutions whereby the customer would travel in to the main offices in order to use the company's computers to draw their new kitchen.

Paper 5219

Programming Project

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.

Centres are again 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. Also, the project work is designed to test the understanding of the systems life cycle, these requirements are clearly set out in the syllabus. The guidance on marking projects in the syllabus 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. Candidates are also 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. Unfortunately this session, no Centres had ensured that their candidates had made good use of library elements and followed this approach.

Candidates can use library elements in different ways: they can make use of pre-prepared libraries e.g. a library of date functions, they can identify new functions that they wish to use, and either customise an existing library by adding new functions to it, or set up a separate library of functions that is required for this particular system.

Project Assessment and Marking

Most assessment by the Centres was too generous, particularly where there was no evidence of user involvement and *no library* elements were evident in the candidate's report.

Centres should 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 set out in the syllabus. This greatly aids the moderation of the projects allowing Moderators to identify why marks have been awarded. Moderators cannot make informed comment on the Centres' report forms as to the accuracy of the Centres' marking of each section where only a single final mark has been provided.

The requirements are clearly set out in the syllabus in 'The Guidance on Marking the Computing Project' section. Also, these requirements can also act as a useful checklist, for both teachers and candidates, setting out the expected contents of each section.

Centres are also reminded that candidates should use this guidance for the expected contents of their reports rather than some of the popular A Level textbooks available for project work, which do not cover the full requirements of the CIE syllabus.

Comments on specific questions

The comments set out below identify areas where candidates' work is to be praised, or areas of concern expressed, 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 described the organisation and some described the methods used but only the better candidates identified the origins and form of the data. Centres are reminded that a detailed description of the organisation covering many pages is not required here, just a short paragraph covering the appropriate areas.

(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:

- 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.
- Intended benefits of the library elements have been identified and explained.
- 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 standalone 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

Centres are again reminded that the requirements specification set out in the analysis needs to be discussed with the user, leading to a set of achievable, measurable objectives that have been agreed with the user. These objectives will then form the basis for the project evaluation. Candidates often clearly proposed data structures and designs for input screens but then forgot to provide a detailed description of the processes to be implemented *and designs for the required outputs.*

(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

Few 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 and 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

This section was very poorly completed by many candidates, with many trying to attempt an evaluation without evidence provided from their end users. End user involvement is clearly required in **(i)** and **(ii)** of this section. There are detailed guidelines, for this and all sections, clearly set out in the guidance for marking projects section of the syllabus.

(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 which is essential. Candidates need to obtain the users 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

Many candidates identified limitations and possible extensions but sometimes forgot to identify the good and bad points of the final system.