CARIBBEAN EXAMINATIONS COUNCIL

REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION
MAY/JUNE 2005

COMPUTER SCIENCE

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INTRODUCTION

This is the fifth year of open examinations for Unit 1 and the fourth year for Unit 2. There were three examination papers in both units, namely, Paper 01, Paper 02, and Paper 03. In each unit, Paper 01 and Paper 02 were examined externally by CXC while Paper 03, the Internal Assessment, was examined internally by teachers and moderated by CXC.

In each unit, Paper 01 consisted of short-answer questions that were designed to test candidates' breadth of coverage of the syllabus. On the other hand, Paper 02 consisted of essay-type questions that were designed to test their depth of understanding of the syllabus. Thus, candidates were expected to show deeper insight and understanding of the topics examined in Paper 02.

In each unit, Paper 01 consisted of three sections, each one corresponding to a module of the syllabus. There were five compulsory questions within each section, and each question carried 10 marks. The maximum amount of marks that could be obtained in Paper 01 was therefore 150.

Similarly, Paper 02 of each unit consisted of three sections, each one corresponding to a module of the syllabus. There were two questions within each section, and each question carried 30 marks. Candidates were expected to answer one question from each section. The maximum amount of marks that could be obtained in Paper 02 was therefore 90.

The individual contributions of Paper 01, Paper 02, and Paper 03 to the final grade remained 50 percent, 30 percent, and 20 percent, respectively.

GENERAL COMMENTS

In general, performance on both units has continued to improve, compared to previous years. Performance in Unit 1 suggests that teachers and candidates are completing the syllabus and are becoming more familiar with what is required.

Even though the performance in Unit 2 has improved, there is still concern about the level of programming ability being demonstrated in Sections B and C of both written papers. Candidates continue to find it extremely difficult to write even simple programs, especially in the object-oriented programming languages.

A major problem detected in the responses to questions in both Units that require the writing of prose is that of candidates' inability to clearly express their answers. Candidates need to understand what is required in a question and should learn to distinguish between key words such as "state", "list", "explain", "discuss", "describe" and "identify". Many candidates lose marks by making a simple statement on a topic and not discussing the topic in sufficient detail.

DETAILED COMMENTS

UNIT 1

PAPER 01

SECTION A – Components of Computer Systems

Question 1

This question examined candidates' knowledge of server computers in a computer network and their ability to distinguish between two different types of cabling used in a computer network. Most candidates seemed to be quite knowledgeable of the role of a server in a client/server network and the question was well answered by most of them. In Part (a)(ii), candidates were generally unable to name specific types of servers typically found in a computer

network (e.g., printer server and mail server). Some candidates mistakenly believed that peer-to-peer, client-server, hub, and routers were types of servers and went on to explain the purpose of these terms.

Question 2

This question tested candidates' understanding of operating system concepts such as memory protection, scheduling, and file management. It also required candidates to identify two applications in which a supercomputer can be used. The responses indicated that candidates had a very limited understanding of the concepts of memory protection and scheduling algorithms. Some candidates even wrote that memory protection refers to physically protecting the hard drive. However, the majority of candidates gave good responses for Parts (a) and (d).

Question 3

This question tested candidates' understanding of the data and processing requirements that should be considered before purchasing a computer system. This question was not done well by the majority of the candidates. Data requirements include considering the volume of data to be stored, sharing data, and securing data. Processing requirements include considering the speed and type of processing.

Question 4

This question examined candidates' knowledge and understanding of local area networks and different types of network configurations such as distributed, peer-to-peer, and centralised. The overall performance on this question was quite good, with an average of almost 6. However, a number of candidates confused the term 'configuration' with 'topology' and 'network type', and gave answers for network topologies and network types. In Part (b), while it was clear that candidates understood what is a local area network, their diagrams were badly drawn.

Question 5

This question tested candidates' knowledge and understanding of various concepts related to computer memory, such as 'volatility', 'memory size' and 'word size'. It also required candidates to describe one specialised feature of a mouse as an input device. However, it is felt that some candidates could have obtained more marks if they had not misinterpreted Part (a)(i) to be "What is volatile memory". 'Volatility of memory' refers to the degree that data in memory can be lost easily, for example, when electricity goes. Also, in Part (b), instead of describing a specialised feature of a mouse such as a scroll button, some candidates incorrectly gave examples of specialised input devices while others described the purpose of a mouse.

SECTION B – Application of Computers

Question 6

This question tested candidates' understanding of computer applications in an organization as well as the implications of computer automation. Most candidates were able to outline at least one benefit and one negative consequence of using computers in an organization.

Question 7

This question tested candidates' knowledge and understanding of various types of information systems such as transaction processing systems (TPSs) and data warehouses. Candidates were also required to discuss what happens during data mining. As with similar questions in the past, most candidates answered the question poorly and the average mark was less than 4. Some candidates were unable to give an actual example of a TPS though they correctly named the inputs and outputs of the system. Others had difficulty in distinguishing between the inputs/outputs of a system and the input/output devices for that system. Using automatic teller machines as an example, some candidates incorrectly identified keyboard/mouse and printer/monitor as inputs/outputs of the system, respectively. The responses for Part (b) were generally vague, demonstrating candidates' limited knowledge of data warehouses and data mining. For example, a common response was that a data warehouse is a location where data is stored.

Question 8

This question required candidates to demonstrate their understanding of special-purpose computer systems, specifically, expert systems and embedded systems. Many candidates gave good examples of expert systems and correctly identified the inputs/outputs of these systems, although some had problems identifying inputs/outputs as explained in Question 7 above. However, the inference engine was generally omitted in describing an expert system in Part (a). Some candidates also confused expert systems with embedded systems. Many candidates incorrectly stated that an embedded system is a piece of software that is added to another larger piece of software such as an operating system. Candidates were expected to state that an embedded system is a computer system placed inside other products to add features and capabilities that are computer-based (e.g., an embedded system is used inside a microwave oven).

Question 9

This question tested candidates' understanding of the concepts of telecommuting and videoconferencing and was answered fairly well. Most candidates were able to correctly explain how communication is achieved in videoconferencing. However, many candidates confused telecommuting with teleconferencing and telemarketing. Telecommuting refers to a work arrangement where employees work away from their offices using personal computers (e.g., at home), communicating with their offices using email and other forms of communication technology. The advantages of telecommuting and videoconferencing were also not clearly stated by many candidates.

Question 10

This question tested candidates' understanding of data security and how to protect data in an organisation, both from damage and from unauthorised access. In Part (a), most candidates identified two ways in which data could be accidentally damaged but did not state exactly what damage was caused. However, in Part (b), most candidates were knowledgeable about the techniques that could be used to protect data from unauthorised access.

SECTION C – Computer-based Problem Solving

Question 11

This question examined candidates' knowledge of using different computer-based tools to solve the real-life problems of generating a report on the performance of candidates in the CSEC Information Technology examinations and maintaining student information at a school on a day-to-day basis. This question was well answered by most candidates. In both Part (a) and Part (b), candidates were able to correctly identify appropriate software tools (word processor and spreadsheet, and database management systems, respectively). However, several candidates did not clearly state the features of these tools that made them appropriate for the task at hand. As indicated in the question, it is important for candidates to link the features of the tools to the task that must be performed.

Question 12

This question examined candidates' knowledge of using a software tool to solve the real-life problem of making a presentation of a company's sales performance. Candidates were also expected to understand the kinds of problems that could affect the use of the tool selected and how to solve these problems. This was a fairly easy question and it is surprising that candidates' performance was not much better than it was. The obvious software tool for the problem was presentation software such as Microsoft Powerpoint. However, some candidates stated that spreadsheet software could be used and this was also accepted. Similar to Question 11, candidates were often unable to state three features of the tool that made it appropriate for the task. Several candidates gave simplistic responses for Part (b) such as the software and presentation data must be stored on a computer. It should be noted that the questions in this section deal with Computer-based Problem Solving, so the need for computers, software, and data is clearly understood. More appropriate responses on potential problems that can occur when using the software tool are that the vice-president may not know how to use the software (i.e., training is required) or that the presentation file may become damaged for some reason (requiring backup measures to be put in place).

Question 13

This question tested candidates' knowledge and understanding of information sources and their ability to select appropriate knowledge sources for a given information need. The question was well answered by the majority of the

candidates. Several candidates obtained full marks in this question. However, given its straightforward nature, a higher average was expected.

Question 14

This question tested candidates' knowledge and understanding of the characteristics of information (with an emphasis on reliability) as well as their ability to analyse a situation to determine the quality of information that can be obtained. It was generally answered satisfactorily with many candidates losing marks for not developing their responses or repeating a source of un/reliable information already given. Also, the majority of candidates were unable to furnish an example in Part (a)(i) when they explained the term 'reliability of information'. In Part (b), the reasons given for not accepting the information were often quite poor or underdeveloped. Candidates were expected to give responses such as the receptionist had no authority to give out the information requested and may also give inaccurate information since this was not his/her job area.

Question 15

This question tested candidates' knowledge and understanding of a digital library as an information source. It was clear that many candidates had limited understanding of a digital library, and many of them opted to answer the question from the point of view of a CD. A digital library is a database containing documents such as journal and magazine articles in digital form that can be accessed by users and downloaded to their own computers. Candidates also gave a general list of advantages and disadvantages of a digital library, without attempting to elaborate on the points stated. This may be attributed to their limited understanding of a digital library.

PAPER 02

SECTION A – Components of Computer Systems

Question 1

This question tested candidates' in-depth knowledge and understanding of a number of hardware-related and network-related concepts covered in the unit. Generally, candidates were able to differentiate between ROM and EPROM, MAN and LAN, and between workstation and supercomputer. However, some displayed weaknesses in comparing a hub and router and in comparing EPROM and EEPROM. The characteristics of the transmission media given were also well described. However, weak responses were obtained for Part (c), when describing network-related problems that can be solved using diagnostic tools. Many candidates also seemed unfamiliar with compression utilities. Their discussion of radio waves as a transmission medium was often poor.

Question 2

This question tested candidates' understanding of issues related to purchasing a mouse, the role of the user interface in an operating system, and various network-

related concepts such as microwave transmission and the FDDI and ring network topologies. Candidates gave very good responses on the issues related to purchasing a mouse, but the role of the user interface in an operating system was not clearly explained. Also, most candidates were unaware that FDDI is composed of two rings of fibre-optic cable. This caused them to lose marks in the other sections of Part (d). Candidates generally gave good answers for how data is transmitted in a ring network, but often failed to mention the presence and purpose of the token.

SECTION B – Application of Computers

Question 3

This question tested candidates' understanding of the changing information needs of an organization over time as well as their understanding of the historical changes in computer applications over time. Very few candidates (less than 5%) chose to answer this question. From the responses obtained, it seemed that few candidates understood what was being asked by the question and their responses were vague and off the point. Even though candidates were able to identify changes in storage and processing capabilities, they did not relate these changes to the specific needs of the business, such as handling an increased number of customers, employees, products, etc. In Part (c)(i), candidates were generally unable to specify the information processing activities that would take place at the operational and

strategic levels of the organization. Candidates need to be able to better distinguish between the operational and strategic aspects of information processing in an organization. However, it is encouraging to note that in Part (c)(ii), several candidates were able to correctly identify transaction processing systems, management information systems, and other systems that could be used at the organization.

Question 4

This question tested candidates' in-depth understanding of data security and how to protect data in an organisation, both from unforeseen circumstances such as hurricanes and fire, and from unauthorised access. More than 95% of the candidates attempted this question and all parts of this question were generally answered well. In particular, there were very good answers for Part (a)(i) when candidates were asked to discuss two means by which unauthorised access to data could occur in the bank.

SECTION C – Computer-based Problem Solving

Question 5

This question tested candidates' knowledge and understanding of using different computer-based tools to solve a real-life problem of attracting investors to a company. Only about 30% of the candidates chose to answer this question instead of Question 6. Candidates were able to correctly identify software tools and explain how these could be used in the company's venture to attract investors. However, marks were often lost because an appropriate discussion was not given.

Question 6

This question tested candidates' knowledge and understanding of information sources and evaluative criteria that can be used to determine the validity of an information source. It also tested candidates' understanding of the problem solving process required for developing a computer-based solution for a business problem. About 70% of the candidates opted to answer this question. Part (a)(i) was answered well by most candidates who correctly identified four other sources of information that could have been used to confirm the information obtained. Part (b) was also answered well by most candidates who recognised that many different kinds of information could be obtained from the Internet. However, candidates were weak in their understanding of evaluative criteria for information, such as currency and authorship. Weak responses were also obtained for Part (c) when describing the four stages of the problem solving process.

UNIT 2

PAPER 01

Section A – Software and Software Development

Question 1

Candidates answered the question generally well although many of them did not fully explain their answers. Most candidates had some concept of the answers required and most stated responses either exactly as required or provided synonyms for the terms required. A few candidates interpreted the term 'development' as 'design'.

Question 2

This question was poorly answered. One strong point was that candidates knew the steps for the waterfall model. Some candidates did not understand what was required

for Part (a) and simply stated the phases. Generally, candidates had a poor understanding of the waterfall model when compared to the evolutionary model of software development. Those who understood the models emphasized the wrong points. For Part (c), some candidates needed to understand that stating an advantage/ disadvantage is not enough; it must also be explained.

Question 3

This question was answered fairly well. There were many good responses for Part (a). Some candidates confused the feasibility study with the steps of the development process.

Question 4

This question was answered fairly well by most of the candidates. Generally, the data flow diagrams were well done. However, misconceptions on functional/non-functional requirements were present.

Question 5

This question was generally done satisfactorily. Candidates had a strong understanding of user-interface design principles. There were some misinterpretation and confusing arguments in some of the responses of the candidates.

Section B – Programming Languages

Question 6

There was a **major** misinterpretation of this question by candidates. Some candidates focused on the systems development life cycle rather than the characteristics of a program. Generally, the candidates who scored between 6 to 8 (highest) had a good knowledge of the concepts and theory being examined. A few candidates misinterpreted the question as the "stages of a compiled program" and the "software life cycle".

Question 7

Generally, the performance on this question was good and there were several cases where candidates got full marks. Most candidates knew how to describe imperative languages. However, many candidates were unable to describe declarative languages. For Part (b), some candidates thought that defining a top-down approach was specifying an advantage.

Question 8

Overall responses for this question were very good but in some cases, groups of candidates performed very poorly. In many cases candidates achieved full marks. Candidates did very well at distinguishing between 2GLs and 3GLs. Many candidates did not relate their explanations of the factors given (such as runtime / portability / maintainability) to the issue of choice of programming language. In the context of choice of programming language, the responses were generally vague. Many candidates could explain the factors given (in isolation), but displayed confusion when attempting to say how the factors influenced the choice of a programming language.

Question 9

The performance on this question was fair. Logical thinking by candidate was generally not displayed. Loops were in the wrong place and many candidates had the correct logic, but lost marks when printing the required value. The drawing of flow charts instead of writing an algorithm was one of the weak points. The use of an array to store the values instead of the use of two variables would have also been a correct approach to this question. Candidates need to read the question to determine what is required. More practice on the logical flow of a solution should be done. Practical coding would benefit both candidates and teachers.

Question 10

This question was not done very well. Many candidates were able to define the term algorithm. However, some candidates could not distinguish between bounded and unbounded iteration and it was clear that they were not familiar

with the terms. Also, many candidates did not have a good grasp of classes and objects as well as private and public methods.

SECTION C – Program Development

Question 11

The responses in this question were fairly good. Part (a) and Part (b)(i) were answered fairly well. However, Part (c) was challenging to candidates. Many candidates were able to identify the user interface objects and describe the purpose of these objects quite well except for fonts. Most identified the event in Part (b)(i) correctly. In Part (b)(ii) many candidates wrote algorithms based on procedural programming. Some candidates actually wrote programming code for Part (b)(ii), but an algorithm was required. Future candidates are encouraged to gain practice in writing algorithms for event-driven programming problems.

Question 12

This question was not well done by most candidates. The candidates who knew the material scored higher marks and the remainder performed badly. Some candidates drew the stack and showed the contents or used trace tables. Some candidates did not show the contents of the stack during each pass of the loop and just wrote the output. Many candidates did not seem to understand the purpose of the "else" statement. In the end, many could not figure out the purpose of the algorithm. Future candidates and teachers are encouraged to gain practice in tracing and understanding algorithms by using more practical examples of ADTs.

Question 13

The responses to this question were generally not of a high quality. In many cases, it was clear that candidates did not know the proper syntax for programming statements and tended to give answers in pseudocode. Candidates need to obtain more practical experience in programming to answer the questions in this section.

Question 14

The responses to this question were generally good. The strong point of this question was candidates' ability to correctly list four tools typically provided in a programming environment. However, the explanation of how these tools are used was often poor, with few candidates being able to differentiate between a tracer and a stepper. DFDs, HIPO charts etc. were common responses. It is suggested that candidates make more active use of the tools in a programming environment so that they can answer questions of this nature.

Question 15

The responses to this question were fairly good. Most candidates were able to list two types of documentation and describe them properly. More than 50% were able to get at least 1 out of 2 for Part (a)(i). Some candidates gave the same explanation for unit testing and system testing. The key difference between unit and system testing needs to be understood by candidates. A good response should have included a phrase like "integration of modules" when describing system testing. More practical examples should be used in demonstrating to candidates how system testing and unit testing is done.

PAPER 02

Section A – Software and Software Development

Question 1

The question was fairly well answered by candidates. Candidates comfortable with data flow diagrams (DFDs) gained most of the marks for this question. Most candidates were able to identify the customer entity in the DFD. Some candidates were able to explain what is an entity-relationship diagram (ERD) but were unable to differentiate between an ERD and a data dictionary. Candidates often confused data flow diagrams with ERDs and flow charts. Hence they were unable to give good answers for Part (b). Candidates were also unable to give a good example to explain what is a data dictionary. Future candidates need to gain more practice in drawing DFDs. The distinction between DFDs and other types of diagrams such as ERDs should also be carefully made and their respective symbols clearly distinguished.

Question 2

In Part (a), most candidates were unable to properly explain the use of CASE Tools. Part (c) of the question was answered well by many candidates. The strong points of candidates in this question were in identifying the attributes and relationships in Part (b), defining object-oriented design in Part (c), and listing the design process activities in Part (c). . Candidates also need to know the proper symbols to use when drawing an entity-relationship diagram (ERD) and the features of function-oriented design. Future candidates also need to gain more practice in drawing ERDs and understanding the differences between other types of diagrams such as data flow diagrams.

Section B – Programming Languages

Question 3

Candidates demonstrated a poor grasp of several basic concepts in computer programming and the only strong point observed was in their explanations for Part (a), on generations of programming languages. Most candidates had no understanding of the concept of recursion and how to write a recursive algorithm. Candidates should spend some more time on the topic of recursion and in understanding control structures (if-else, loops).

Question 4

The responses to this question were generally good. The concept of an object, instance variables, and classes were understood by most of the candidates. Parts (b)

and (c) were generally answered well; however, Part (c) had some poor answers. In Part (a), some candidates were unable to identify the accessor and modification methods required, so they just wrote any methods that came to mind. Candidates also demonstrated weakness in explaining the concept of encapsulation. In Part (a)(iv), they also had some problems in drawing the class diagram for the *Plane* object. In the future candidates should practice drawing class diagrams listing the attributes, and methods of a class.

SECTION C – Program Development

Question 5

This question was poorly answered, especially where ADT operations were required. The best-answered portion of the question was Part (a), which required candidates to identify different types of GUI controls for the user interface. Candidates need to develop application and synthesis skills to tackle the problems in this section. Many candidates

are weak at problem solving and algorithm design. To perform well in this section, future candidates need to improve in these areas.

Question 6

This question was generally not answered well. However, there seemed to be an improvement in the quality of responses to this type of question, compared to the examinations of 2004. Some candidates are still not able to write proper programming statements. In Part (a), many candidates did not understand what "constructors" and "accessors" were. In Part (b), the "addStudent" method was generally poorly done, with incorrect code being written. Part (c) was generally well done except for section (iii), which involved adding *Student* objects to a *Faculty* object. This operation required the *Faculty* object to have a data structure such as an array that could be use to hold the *Student* objects. The "addStudent" method is then implemented by inserting the *Student* object into the array at an appropriate position (e.g., the end of the array).

PAPER 03

INTERNAL ASSESSMENT

GENERAL COMMENTS

The performance on the Internal Assessment was generally good. However, compared to the performance in 2004, there was a decline in both units, especially in Unit 2. It was observed that the projects submitted by candidates were deficient in various aspects and were still being awarded high marks by teachers. There were also a number of cases where it was clear that candidates did not know exactly what was

required of them in the Internal Assessment and consequently, obtained very low marks. Better performances on the Internal Assessment should lead to better overall performances on both units as well as better performances on the other papers. Candidates need to maximize the opportunity to get higher marks on the Internal Assessment. Teachers also need to become more closely involved in the supervision of the projects. This should lead to an improvement in candidates' performance on the Internal Assessment, solidifying their understanding of the theoretical aspects of the units, which in turn, will lead to an overall improvement in performance.

Generally, most candidates chose appropriate topics for the Internal Assessment. The topics chosen were relevant to the level of the candidates and the specific objectives of the respective syllabuses. The treatment of the topics by the candidates was adequate. A small percentage was comprehensive though some tended to be superficial. The reports were also generally well presented and teachers complied with requirements such as ensuring that there was a cover page for each project and entering the marks on the required form.

DETAILED COMMENTS

Unit 1

Some of the projects submitted demonstrated below average performance in a number of areas such as description of context, purpose of study and solution process. In many cases, the responses to these areas and others defined in the syllabus were non-existent, vague, or poorly expressed. Often, marks were awarded to areas that were not specified in the syllabus and in those instances teachers were not adhering to the mark scheme provided. In other cases, full marks were awarded even though the defined criteria were completely absent.

In the problem identification section, it was clear that a number of candidates did not understand the term "external entities and processes". The description of the current system and procedures also needed improvement. Candidates took the purpose of their study straight from items described in the syllabus. However, these items need to be tailored to their specific projects. Finally, candidates need to be reminded that there is a word limit for their projects.

Unit 2

There were a few cases where candidates used the old Unit 2 syllabus to prepare their Internal Assessment. As a result, irrelevant information was submitted. Similar to Unit 1, marks were often awarded in a manner that was not consistent with what is defined in the syllabus.

From the moderation of the Internal Assessment, it is clear that many candidates do not understand how to write programs in a programming language. In some cases, candidates wrote pseudocode where program code was required and this was awarded full marks. In most cases, the functionality of the program written was poorly described and there were no screen shots of the working system displayed in the reports (perhaps indicating the inability of the program to work in the first place).