

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION**

MAY/JUNE 2004

COMPUTER SCIENCE

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INTRODUCTION

This is the fourth year of open examinations for the Unit-one course comprising three papers and the third year for the Unit-two course. Papers 01 and 02 for both units were examined externally by CXC while Paper 03 was examined internally by the teacher and moderated by CXC.

Paper 01 consisted of three sections, each corresponding to a module of the syllabus. There were five compulsory short-response questions within each section, for which a maximum of 50 marks could be obtained, for a total of 150 marks.

There were six questions of equal weighting in Paper 02, two questions per module and candidates were expected to answer one question from each module. These extended-response questions required more depth of understanding than the questions in Paper 01.

The individual contributions of Papers 01, 02 and 03 to the examination remained 50 per cent, 30 per cent and 20 per cent respectively.

GENERAL COMMENTS

Performance in Unit 1 suggests that teachers and candidates are completing the syllabus, and as such candidates are for the most part performing well.

Examiners continue to be very concerned about candidates' performance in Unit 2; in particular Modules 2 and 3 where programming knowledge is tested. Candidates continue to find it extremely difficult to write even simple programs, especially in the object-oriented languages.

However, it appears that teachers are not completing the syllabus for Unit 2, and therefore, candidates are coming to the examination having not acquired all the necessary skills. It seems that candidates are not getting the necessary practice during preparation for the examination. Perhaps this is so because, in many cases, they are coping with learning a new programming language, whilst simultaneously developing a system in order to satisfy the requirements for the internal assessment. For Unit 2, teachers are reminded to have several practical sessions with students before the final exam.

Candidates should be encouraged, as part of their examination technique, to read questions carefully and to respond with sufficient detail to commensurate with the marks indicated.

DETAILED COMMENTS

UNIT 1

PAPER 01

SECTION A – Components of Computer Systems

Question 1

This question tested candidates' knowledge of terms relating to computer hardware. In general, part (a) was poorly answered. Many candidates described clock speed as time taken to perform a task. Few candidates were able to mention the function of cache memory. The main strong point in the responses was the ability of most candidates to correctly identify two problems that the UPS can prevent. In a few cases candidates listed features of the UPS as problems that it can prevent.

Question 2

This question examined candidates' understanding of the resource management functions of an operating system. Candidate response was generally weak. There were no strong points in the responses. Of particular concern was the candidate's lack of knowledge of deadlock, interrupt and channel bandwidth. A bit more depth of coverage of this area of the syllabus is recommended so that candidates can express themselves more clearly.

Question 3

This question tested candidates' knowledge of the reasons why operating system (OS) software needs to be kept up-to-date and the services offered by disk management software.

The average mark for this question was 50 per cent. Most candidates failed to give correct responses to Part (a). They seemed not to recognize that updates are really additions or changes to the original software. Updates are needed to fix errors due to undetected bugs; add new features to the OS; provide new code that can perform tasks more efficiently. There were generally good responses to Part (b). Generally,

candidates were able to correctly identify the services offered by disk management software.

Question 4

This question tested candidates' understanding of the functions of components in a network. Candidate responses were generally good. The diagrams and explanations relative to a hub in a network were quite good. The meaning of 'data encryption' was well explained, including the method and reasons. Candidates understood the need for confidentiality and security. Items that are normally encrypted were correctly identified.

Question 5

This question examined candidates' knowledge and understanding of transmission media and network topologies. The overall performance on this question was fairly good. Parts (a) and (b) (i) were well answered. Candidates seemed not to understand what was required for Part (b) (ii). The main weak point was that many candidates' descriptions of the FDDI topology were not reflected in the diagrams that they drew.

SECTION B – Application of Computers

Question 6

This question was designed to test candidates' understanding of the role of computers within an organization. The majority of candidates seemed to have misinterpreted the question. They treated the application areas of the business as Word Processing, Spreadsheets and Database Management. Consequently, responses to Part (b) were generally meaningless.

Question 7

This question tested candidates' knowledge of the various types of information systems. This question was generally well done. Part (a) was well known by most candidates. However a few candidates did not mention at which level in the organization the information system was used. The main weaknesses were in Part (b). Few candidates were able to recognize that an 'executive information system' is similar to a 'decision support system'.

Question 8

This question tested candidates' knowledge of issues relating to telecommuting, piracy and data security. Part (a) was not answered well by a lot of candidates. Most candidates mistook telecommuting for telemarketing and wrote about buying and selling. Part (b) was well done as most candidates knew the implications of pirating software and also the use of firewalls and encryption.

Question 9

This question examined the different types of data security and the strategies for ensuring data security. This seemed to be a popular topic with candidates. The question was very well done. The security controls were well identified and explained.

Question 10

This question tested candidates' knowledge of the benefits and drawbacks of using a computer-based system in an organization. This question was generally well-answered. Most candidates were able to give good responses. Candidates should be encouraged to use examples, descriptions and explanations that are required at this level.

SECTION C – Computer-based Problem Solving

Question 11

This question assessed candidates' knowledge of the use of a computer-based tool in the solution to a real-life problem. The question also tested knowledge of information sources. It was answered very well. The only weak point was that a few candidates did not know the features of the tools that were useful in performing the given task.

Question 12

This question tested candidates' knowledge of the characteristics of information sources. The responses were for the most part reasonable. Candidates were able to correctly identify and discuss characteristics such as *currency, relevance, cultural context, bias, accuracy* etc. In part (b), even though candidates knew differences between 'book and newspaper', 'CD-ROM and DVD-ROM', those differences did not relate to information. Surprisingly many could not state similarities such as: *book*

and newspaper – both use a printed medium *CD-ROM and DVD-ROM* – both based on optical technology; both can store at least 650 MB.

Question 13

This question tested candidates' knowledge and understanding of issues related to online/internet publishing. Part (a) was poorly done. Candidates failed to recognize that the publisher could derive revenue by letting customers pay a fee to subscribe and then each customer gets a username and password. Parts (b) and (c) were fairly well done. Candidates were able to correctly describe advantages and disadvantages to the customer of having the book available online.

Question 14

This question tested candidates' knowledge and understanding of the selection of computer-based tools that are best suited to a given situation. The question was generally well done. In both Parts (a) and (b), the candidates demonstrated that they were familiar with the tools and that they knew the appropriateness of the chosen tool for the task to be performed. In Part (c) there was some doubt as to the precise functions of the built-in grammar checker. For example some did not know that a grammar checker also provided the meaning of words.

Question 15

This question tested candidates' knowledge and understanding of issues relating to different types of information sources. This question was very well done. Candidates were easily able to identify information sources and suggest why they were suitable choices. The difficulty was with Part (c) where the discussion on the disadvantages was limited and most candidates received 2 of the allotted 4 marks for that section.

PAPER 02

SECTION A – Components of Computer Systems

Question 1

This question examined candidates' knowledge and understanding of different types of networks, network configurations and protocols. Generally Part (a) was answered fairly well. Some good diagrams were drawn. However, in some cases candidates'

description of the function of the Virtual Private Network (VPN) was limited. They omitted the fact that the VPN devices at the branches translated between the packet format of the Internet and the packet format of the networks at the branches. Part (b) was well known by most of the candidates. Part (c) was poorly done. Many candidates could not show how the peer-to-peer and client/server configurations could co-exist on the same network. Most candidates got the OSI model correct. The weaker candidates were able to draw at most 4 layers in the correct order. The main weak points in the responses were the major cost associated with VPN and the client/server – peer-to-peer diagram.

Responses to this type of question can improve with a better understanding of network types, especially VPN and VAN.

Question 2

This question was designed to test candidates' knowledge of network components and their understanding of the factors that have to be considered when installing networks. This question was poorly done. Most of the candidates got less than 30 percent of the marks allocated. For Part (a) very few could identify the factors to be considered. Even fewer understood what was involved in providing simultaneous Internet access to a number of computers in a network. For Part (b) again only a few candidates correctly identified component A as a *gateway* and component B as a *hub*. The majority of candidates obtained the marks for Part (c).

SECTION B – Application of Computers

Question 3

This question tested candidates' knowledge and understanding of data security issues/problems, and their understanding of expert systems. Responses were generally good. Part (a) was well answered. Candidates demonstrated a good understanding of the data security problems - and the strategies to deal with those problems - which a company may face when sensitive data is held on a computer. In response to Part (b), candidates' definitions of an expert system were not clear. For Part (c), some gave advantages of expert systems such as: hospital can save money by hiring fewer doctors. Those who attempted Part (d), mentioned only one disadvantage, namely that the expert system could misdiagnose and possibly lead to the death of a patient. Another disadvantage is that the system is difficult to keep up-to-date with all recent medical findings.

Question 4

This question tested candidates' knowledge of the use of robots in industry, and issues relating to the use of Automatic Teller Machines (ATM) in banks. The question was for the most part well done. Most candidates were familiar with the use of the robotics, particularly in a vehicle assembly plant. Part (c) was also well done. Candidates demonstrated a good understanding of the ATM. The question intended to ask for one technique that the *bank* could use to protect a customer's account from disclosure while using the ATM. However, many candidates interpreted the question to be requiring one technique that the *customer* can use. Part (a) was the weak point. Candidates did not understand what an expert system was and therefore could not properly answer this part. On the whole this was a very popular question.

SECTION C – Computer-Based Problem Solving

Question 5

This question tested candidates' knowledge and understanding of the stages in the problem-solving process, and their ability to describe types and characteristics of information sources. Very few candidates answered this question to the satisfaction of the examiners. Those who attempted Part (a), succeeded only in listing the stages in the System Development Life Cycle, but were unsure of the deliverables of each stage. Part (b) was fairly well done. The responses to Part (c) showed that candidates had ideas of what was required but had difficulty expressing their ideas clearly.

Question 6

This question examined candidates' knowledge of the features of modern productivity tools, and their suitability to certain tasks. Overall performance in this question was fair. Part (a) was well done with most of the candidates obtaining more than 75 percent of the allotted marks. Many candidates did seem to understand the question. Many wrote of preventing paper wastage by reducing font size and margins. In Parts (c) and (d), candidates stated the features without full descriptions as to their suitability for the given task.

UNIT 2

PAPER 01

SECTION A – Software and System Development

Question 1

This question tested candidates' knowledge and understanding of the need for a structured approach to software development and the activities that are common to all software development processes. Both sections of the question proved difficult for the candidates. Part (a) was poorly done. Many candidates wrote the stages of the System Development Life Cycle. Even though most candidates performed better in Part (b), the responses given were for the most part verbatim from the recommended texts.

Question 2

This question examined candidates' knowledge of the attributes of well-engineered software, and the effect that lack of such attributes will have on the software. This question was fairly well done by most candidates. Some candidates, however, correctly identified the attributes of well-engineered software, but gave incorrect descriptions. Responses to Part (b) were in many cases generalized and were not related to the attributes stated in Part (a). A comparison chart or attribute table may be instructive in assisting candidates with this area of the syllabus.

Question 3

This question assessed candidates' knowledge of functional and non-functional requirements and the techniques used in the analysis phase to obtain these requirements. This question was very well done.

Question 4

This question tested candidates' knowledge and understanding of the use of Data Flow Diagrams (DFD) during analysis. Part (a) was well done. In Part (b) many candidates copied the symbols as given in the question, but were unable to identify the data flows to complete the DFD. More exposure to DFDs should be provided.

Question 5

This question examined candidates' knowledge and understanding of the activities, tools, techniques and deliverables of the design phase of software development. Most candidates were able to list the activities of the design phase, but had difficulty in providing meaningful explanations. For example many candidates did not include key terms in their responses such as a HIPO chart emphasises the 'relationships' among the elements of a system. Most mentioned only that the HIPO chart showed input, processing and output. Most of the examples used did not reflect a system, but rather a component of a system. Candidates should have more exposure to practical examples of the use of HIPO charts and teachers should ensure that proper annotations are included.

SECTION B – Programming Languages

Question 6

This question assessed candidates' understanding of the term 'algorithm' and their ability to write a simple algorithm. Most candidates were able to explain what was meant by the term 'algorithm'. However, many had difficulty writing the required 'algorithm' for Part (b). Candidates need to be given more practice in the writing of 'algorithms'.

Question 7

This question tested the candidates' knowledge of the characteristics of programming languages, and the ways in which programming languages differ. The question was generally well done, however, many candidates attempted to give too much detail when the question asked for 'brief' descriptions. In their description of the object-oriented programming paradigm, many candidates omitted the fact that the programs consist of a set of communicating objects.

Question 8

This question examined the candidates' knowledge and understanding of programming constructs and tested their ability to describe the function of the constructs using examples in each case. Most of the candidates were able to describe the function of the construct and provide appropriate examples. However, surprisingly, they could not identify the constructs by their names, for example, 'selection', 'iteration', 'sequencing'.

Question 9

This question tested the candidates' understanding of the factors that have to be considered when choosing a programming language for a given application. The question was generally well done. The candidates' main strong points were in identifying the factors to be considered. However, their explanations were far from adequate. Part (b) was poorly done - only a few candidates demonstrated any understanding of the functional programming paradigm.

Question 10

This question tested candidates' understanding of concepts associated with the object-oriented and procedural paradigms. Many candidates had a general idea of the conceptual building blocks of object-oriented design, but only a few demonstrated real mastery. Almost all candidates were able to explain the term 'recursion' with respect to the procedural paradigm. Part (c) was generally well done.

SECTION C – Program Development

Question 11

This question tested candidates' ability to draw the layout of a simple Help system using a Graphical User Interface (GUI), and to identify events that the help system should anticipate when the user interacts with the system. In Part (a) most candidates had difficulty identifying the events and it was clear they were not sure what an event was. For Part (b) it was widely known by candidates that a diagram had to be drawn. However, many candidates did not properly identify the GUI objects in the layout. In some cases candidates thought that designing a layout meant writing a description or writing code.

Question 12

This question tested candidates' knowledge and understanding of abstract data types (ADT) and operations on ADTs. Parts (a) and (c) were answered well. However, Part (b) was poorly answered. Generally, candidates demonstrated little knowledge of ADT operations.

Question 13

This question assessed candidates' knowledge of the tools typically available in a programming environment. This question was generally poorly answered. Candi-

dates were unable to identify or describe editor features. Some even confused this development tool with a newspaper editor. In Part (b), candidates were able to state the tools but could not describe them.

Question 14

This question examined candidates' knowledge and understanding of the activities of the implementation phase of software development. This question was fairly well done. Most candidates knew what code libraries were and the purpose of user documentation. Some candidates however did not describe the advantages of using code libraries during the coding process even though they knew what they were. Many candidates did not realize that the testing required was unit testing, system testing or dry-run testing.

Question 15

This question tested the candidates' ability to write code in an object-oriented programming language to implement a 'Square' class. Many candidates attempted this question, but the responses were generally very poor. The candidates had particular difficulty with the writing of constructors. In addition, many candidates did not know which methods did and did not require parameters.

PAPER 02

SECTION A – Software and Systems Development

Question 1

This question tested candidates' understanding of the software development life cycle models and the tools and techniques of the analysis phase of software development. The overall response to the question was for the most part satisfactory. There were many correct responses to Parts (b) (i) and (c). In Part (a) some candidate confused the word 'features' with 'steps' and so most of them simply listed the steps in the 'waterfall' approach. Parts (b) (ii), (b) (iii) and (d) were poorly answered. Even though it is clear that candidates are familiar with evolutionary development, they are unable to discuss the pros and cons of one development approach viz a viz another. The responses to Part (d) expose the need for more practice in the use of data flow models to document the flow of data.

Question 2

This question examined candidates' ability to differentiate between: 'top down' and 'bottom up' design strategies; functional and object-oriented design strategies; and to identify the features of good software design. In Part (c), an Entity-Relationship Diagram (ERD) was needed to capture given information. Candidate responses indicated that this was a less popular question but the responses were generally satisfactory. Some of the strong points in this question were the ability of the candidates to correctly draw the ERD, and their understanding of the differences among the various design strategies. The weak point was that many candidate responses to Part (b) (i) showed that they were unclear about what was required and consequently they were unable to answer Part (b) (ii). It seems this was a first exposure to this type of question.

SECTION B – Programming Languages

Question 3

This question tested candidates' understanding of the major stages in the compilation process and their ability to compare the procedural and object-oriented paradigms. Candidates were also required to write recursive and non-recursive functions that involved finding the factorial of a non-negative integer. Parts (a) and (b) were generally well done. However, in Part (a) the candidates did not explain the stages in sufficient detail. For Parts (c) and (d) few candidates were able to formulate a solution. The majority simply did not know how to approach the problem. More time has to be spent on the development of algorithms in the problem solving process.

Question 4

This question assessed candidates' ability to identify and use programming constructs, features and techniques in both the object-oriented and procedural paradigms. Candidates' strength was demonstrated in their ability to identify objects in an application, state, with type, instance variables for each object and use examples to differentiate between bounded and unbounded iteration.

Some candidates thought that the use of the word 'specify' in Part (d) meant that they were to write code. The responses to Part (g) indicated that the candidates were guessing at the role of the linker in a programming language. The candidates performed generally well in this question.

SECTION C – Program Development

Question 5

This question tested candidates' ability to develop an object-oriented application to keep track of course and student information for a university. Candidates' understanding of abstract data types (ADT) and their operations was also tested. This was a very popular question among candidates, but the responses were generally poor. The only strong point was the ability of candidates to declare the class attributes in Part (a) and to identify the appropriate ADT and operations in Part (b). Writing code for the class – constructor and methods proved very difficult as candidates did not understand what was required. In the classroom greater attention needs to be paid to the syntax of the language which the candidates are expected to use in the examination.

Question 6

This question tested candidates' knowledge of the operations of the queue abstract data type (ADT), and their ability to write code to implement the queue ADT as a class. Few candidates attempted this question. Those that did attempt it were able only to describe the function of each of the operations. Writing code proved extremely difficult for the candidates. For the most part there was a clear lack of understanding of object-oriented language programming. Candidates' performance on programming questions can be improved only with practice in the classroom.

PAPER 03

INTERNAL ASSESSMENT

GENERAL COMMENTS

Candidates performed well on the Internal Assessment. For the most part the projects areas were well chosen, covering a variety of areas and the reports were generally of good quality. Candidates did best when the projects were based on real situations which they had experienced.

SPECIFIC COMMENTS

There are some concerns which the moderators have with the samples submitted.

Unit 1

The main areas of concern are

- The awarding of marks for work not submitted. In one instance, the teacher awarded full marks for Networking when the candidate did not present any work on networking.
- The *Data Analysis* and *Organizational Impact* sections of the report were poorly represented in the project submitted.

Teachers (especially new teachers) are reminded that they should be fully familiar with the requirements and composition of the Internal Assessment and are to be guided by the criteria set down in the syllabus.

Unit 2

- Some of the samples submitted were not of the standard expected of candidates at the CAPE level.
- All section of the report must be submitted since moderators must be able to verify the marks awarded to each candidate.
- Testing of projects was often totally inadequate. Sample output from screens, must be included as part of the documentation to verify that the program is working.
- In many cases the user documentation was inadequate.
- The written report is expected to reflect the work done from the beginning of the project, not simply to concentrate on the finished product.