CARIBBEAN EXAMINATIONS COUNCIL

REPORT ON CANDIDATES' WORK IN THE CARIBBEAN ADVANCED PROFICIENCY EXAMINATIONS

MAY/JUNE 2003

COMPUTER SCIENCE

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INTRODUCTION

This is the third year of open examination for the Unit-one course comprising three papers and the second year for the Unit-two course. Paper 1 and 2 for both units were examined externally by CXC while Paper 03 was examined internally by the teacher and moderated by CXC.

Paper 1 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 per section could be obtained, a total of 150 marks.

There were six questions of equal weighting in Paper 2, two question per module and candidates were expected to answer one question from each module. These extended-response questions required more depth of understanding than questions in Paper 1.

The individual contributions of Papers 1, 2 and 3 to the examination remained 50 per cent, 30 per cent and 20 per cent respectively.

GENERAL COMMENTS

For Unit 1, the module 1 mean score was higher than all the previous years. The mean score for module 2 was almost the same as last year's. Candidates performed fairly well in module 3.

Performance on both the procedural programming and object-oriented programming of Module 2 and Module 3 of Unit 2 was below the required standard. It appears that most of the candidates did not acquire the skills stated in the syllabus. A large part of Unit 2 involves the development of programming skills and teachers and candidates should be reminded that such skills are acquired by a significant amount of practice with real life problems on the computer.

DETAILED COMMENTS

UNIT I

PAPER 1

SECTION A – Components of Computer Systems

Question 1

This question examined candidates' ability to differentiate between pairs of terms related to computers and information systems. In this question, some candidates incorrectly identified a mini-computer as a hand-held device such as PDA or watch. Many of the candidates also compared the speed of the two types of systems but failed to indicate which was faster. Few candidates adequately identified the mainframe's ability to scale better than a minicomputer to handle load increases. Candidates generally knew the English meanings of 'distributed' and 'centralized' but failed to adequately identify how the systems were different. Many candidates also did not identify the means by which data and other resources were accessible in either system. Candidates frequently gave a definition for a client and the converse for a server without indicating clearly that the server does not request services from the client. A few candidates also referred to the client incorrectly as the 'end user' when doing the comparison.

Similar to Part (b), candidates generally defined what a VAN and VPN were but after expanding the acronyms, did not differentiate between the two. Many candidates used examples to attempt to compare the technologies but unfortunately were either vague or incorrect in their examples, in addition to not providing characteristics for differentiation.

Question 2

This question examined candidates' knowledge and understanding of peripheral and secondary stage devices.

Most candidates did very well on this question. Some candidates were unable to give the correct meaning for a peripheral device. Few candidates were unable to give all three examples of peripheral devices but could at least name one.

Most candidates were able to answer Part (c) correctly.

Question 3

This question examined candidates' knowledge and understanding of various components of a computer system. Candidates handled this question fairly well. In Part (a), one weakness was that in some cases vague or insubstantial differences were given; for example "system software is needed for the computer to operate while the computer will work without application software". This is a valid point and thus credit was given to

candidates. However, answers which pinpointed clear differences in nature and functionally are more substantial. For example, the system software manages the hardware resources of the computer while applications software provides a service directly to the user. System software interfaces with the hardware directly while application software gains access to the hardware resources only via system software.

In Part (b), candidates were in most cases awarded only one out of the two possible marks. Many candidates spoke about CD-ROM being erasable and re-writeable via electrical pulses. Many did not specifically address an advantage of EEPROM.

Part (c) was also poorly answered in a number of cases.

Frequent misconceptions were:

- Cache is larger than ROM

- Cache is virtual while RAM is real

- Cache is permanent while RAM is temporary.

Part (d) of this question was handled fairly well by most candidates.

Question 4

This question was designed to test candidates' knowledge and understanding of various software utilities and network topologies.

Part (a) of this question was answered well by the majority of candidates.

In Part (b), a number or candidates responded that data transmission could still occur.

In Part (c), responses were generally correct.

Responses in Part (d) were too broad. Many candidates demonstrated a thorough understanding of the difference between an antivirus and encryption utility.

A number of candidates responded that the ring would work if the failed system were removed. On the whole, a greater understanding of the characteristics and communication methods employed by the Bus and Ring topologies are required. Visual aids showing how data is sent and received on a network as well as the effects, responses of data collision and system and cable faults are required.

Question 5

This question tested candidates' knowledge of rings and networks. Overall, the most difficult part of this question for candidates seemed to be Part (d). Most candidates knew

about the ring network, but hardly anyone could say how the FDDI was different from the ring. The FDDI consists of two rings, with data being transmitted in two directions. If one of the rings fail in the FDDI network, the other ring can be used as a back-up.

Question 6

This question assessed candidates' ability to differentiate between different types of computer application and modes of processing.

Part (a) of this question was answered generally well. A large number of candidates demonstrated that they knew the differences between processing in batch mode and processing data online. Good responses included "Batch is the processing of data at set intervals, such as of peak periods. Batch processes need little user interaction". A number of candidates, however, gave examples of manual procedures such as sorting files; mail by hand and 'teachers collecting marks for candidates'.

In Part (a) (ii) of this question, the examples given were good overall.

Part (b) was poorly answered by the majority of the candidates. Some candidates simply answered that MIS is used to manage information and DSS is used for decision-making. Good responses for Part (b) included:

(i) the nature of information, structured or unstructured;

(i) the level of organization, operational or strategic and

(i) the analysis method, summary or analytical.

In Part (c), many candidates responded by giving monitoring systems only. Many times the control aspect was ignored.

SECTION B –Application of Computers

Question 7

This question tested candidates' knowledge of data integrity issues as it relates to a computer system.

In Part (a), most candidates excluded the fact that data integrity also dealt with the currency and consistency of data. Many candidates emphasized only the accuracy of data. A few candidates also confused data integrity with data security.

In Part (b), most candidates performed poorly and ignored the fact that methods of maintaining data integrity can include storing data in one central location rather than having to update data in more that one location. This helps in controlling data redundancy

and helps maintain the integrity of the data. Application programmes may also perform various checks such as violation checks. Candidates also included the use of encryption and passwords, but didn't go on to specify how passwords and encryption can help to maintain the integrity of data. A few candidates also mentioned antivirus protection without sufficient explanation.

The majority of the responses from candidates in Part (c) dealt with data being damaged as a result of power outages but they weren't specific enough. Candidates didn't say whether or not the data was lost through the data storage medium being damaged or if the data was on a volatile medium. Others went on to give a solution to the problem that would involve buying a UPS rather than explaining how it works after being implemented in the system.

Candidates also ignored the fact that if viruses were spread through the use of diskettes, then antivirus software could be used to get rid of viruses.

Question 8

This question tested candidates' knowledge of an 'expert system' in a public hospital environment. The question was generally not well done by the majority of candidates.

In Part (a), some candidates were not clear with their definitions of an Expert System. Most knew that this was a knowledge based system but did not state either that this knowledge came from experts in a particular field or that the knowledge was used to make inferences similar to that of an Expert. They also did not know that it comprised of both hardware and software.

In Part (b), candidates again lacked proper explanations of the features of the Expert Systems, as it would apply to use in a hospital. Most knew of the large knowledge base but few explained the other abilities properly such as, the ability to deal with incomplete information, ability to evaluate complex situations and ability to explain reasoning when coming up with its diagnoses.

In Part (c), candidates seemed to have either misinterpreted or misread the question. Instead of giving reasons why a doctor would be reluctant to use an Expert System, they gave just the opposite.

Most knew of the doctors' fear of computers either taking over their jobs or using the computer, and afraid of wrong diagnoses. Few candidates gave reasons for the lack of use and testing. Also no mention was made of legal and ethical concerns if misdiagnosis occurs.

Question 9

This question examined candidates' knowledge of the benefits and drawbacks of using a computer-based system in an organisation.

In Part (a), candidates seemed to have difficulties identifying benefits to the organization. Instead, they identified benefits to the employee. Others provided very vague benefits such as “make work easier” and “increasing efficiency”, without saying exactly how this is achieved. Some also repeated the same point in different ways and gave general descriptions of characteristics of computers, (such as, good at performing repetitious tasks, can perform complex calculations) instead of benefits to the organization.

Part (b) was fairly well done, however, some candidates did not identify the direct costs to the organization, others gave drawbacks that were not specific to the organisation. A few candidates gave disadvantages that were too general, such as power failure and over dependence on technology.

Question 10

This question tested candidates’ knowledge and understanding of issues relating to e-commerce.

The question was fairly well done by most of the candidates.

In Part (a), candidates gave valid benefits of using the e-commerce, such as, increased market area due to use of Internet, and being cost effective. One problem was that they brought up ideas of advertising, but this is different from e-commerce. Not many mentioned comparing computer-based e-commerce and a paper based company system.

In Part (b), most candidates gave valid points but some could not properly expand on the points, for example, ‘computer fraud’. Only a few incorporated the fact that since data was being transmitted via the Internet, it was prone to being intercepted by persons to use them for fraudulent purposes.

SECTION C - Computer-based Problem Solving

Question 11

This question assessed candidates’ understanding of the value of information.

This question was fairly well done. Only a few candidates didn’t give detailed responses.

In Part (c), most candidates looked at what was in the newspapers as opposed to its characteristics.

Question 12

This question tested candidates' knowledge of the purpose of software tools for creating a document. Candidates also had to distinguish between the terms 'breadth of coverage' and 'depth of coverage' as they apply to an information source.

In Part (a) (i), candidates listed specific software such as Microsoft Access and Microsoft Excel instead of Database and Spreadsheet. Generally, responses were excellent.

In Part (a) (ii), many candidates failed to list two points for each tool. Some of the candidates listed charts and graphs as two different features of Spreadsheet software. Major weaknesses were identified in candidates' explanations of how a word processing software package (its features) would be used in creating the report.

Many candidates answered Part (b) along the lines of an information source. Some candidates failed to mention that 'breadth of coverage' dealt with little details. 'Depth of coverage' was excellently dealt with.

Question 13

This question was designed to test candidates' knowledge and understanding of information sources.

Candidates' performance on this question was not good. Most answers referred to techniques of information gathering such as surveys and questionnaires instead of sources such as medical journals, Internet sites (PAHO, CDC.gov) and documentaries like those seen on Discovery Channel. Another area of weakness was that candidates did not describe the sources of information.

Most candidates stuck to a response of using audio to transmit information. As radio and television is based on audio it would be natural that this is the medium of transmission. The fact that they both catered for a vast audience was missing. The area of 'referred information' was not answered correctly by the majority of candidates. It appears that the term was not understood. Too many candidates did not respond to Part (c) of this question.

PAPER 2

SECTION A - Components of Computer Systems

Question 1

This question was designed to test candidates' ability to define and illustrate intranet, extranet, LAN and Internet. It also tested candidates understanding of components of a network and transmission media.

Part (a) (i) was poorly done. Candidates failed to include in their answers the fact that the Intranet uses Internet-based technologies.

Part (a) (ii) was generally well done. A few responses failed to indicate that the extranet is an extended intranet with selected external access.

Part (a) (iii) and (iv) were satisfactorily done. Most candidates mentioned global network connecting millions of users and other networks, but failed to incorporate the fact of sharing information and other resources.

Part (b) was fairly well done. However, a few candidates did not clearly distinguish the terms using the concept of 'similar and dissimilar' networks.

Question 2

This question assessed candidates' knowledge and understanding of processes and networks. Candidates also had to state two reasons why computers on a previously functional network can no longer communicate. Finally, they had to describe hardware that the branch of a company would need for setting up a bus network, list an explain the function of any other hardware that would be needed to ensure connectivity between two networks and draw a diagram to show how a new network could be connected to another existing network.

Some candidates gave responses about artificial intelligence and not on processing. Candidates didn't know the meaning of VAN and its functions. Candidates generally answered Part (f) (iii) well, however, most candidates left out the device to enable connectivity between the two networks or only included one of the devices at one end of the connection between the two networks.

Part (d) was not answered correctly by most candidates. Candidates understood what a complier was but could not clearly state the relationship between the two.

SECTION B - Application of Computers

Question 3

This question was designed to test candidates' knowledge and understanding of issues relating to the use of Point-of-sale computers systems.

Part (a) of the question was well done. Candidates did not seem to understand Part (b) of the question. They didn't list and explain the features of the database management system that would make it suitable for use in a Point-of-Sale system. For part (c), some candidates said that a 'data warehouse' is a place and 'data mining' involves searching through a warehouse. Most candidates didn't understand the types of analyses that are performed during data mining.

Question 4

This question examined candidates' ability to, describe situations that may arise if an unauthorized person gained access to the data held in a criminal information system and to provide a plan to prevent unauthorised access.

This question was fairly well answered. Most candidates were able to adequately describe situations that could possibly arise if unauthorized access was gained to the system. Additionally most candidates developed a plan that would adequately prevent or reduce the likelihood of unauthorized access.

In Part (a) and (b) there was a great amount of redundancy in the responses. In Part (b) the concepts of using a firewall as a security mechanism was generally misunderstood.

Part (c) was poorly answered. Candidates were generally unable to explain measures that would ensure the 24/7 reliability of the system. Security rather than reliability issues were usually addressed.

SECTION C - Computer-based Problem Solving

Question 5

This question examined candidates' ability to outline the steps required to develop an information system and choose the best software tools that could meet some given requirements.

Most candidates answered the question well. A few listed the steps to develop the info system but gave no explanation. Many candidates gave the best software tools and listed some of the four reasons; however, mainly knowledge of a DBMS was displayed. On the whole, candidates had problems expressing themselves clearly.

Question 6

This question assessed candidates' understanding of the use of different information and information sources.

Many candidates went into details on examples of heart monitoring equipment instead of characteristics. Some were able to identify currency and accuracy but not availability.

Many candidates understood that an Internet connection was required to upload information to server, but focused on less technical aspects of the steps to be performed such as cost analysis.

Part (c) (i) of this question was fairly well done. A few candidates however believed that an advantage was to be able to print the information from the CD – ROM.

Part (c) (ii) was very well done. Candidates were clear in their comparison when identifying advantages.

Part (d) (ii) was not well done. Candidates in general were able to identify currency as a characteristic of the information but failed to identify detail and reliability.

UNIT 2

PAPER 1

Paper 1 of this Unit tested the breadth of topics specified in the syllabus, and it is clear from the performance on individual questions that some candidates did not prepare for some of the items specified in the syllabus. However, it is encouraging to note that the overall performance on some questions was above the required standard.

SECTION A - Software and Systems Development

Question 1

This question tested candidates' knowledge of the 'software crisis'. There were generally good responses. Most candidates were able to identify two attributes that reflect the quality of a software product.

Question 2

This question assessed candidates' knowledge and understanding of a feasibility study, functional and non-functional requirements and the role of users and management in the analysis phase. The question was generally poorly done. However, most candidates knew the role of the user in the analysis phrase. In some cases, 'feasibility study' was confused with 'requirements specification'. Some candidates thought that functional requirements involved calculations and non-functional requirements did not.

Question 3

This question assessed candidates' knowledge of entity-relationship diagrams. It was generally poorly done. Some of the weak points included:

- separate diagrams being drawn for each relation
- mixing up ERD with DFD
- using object oriented diagram symbols for relationships and entities
- the omission of cardinality in the diagrams.

More exposure to ERDs should be provided. Distinguishing features of ERD should be established. Candidates should learn to draw an ERD and pay attention to conventions.

Question 4

This question examined candidates' knowledge of object and function-oriented designs and the features of a design that could affect the ease with which software could be maintained. Performance on this question was not good. Quite a few candidates recognized that cohesion and coupling were design features that affected the ease with which some software could be maintained in the future. Quite a few candidates didn't recognize that in an O-O design there is a set of collaborating classes. Most responses merely focused on the object. Additionally the candidates often took O-O designs to mean GUI or event driven interfaces, and 'function oriented' to mean command-driven. O-O designs could have been adequately explained without the use of the word class. Adaptability, maintainability and probability are also some correct responses to this question.

Question 5

This question tested candidates knowledge and understanding of the styles of user interaction with a computer system. It was generally answered well by most candidates. They knew the interfaces, their strengths and weaknesses. Some wrote about input devices – keyboard, mouse, and joystick. Some wrote about GUI objects – scrollbars, buttons etcetera.

SECTION B - Programming Languages

Question 6

This question assessed candidates' understanding of virtual machines and the classifications of programming languages. The questions were answered poorly. Candidates were confident when responding to Part (b) (ii) object-oriented, that is, they were able to identify the use of the objects. Some candidates were weak in describing the procedural and functional VMs. Responses to logic VM were significantly low as most candidates were not sure or did not know the correct answer. Candidates must improve their ability to identify keywords and points.

Question 7

This question tested candidates' knowledge of the ways in which programming languages differ. It was not adequately answered.

The performance of candidates on this question was disappointing to the Examining Committee. Candidates clearly need to understand the area to be covered when asked about differences in programming languages, and the criteria by which these should be evaluated. Some possible areas that could have been described are portability, usability, efficiency and unattainability.

Question 8

This question tested candidates' knowledge of the advantages of a modular approach to program development and programming constructs. Generally the question was adequately answered. Some candidates clearly understood the question asked and were able to give advantages rather than define the modular approach. Inadequate responses were given to Part (b) as many candidates did not understand that the questions were asked with regards to programming constructs and not the language. Misinterpretation of concepts were evident. Candidates need to understand keywords in the question being asked, to ascertain what is required from the keywords used.

Question 9

This question examined candidates' ability to write a simple program and distinguish between 'bounded' and 'unbounded iteration'. The question was poorly answered. The candidates' main strong points were identifying a fixed loop and using the 'FOR' statement as an example. For Part (b), candidates were able to use a 'FOR' loop for the iteration. The major misconception identified was stating that the WHILE loop was an infinite loop, without saying that there is a condition that makes the loop stop.

Question 10

This question tested candidates' ability to write a simple object-oriented program. This question was done poorly by most candidates. There were no strong points as many candidates showed evidence of not understanding what was required of them. Candidates who used JAVA or C++ gave mediocre responses.

Many candidates did not recognize that what was required was actual code as opposed to design notes. Errors were clearly seen in the use of instance methods.

Candidates should show a better understanding of decomposing a problem situation, probably in class diagrams, and then writing code from these. Candidates should be able to design and write code from an algorithm.

SECTION C - Program Development

Question 11

This question tested candidates' ability to write object-oriented code related to a given user interface. Many candidates answered the question using C or other procedural languages. Very few candidates showed any understanding about managing events. Candidates need to have a grasp of the basic concepts of object-oriented programming.

Question 12

This question tested candidates knowledge and understanding of abstract ADTs, data structures and ADT operations. Part (a) was answered well. However, Part (b) was poorly answered. Candidates failed to realize that parameters were generally required for the List operations.

Question 13

This question examined candidates' ability to implement some operations of a Stack class. Very few candidates even attempted this question. There were few good answers. Those that did attempt it, showed some knowledge of a stack but there is a clear lack of understanding of the basic concepts of object oriented programming languages. Some candidates simply put down a jumble of words they knew in the language.

Question 14

This question assessed candidates' ability to write and object oriented programs to implement in an "Account class".

Few candidates attempted this question. Those that did attempt it, generally answered poorly. Few candidates demonstrated familiarity with coding in an object oriented language. Many of the responses, contained mixed syntax from several languages. For the most part, the candidates did not seem to be able to write code. This is most likely due to the use of visual development tools. As candidates are expected to write code in the exam, they need to be exposed to it in the classroom.

Question 15

This question tested the candidates' ability to describe features of an object oriented development environment and techniques to reduce the likelihood of the piracy of software. The question was well done by most candidates.

In Part (a) many candidates wrote on the benefits of object oriented languages.

Most candidates answered Part (b) very well. Many candidates wrote that making the software read only would reduce piracy. Some of the correct responses included copy protection, encryption, strict licensing, online activation and media presence.

PAPER 2

SECTION A - Software and System Development

Question 1

This question examined candidates' ability to differentiate between 'software process' and 'software process model'; describe activities related to all software processes; answer questions based on evolutionary development and the waterfall model. Parts (a) and (b) (i) were very well answered. Parts (b) (ii), (c) and (d) (i) were poorly answered. Part (d) (ii) and (d) (iii) were fairly well done.

General misconceptions by candidates included:

- a variety of meanings for 'implementation';
- design and development being used as one similar process;
- the inability to recognize only one role of CASE tools in the software process;
- interpreting 'features' of the waterfall model to mean 'phases'.

Question 2

This question examined candidates' knowledge of data-flow diagrams, functional decomposition, and the data dictionary. Some parts of this question were poorly done. The ability of candidates to recognize and draw symbols, accurately draw a DFD, and correctly state the purpose of DFD were some strong points in this question. The weak points were:

- the relationship between DFD and code;
- 'functional decomposition' was left out or badly explained;
- the bank was not recognized as an external entity;
- data dictionary contents were generally not known.

Improvement is needed in the quality of diagrams (DFD) drawn. A more structured approach can be given to candidates to create DFD from narratives.

SECTION B - Programming Languages

Question 3

This question examined candidates' knowledge of 'structured programming' and iterative and recursive approaches. The question was generally done poorly.

Most candidates answered Part (a) reasonably well. Overall, the question was done inadequately. In Part (a), most candidates wrote about Modular Programming/SDLC.

In Part (b), some candidates' answers involved a comparison of object oriented and procedural paradigms.

In Parts (c) and (d), few candidates demonstrated an ability to write code, and most were unable to develop working algorithms.

Programming skills could be improved with additional practice.

Question 4

This question assessed candidates' ability to:-

- describe the characteristics of third and fourth generation languages
- describe factors that should be considered when choosing the programming language to be used for writing an application
- write object-oriented programs to implement a 'Plane' class.

The question was answered fairly well. Many candidates wrote that 3GLs are procedural and 4GLs are object-oriented.

A good response to Part (a)(ii) was that 4GLs include report generators. For Part (c), candidates need to practice writing code under examination conditions. Teachers need to spend more time on the syntax of the specific language.

SECTION C - Program Development

Question 5

This question examined candidates' ability to write a GUI program in an object-oriented language to accept, validate and process student data. The question was poorly done. Declaration of variables and diagrammatical layout of the window were the strong points in the responses given. The examiners found that many candidates could not sort the data and most did not use an array. Writing code was difficult for the candidates and they were weak in validation.

Question 6

This question assessed candidates' ability to develop an object-oriented solution to a given problem. They had to read and store some data on products, do queries on the stored data and calculate and print the sales revenue derived from the sale of each of three products.
The question was poorly done, with no strong responses being submitted. Few candidates showed any grasp of even the fundamental ideas of programming.

PAPER 3

INTERNAL ASSESSMENT

Candidates performed well in the Internal Assessment. There was evidence in this year's examination, that teachers had taken into consideration the moderator's comments of the pervious year when preparing candidates for the Internal Assessment. The projects were generally of a very good quality.

UNIT 2 - Internal Assessment

During the procedures of project samples for unit 2 the following were observed:

1. Teachers are accepting projects that are way below the standard for a CAPE project.

2. Module 3 was not done by quite a few candidates.

3. In most cases design specification, functional and non-functional requirements and systems documentation were poorly completed.

4. The diagrams for the system modules section did not include the correct symbols.

MODULE 1 – Components of a Computer System

The items in this module were generally well done. Some candidates lost marks for not describing the computer network and/or software properly. Details of the network and other components must be provided, with suitable justification. Candidates should also describe the application software which is a key part of the new system, and explain how it will be acquired or developed, and at what cost.

MODULE 2 – Application of Computers

There were a number of projects that provided a good discussion on the organizational impact of the new information system. However, there were several projects where only a few sentences of discussion were devoted to the topic. It should be remembered that the items examined in this module bear the same weight as the other modules; so equal emphasis must be placed on the items in this module.

MODULE 3 – Computer-based Problem Solving

The items in this module were generally done well by most candidates. However, the solution process that was used to arrive at a new system was not explained properly and candidates did not link data analysis with the data obtained from the data capture process.