COMPUTER STUDIES

Papers 0420/01and 0421/01

Paper 1

General comments

The performance of the candidates was again similar to that of previous years. The paper produced a good spread of marks and most of the candidates were able to attempt all of the questions. The overall standard of English was good. There was no indication that the candidates had insufficient time to complete the paper.

Majority of the candidates performed best on questions where information was given in the question for the candidate to use and respond to. Candidates that had learnt the definitions scored well on **Question 1**. The majority of the candidates made a good attempt at writing algorithms; very few candidates either rewrote the question or wrote an essay instead of an algorithm. Weaker candidates continue to confuse terminology; in particular they confused verification with validation and an interpreter with an assembler.

Some of the candidates lost marks on more than one question, they did not read the questions carefully enough and consequently did not answer the questions asked.

A significant number of candidates had prepared very well for the examination and others not so well. Candidates do need to revise thoroughly for the written paper if they wish to do well. A suggested book list can be found on the CIE web site and past papers, mark schemes and subject reports can be purchased from the CIE Publications Department.

Comments on specific questions

Generally candidates were awarded one mark for each correct point/answer or example.

Question 1

(a) Most of the candidates gained two marks for stating that multimedia software combines more than one medium for example sound and animation. Some of the candidates incorrectly thought that multimedia was hardware and incorrectly gave speakers as an example.

(b) Very many of the candidates had no idea as to what an array was. A satisfactory answer was that it is a set of storage locations referenced by a single identifier, e.g. FRED(20), SAM(3,5).

(c) De-skilling was reasonably well known. Most of the candidates knew that de-skilling is skilled or semi-skilled labour being reduced or replaced by computer systems, for example in manufacturing and office tasks. Weaker candidates confused de-skilling with stepwise refinement.

(d) Many of the candidates had rote-learnt the definition of an expert system and obtained full marks. A suitable answer was that an expert system is a program that behaves in the same way as a human expert; examples are medical diagnosis and oil prospecting.

(e) The candidates that had learnt the term verification obtained full marks easily. A popular correct answer given was a description of 'checking data (at the input stage)' for one mark and 'by comparing copies' for the second mark. Weaker candidates confused verification with validation.

Question 2

This question was not well answered. Candidates either gave brief descriptions of scanning a document and saving it to a file or described the difference between a hand-held scanner and a flat bed scanner. Suitable answers included the use of a light sensor, OCR, OMR, or description that included digital images and bitmaps.

Question 3

(a) EFT was sometimes confused with on-line banking. The majority of the candidates gave correct answers based on security for one mark. The better candidates also said that it was faster because there was no paperwork or no cheque clearing process for the second mark.

(b) The most popular correct answer was hacking, the other acceptable answer given was card fraud.

Question 4

(a) This question was generally well answered. The most popular correct answers were portable, easy to write and easy to debug.

(b) Very many candidates knew the difference between a compiler and an interpreter and gave suitable answers such as a compiler converts the whole program into object code in one go with all the errors reported whilst an interpreter converts each instruction then carries it out until the first error. Weaker candidates confused an interpreter with an assembler.

Question 5

(a) Many candidates confused tasks done by the operating system with tasks done by the bank's application software and consequently gave incorrect answers that described cash flow, sorting and clearing cheques. The better candidates gave three tasks done by the operating system such as file management, memory management and input/output control.

(b) Almost all of the candidates gained one mark for saying 'use the backup copies'. A few candidates gave auto restart for the second mark. It was the exceptional candidate that suggested re running the old master file with old transaction file.

Question 6

(a)(i) Many of the candidates did not realise that a device was required, even though it was stated clearly in the question, therefore they gave a wrong answer such as temperature or humidity instead of the correct answer temperature sensor or humidity sensor.

(ii) A considerable number of candidates thought, incorrectly, that the air-conditioner was the output device. Popular correct answers given were a heater, a cooler or a fan.

(b) Very few candidates were able to explain feedback correctly; it is still a very misunderstood topic. Many candidates said, incorrectly, that it was the sensors that controlled the process by making decisions and activating devices. Correct answers described how the data input from the sensors was compared against stored pre-set values for one mark, how the output from the system made changes to conditions in the museum for a second mark and for the third mark stated that the output affected the input.

(c) In general this question was correctly answered. Some of the weaker candidates gave vague answers such as 'happy customers' and 'more visitors' which were not awarded any marks. Suitable correct answers given were that there is no need to worry about items in the museum deteriorating, there is no need to employ anybody, or that the system only works when it is needed.

Question 7

(a) Very few candidates seemed to be fully aware of what can be achieved with image processing software. Many of the candidates correctly suggested decoding the radio signals and adding colour to the images. The better candidates gave two correct answers from sharpening the images, putting lines/contours or icons on the images and the production of animated pictures of temperature variation and cloud movement.

(b) Most of the candidates gained at least one mark. The popular correct answers were greater accuracy, cloud cover can be calculated and storms and hurricane movements can be seen faster and over a wider area.

Question 8

(a) Majority of the candidates gained all of the three available marks. Weaker candidates failed to realise that the commands needed to be in the right order and so they were only awarded two marks. A correct answer is:

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Down 40
Right 90
Backward 20
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(b) It was disappointing to see many candidates did not make use of the procedure, BELT. They appeared not to realise that it was available and therefore wrote their own routine for putting 50 boxes onto the conveyor belt. Many of the candidates did not produce an algorithm with a correct loop structure. The candidates that used a flow chart to represent their algorithm usually scored well. One mark was awarded for initialising a counter, a second mark for a loop that terminated after 50 and the third mark for either the inclusion of the procedure BELT or a correct routine written by the candidate.

A correct answer is:

```
Set count = 0
Repeat
        BELT
        count = count + 1
Until count = 50
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Question 9

(a) This question was answered correctly by almost all of the candidates. The correct answer is:

0							

(b) This question was answered correctly by majority of the candidates. The correct answer is:

1	0	0				1	1

(c) Not many candidates knew what could cause a bit to change during transmission. Better candidates answered correctly with electrical interference or magnetic fields. Common wrong answers given included hardware failure, mis-typing and transmission errors.

Question 10

(a)(i) Answered correctly by almost all of the candidates.

(ii) Answered correctly by majority of the candidates.

(b) Many candidates lost marks because they missed out the brackets or used the ÷ symbol instead of the / symbol. Examples of a correct answer are (B2+C2)/2 and AVG(B2:C2).

(c) The majority of the candidates obtained both of the available marks. For marks to be awarded actual cell references must be given. A suitable answer was 'highlight or select D2' for one mark and 'copy and paste/replicate' or 'click and drag' for the second mark.

(d) This question was generally not well done. Candidates were usually able to state correctly how column B could be selected for one mark, but were not able to describe for the second mark, the sequence of actions required to sort the data into descending order.

(e) Usually well done. The correct answer for one mark was A1:D6 or A2:D6. Two marks were awarded for A1:D6 and D1:D6 or A2:A6 and D1:D6.

Question 11

(a) Candidates often gave incorrect data types such as alphabetic, string or letters. The field sizes given were usually correct. One mark was awarded for all of the data types correct and the other mark for all the field types correct. A correct answer is:

DATA TYPE	FIELD SIZE
Text/character/alphanumeric	6
Text/character	2
Number/numeric/integer	2
Text/character	7 -30
Number/numeric/integer/currency	3 - 6

(b) This question was generally well answered. Popular correct answers were that coding saves storage space, there are less input errors and that processing/sorting is faster.

(c) Usually two correct answers such as the name of the customer and date of the booking were given.

(d)(i) Almost all of the candidates obtained one mark for BK0042 and most of the candidates obtained the second mark for BK0043, BK0046 and BK0050.

(ii) This question was usually answered correctly. A correct answer is:

(NIGHTS > 7) AND (PRICE ($) $\geq$ 450), with one mark being awarded for (NIGHTS > 7) and the second mark for AND (PRICE ($) $\geq$ 450). The most common errors were to use OR instead of AND, to put quotes around the number 7 and to confuse > and <.

(e) A maximum of two marks was available for both the processing and the output with an overall maximum of three marks. Majority of the candidates obtained one mark for recording a booking on a computer system and two marks for the output.

A suitable description of the processing for two marks was checking/searching the holiday file and calculating the cost of the booking. Candidates that described manual booking methods could not be awarded any marks for the processing.

Items of hard copy output such as a receipt, a printout of the booking details, or a ticket were awarded output marks. A common correct output that was also given was a screen display of the results of a search.

Question 12

(a) This question was well answered by majority of the candidates who gained two marks for saying that a modem converted digital signals to analogue signals so that they could be sent down the telephone line. Candidates that did not mention the telephone line were only awarded one mark.

(b) Almost all of the candidates obtained both marks for stating ‘check the user ID and check the password’.

(c) Majority of the candidates obtained full marks. Popular correct ISP services given included news, on-line shopping, down loading software and the facility to create your own web site.

(d) Very few candidates knew that the Internet is a ‘network of networks’. Many of the candidates tried to explain what it can do rather than what it is. Most of the candidates obtained one mark for knowing that it is world wide, or that data on any one network is accessible by a computer on any other network.

Question 13

(a) This question required the candidate to give three stages in the analysis of the existing system, however very few candidates restricted their answers to the existing system. The majority of the candidates missed the point of the question, they simply wrote all they knew about systems analysis and were rarely awarded any marks. The better candidates answered the question asked and obtained full marks easily. Common correct answers included fact finding, writing a description of existing system, listing the objectives and producing data flow diagrams and systems flow charts of the existing system.

(b) Generally correctly answered, with exception of the few candidates that wrote general statements about cost. Popular correct answers were that the program was written especially for the purpose, there are no extra unwanted features and it is easier to correct errors.

(c) This question was usually answered correctly with two types of test data from standard/normal, extreme and abnormal. Weaker candidates confused types of test data with validation checks.

(d) Very few candidates gained both of the available marks. Most of the candidates gave the terms technical documentation and user documentation whereas items from either were required for marks to be awarded. Some suitable correct answers were screen layouts, user interface design, test data, variables and the system configuration required.

Question 14

(a) Usually well answered with temperature, or heart rate.

(b) Weaker candidates confused the monitoring and control system in the hospital with an expert system for diagnosing illnesses. A correct answer given by many candidates included converting the input data into digital data for one mark and comparing it with pre set limits for the second mark.

(c) Almost all of the candidates were awarded a mark for stating medication, an alarm, or a graph of the patients' temperature or heart rate.

Question 15

(a) The majority of the candidates had a good knowledge of the Data Protection Rules. Almost all of the candidates gained a mark for 'keeping the data secure by using a password'. Other correct answers given were that the data must be accurate, up to date, collected for the stated purpose only, processed fairly and lawfully and kept no longer than needed.

(b) Most of the candidates were able to give at least one possible effect of the doctor not obeying the Data Protection Rules. Popular correct answers given were blackmail or that the doctor would lose his job, be fined, sued or sent to prison.

Question 16

Good candidates wrote a well constructed algorithm and were awarded full or almost full marks. Most of the candidates gained one mark for setting the number of sales = 0, the number of refunds = 0, a second mark for inputting the money and a third mark for outputting the number of sales, number of refunds and the total amount of money. Some of the candidates confused refunds with giving change. Very few of the candidates obtained the mark for a correct loop. A suitable algorithm was:

```
Set number of sales = 0, number of refunds = 0
Input money
Input sale/refund

    IF..sale.. THEN   add money to total amount of money
                      number of sales = number of sales + 1

    ELSE    subtract money from total amount of money
                      number of refunds = number of refunds + 1

Loop
Output – number of sales, number of refunds, total amount of money.
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Paper 0420/02

Project

General comments

The quality of work was of a similar standard to previous years. The number of inappropriate projects which provided limited opportunities for development and therefore did not qualify for one of the higher grades was approximately the same as last year but still included word-processing/DTP projects of a theoretical nature. Such projects are not a valid use of a computer to solve a problem, they simply describe some aspect of computing or computers. In one particular case a candidate submitted an evaluation of a software application. This is another example of an inappropriate project.

The majority of Centres assessed the projects accurately according to the assessment headings. Overall the standard of assessment by Teachers is improving and there are fewer changes than in previous years. **Marks can only be awarded where there is written proof in the documentation**. In some instances marks are awarded by the Centre where there is no written evidence in the documentation. Centres should note that assessment of the project can only be by reference to the criteria in the syllabus and that Centres must not devise their own mark schemes. Half marks are not allowed by the syllabus.

It is important to realise that the project should enable the candidate to use a computer to solve a significant problem, be fully documented and contain substantial sample output from their proposed system. Testing should include full test plans with expected results which can then be compared with the actual results and we would also expect to see labelled printouts which clearly match the test plans. Some projects do not demonstrate that they have actually been run on a computer. Software advances and the use of 'cut & paste' can give the impression that the results have simply been word-processed. It is recommended that candidates make use of appropriate screen dumps and include these in their documentation to show the use of a computer.

However the standard of presentation and the structure of the documentation continues to improve. Many candidates structure their documentation around the broad headings of the assessment scheme, and this is to be commended. For those candidates who do not devise any structure they might find it useful to use the following framework. Many of the sections correspond on a one-to-one basis exactly to the assessment headings, some combine assessment headings and some carry no marks but form part of a logical sequence of documentation.

Suggested framework for documentation of the project

Analysis

Description of the problem

List of Objectives (in computer-related terms or computer processes)

Description of Existing Solution

Evaluation of Existing Solution

Description of Other Possible Solutions

Evaluation of Other Possible Solutions

Design

Plan (including a time scale)

Method of Solution including the algorithms

System Requirements (Hardware)

Software Requirements

Implementation

Method of Solution (related to the individual problem, including any algorithms, flowcharts, top down designs or pseudo-code.)

Testing

Test strategy/plans	Normal data
	Extreme data
	Abnormal data
Test Results	Normal data
	Extreme data
	Abnormal data

Documentation

Technical Documentation and System Maintenance

User Documentation/User Guide

System evaluation and development

Evaluation (must be based on actual results/output which can be assessed from the written report)

Future Development/Improvements

The assessment forms for use by Centres should not allow for a deduction in section 23 for the trivial nature of any project. Centres should not make any deduction in this section. One of the Moderator's roles is to make such a deduction. Therefore if the Centre think that a deduction should be made in this section then that particular project must be included in the sample. Centres should note that the project work should contain an individual mark sheet for every candidate and one or more summary mark sheets, depending on the size of entry. It is recommended that the Centres retain a copy of the summary marksheet(s). In addition the MS1 mark sheet should be sent to Cambridge International Examinations by separate means. It was pleasing to note that the vast majority of the coursework was received by the due date. It causes some considerable problems in the moderation process where Centres fail to meet this deadline. Although the syllabus states that disks should not be sent with the projects, it is advisable for Centres to make back up copies of the documentation and retain such copies until after the results query deadlines. Although disks or CDs should not be submitted with the coursework, the Moderators reserve the right to send for the electronic version. Centres should note that on occasions coursework may be retained for archive purposes.

The standard of marking is generally of a consistent nature and of an acceptable standard. However there are a few Centres where there was a significant variation from the prescribed standard, mainly for the reasons previously outlined. It is recommended that when marking the project, Teachers indicate in the appropriate place where credit is being awarded, e.g. by writing in the margin 2,7 when awarding two marks for section seven.

Areas of relative weakness in candidate's documentation include setting objectives, hardware, algorithms and testing.

The mark a candidate can achieve is often linked to the problem definition. The candidates need to describe in detail the problem and where this is done correctly it enables the candidate to score highly on many other sections. This is an area for improvement by many candidates whereby they do not specify their objectives in data processing or computer-related terms, e.g. they merely state that they want to make a certain process faster, this is really an aim and the candidate should give an indication of how they will make the process faster. If a faster processing time was an objective then in order to test whether or not they have been successful then the candidate would need to time the process before and after the solution and compare the two times. If the objectives are clearly stated in computer terms then a testing strategy and the subsequent evaluation should follow on naturally, e.g. print a membership list, perform certain calculations etc. With effect from 2004 the scheme of assessment will be revised to put more emphasis on the setting of objectives in the first place and then ensuring that subsequent sections of the documentation refer back to these objectives (testing and evaluation).

There was evidence that some candidates appeared to be using a textbook to describe certain aspects of the documentation. Some candidates did not attempt to write this section of the documentation with specific reference to their own problem. It is important to note that candidates write their own documentation to reflect the individuality of their problem and that group projects are not allowed. Unfortunately there was an increase in the number of projects where candidates had produced almost identical work. Where the work of many candidates from the same Centre is identical in one or more sections then the marks for these sections will be reduced to zero by the Moderators. Centres are reminded of the fact that they should supervise the candidate's work and that the candidate verifies that the project is their own work.

The hardware section often lacked sufficient detail where full marks are scored by a full technical specification of the required minimum hardware together with reasons why such hardware is needed by the candidate's solution to his/her problem.

Candidates should ensure that any algorithm is independent of any programming language and that another user could solve the problem by any appropriate method, either programming or using application software. It is possible for some applications to generate the algorithms, these should be clearly annotated by the candidates to score any marks. Algorithms must clearly relate to the candidate's solution. If a candidate uses a spreadsheet to solve their problem then full details of the formulae and any macros should be included.

Many candidates did not produce test plans by which the success of their project could be evaluated. The results of a test strategy should include the predicted results, output both before and after any test data, such printouts should be clearly labelled and linked to the test plans. This will make it easy to evaluate the success or failure of the project in achieving its' objectives. A significant number of candidates do not test their input data. Documentation should include the data designed to test the three types of data, the expected results and then the actual results. The test data and expected results should be numbered in the same way as the objectives and they should be linked together to show how each objective is being tested. Difficulties are experienced by some candidates in the use of extreme and abnormal data. Knott & Waites (1999) define the different types of data as being

1. Normal data ……

2. Extreme data These test the behaviour of the program when valid data at the upper and lower limits of acceptability are used.

3. Exceptional (abnormal) data

Programs are usually designed to accept a certain range or class of inputs. If invalid data is used, that data which the program is not designed to handle, the program should be capable of rejecting it rather than attempting to process it.