Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

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General Certificate of Education
January 2003
Advanced Subsidiary Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

COMPUTING **CPT2**
Unit 2 Principles of Hardware, Software and Applications

Tuesday 14 January 2003 Afternoon Session

No additional materials are required.
You may use a calculator.

Time allowed: 1 hour 30 minutes

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided. All working must be shown.
- Do all rough work in this book. Cross through any work you do not want marked.

Information

- The maximum mark for this paper is 65.
- Mark allocations are shown in brackets.
- You will be assessed on your ability to use an appropriate form and style of writing, to organise relevant information clearly and coherently, and to use specialist vocabulary, where appropriate.
- The degree of legibility of your handwriting and the level of accuracy of your spelling, punctuation and grammar will also be taken into account.

For Examiner's Use			
Number	Mark	Number	Mark
1			
2			
3			
4			
5			
6			
7			
8			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

Answer **all** questions in the spaces provided.

1 **Figure 1** shows a label removed from an item sold at a supermarket.

198-11926167-2420-4

Figure 1

(a) What input device would have been used in the supermarket to read this label?

.....

(1 mark)

(b) The last digit on the right of the item code 198-11926167-2420-4 is a check digit. Why is it used?

.....

.....

(1 mark)

(c) **Figure 2** shows a response form that customers of the supermarket have been asked to complete. The forms are processed using a computer system running a *batch operating system*.

Customer Survey

Q1	**– A -**	**– B -**	**– C -**	**– D -**	**– E -**
Q2	**– A -**	**– B -**	**– C -**	**– D -**	**– E -**
Q3	**– A -**	**– B -**	**– C -**	**– D -**	**– E -**
Q4	**– A -**	**– B -**	**– C -**	**– D -**	**– E -**
Q5	**– A -**	**– B -**	**– C -**	**– D -**	**– E -**

Using an HB pencil place a mark through one of the five letters for questions one to five

Figure 2

(i) Name the most suitable input device to transfer the data on each survey form into a computer system.

.....

(1 mark)

(ii) What is a batch processing operating system?

.....

.....

(1 mark)

4

2 Electronic Funds Transfer (EFT) makes it possible for a company in the UK to pay for goods manufactured in Malaysia without needing physically to exchange money in the form of coins, notes or cheques. The transfer is carried out electronically by messages sent between the company's bank and the supplier's bank.

(a) Why must EFT systems be available for use 24 hours a day?

.....

.....

(1 mark)

(b) EFT messages are encrypted before being sent. Give **one** reason why this is done in this context.

.....

.....

(1 mark)

(c) Some governments have passed laws that require banks to lodge with them the encryption keys that are used to decrypt EFT messages. Give **one** reason why this is done.

.....

.....

(1 mark)

3

3 (a) The growing level of public concern over data stored in computer systems led the government to pass The Data Protection Act 1984. The Act was introduced to protect the right of individuals to privacy.
Give **three** reasons relating to the nature of computing systems that give rise to this concern.

1 .....

.....

.....

2 .....

.....

.....

3 .....

.....

.....

(3 marks)

(b) Name **two** other Acts that relate to computer systems.

1 .....

2 .....

(2 marks)

5

LEAVE MARGIN BLANK

4 (a) Explain how data inconsistency may arise in an application based on a separate file approach.

.....

.....

.....

.....

.....

(3 marks)

(b) How does the database approach prevent data inconsistency arising?

.....

.....

.....

(1 mark)

(c) Name **two** typical validation controls used in a database system.

1 .....

2 .....

(2 marks)

6

5 The role of an operating system is often said to be twofold:

1. To provide a virtual machine.
2. To manage the resources of the computer.

(a) What is meant by "to provide a virtual machine"?

.....

.....

(1 mark)

QUESTION 5 CONTINUES ON THE NEXT PAGE

(b) Name **three** types of resource managed by the operating system.

1 .....

2 .....

3 .....

(3 marks)

4

6 A spreadsheet is used to record seats booked for performances of a school play and to provide booking reports, the number of tickets sold and the amount of money received for each performance.

For each performance there are:

- a fixed number of seats available and each seat is either booked or not booked.
- Ten seats per row.
- Ten rows labelled alphabetically from A to J.

Seats in rows A to E cost £6.00 per seat.
Seats in rows F to J cost £4.00 per seat.

The spreadsheet displays for a particular performance:

- The availability of every seat using 0 for not booked and 1 for booked.
- The total number of seats booked in each row.
- The sub-total of number of seats booked at £6.00 per seat.
- The sub-total of number of seats booked at £4.00 per seat.
- The sub-total of income from bookings for the £6.00 seats.
- The sub-total of income from bookings for the £4.00 seats.
- The total income from all bookings.

Figure 3 shows the spreadsheet for **one** performance.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1						**Friday 10/5/2002**							
2	Seat	1	2	3	4	5	6	7	8	9	10	Total	Income
3	Row												
4	A	0	1	1	0	0	1	1	1	0	1	6	£36.00
5	B	1	1	1	1	1	1	1	1	1	1	10	£60.00
6	C	1	1	0	0	0	1	1	1	0	0	5	£30.00
7	D	0	0	0	0	1	1	1	1	1	1	6	£36.00
8	E	1	1	0	0	1	1	1	1	1	1	8	£48.00
9											Sub	35	£210
10													
11	F	0	0	0	0	0	0	1	1	0	1	3	£12.00
12	G	1	1	1	1	1	1	1	1	1	1	10	£40.00
13	H	1	1	1	1	0	1	1	1	0	0	7	£28.00
14	I	0	0	0	0	0	1	1	1	1	1	5	£20.00
15	J	1	1	1	0	1	1	1	1	1	1	9	£36.00
16											Sub	34	£136
17													
18												Total	£346
19	£6.00												
20	£4.00												

Figure 3

(a) The formula in L4 is Sum (B4:K4). What is the formula in cell L8?

.....

(3 marks)

(b) Write the formula that was entered in M4 and copied to cells M5 to M8.
Your formula should perform an automatic recalculation if the value in A19 is changed.

.....

(3 marks)

(c) Write the formula that was entered in M18.
Your formula should perform an automatic recalculation if the values in M9 and M16 change.

.....

(3 marks)

7 A publisher of a daily newspaper uses a computer system consisting of:

- Reporters' workstations.
- Sub-editors' workstations.
- A page make-up workstation.
- An image processing workstation.
- A central file store.

Each article is word-processed and stored centrally in a separate file.

(a) What type of operating system – real, interactive, batch or network –- must be run at each of the workstations so that

(i) access to the central file store is possible?

.....

(1 mark)

(ii) reporters can word-process articles?

.....

(1 mark)

(b) The editor in charge of an edition enters the layouts of each page at the page make-up workstation. A page is divided into a number of blocks. There is one article per block.

A relational database is used to record details of the page layouts for each edition of the newspaper.

Two relations (tables) **NewspaperEdition** and **PageLayout** are used for this database:

NewspaperEdition (EditionId, Date, NoOfPages, EditorInChargeOfEdition)

PageLayout (EditionId, PageNo, BlockNo, PositionOfBlockOnPage,
WidthOfBlock, LengthOfBlock, FilePathName)

Each newspaper edition is assigned a unique EditionId. There is only one edition per day. FilePathName is used to locate the word-processed article assigned to a block.

(i) State a suitable primary key for the NewspaperEdition relation.

.....

.....

(1 mark)

(ii) State a suitable secondary key for the NewspaperEdition relation.

.....

(1 mark)

(iii) Name the attribute which is the foreign key in the relation PageLayout.

.....

(1 mark)

(iv) State a suitable primary key for the relation PageLayout. Justify your choice.

.....

.....

.....

(3 marks)

(c) Word-processed articles are stored on the N: drive of the file server. Each reporter is allocated their own directory in which to store their files on the N: drive. **Figure 4** shows part of the root directory on the N: drive.

Reporter1	dir
Reporter2	dir
Reporter2	dir
:	
:	
:	
Reporter25	dir

Figure 4

(i) What is the pathname for a file Cricket1.Doc that Reporter1 has written?

.....

(1 mark)

(ii) At the end of each month all the files written by the reporters are *archived*. Explain what this means.

.....

.....

(1 mark)

QUESTION 7 CONTINUES ON THE NEXT PAGE

(iii) Suggest a suitable cost effective medium that could be used to hold one month's archive of approximately 4GB (4 Gigabytes) of information.

.....

(1 mark)

(d) Sub-editors use a split screen workstation with one half of the screen displaying an article for a specific page and the other half showing the corresponding page layout supplied by the editor. The sub-editor adjusts the length of the article so that it fits exactly into a block. A sub-editor's workstation can access any of the word-processed files produced by reporters as well as any of the page layouts produced by the editor.

Sketch and label carefully a possible split screen user interface for the sub-editor's workstation. Consider how this interface can:

- show the page layout and if an article is too long or too short for a block
- select a file
- indicate which article file is being processed
- indicate which page, block and edition of the newspaper is currently selected
- select editing tools/functions
- select different formats for the article
- select on-line help.

(5 marks)

(e) A block of space on a page may also contain an image.
State **two** image processing operations that an image processing workstation might apply to images.

1 .....

.....

2 .....

.....

(2 marks)

18

8 The construction of an electronic English-French dictionary is trialled by creating a simpler version using one hundred English-French word pairs stored line-by-line in a text file, file A.

(a) (i) What is a text file?

.....

(1 mark)

(ii) Name the most suitable type of software for a typist to use to create the contents of file A.

.....

(1 mark)

(iii) What hardware could have been used to enter the word pairs, printed on paper, **directly** into the computer system?

.....

(1 mark)

QUESTION 8 CONTINUES ON THE NEXT PAGE

(b) A computer program reads word pairs, one line at a time, from file A.
It stores each word pair in a sequentially organised file of records, file B, by English word.

(i) State **two** characteristics of a sequentially organised file.

1 .....

.....

2 .....

.....

(2 marks)

(ii) Give the field names for **two** essential fields of file B.

1 .....

2 .....

(2 marks)

(c) File B is read sequentially and its records are stored in file C, on a direct access medium, by applying the following hashing function to each English word in file B.

(Sum of ASCII codes of all letters in the English word) Mod 150

For example, applying the hashing function to the word BAD using ASCII codes A = 65, B = 66, D = 68 produces

(66 + 65 + 68) Mod 150 = 49
(Mod gives the remainder after integer division)

File C consists of one hundred and fifty initially empty records.

(i) What use is made of the number produced by the hashing function when storing each word-pair record in file C?

.....

.....

(1 mark)

(ii) Why is Mod 150 used?

.....

.....

(1 mark)

(iii) Give **two** properties that this hashing function should have.

1 .....

.....

2 .....

.....

(2 marks)

(d) Using only file C, list the main steps that a computer program must follow to display on a VDU the French equivalent of an English word entered at the keyboard. Your solution must take account of the case when the English-French word pair is **not** present in file C.

.....

.....

.....

.....

.....

.....

(5 marks)

16

END OF QUESTIONS