

**COMPUTER SCIENCE
STANDARD LEVEL
PAPER 2**

Wednesday 20 November 2002 (morning)

1 hour 45 minutes

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Answer all the questions.

1. A company employs 500 salesmen to sell mobile phones. The sales figures for each salesman for each month in a year are held in a two-dimensional array `SALES[500,13]` with the following structure:

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	10232	112	209	187	93	103	163	231					
2	10343	13	15	32	22	34	33						
3	10344	324	504	342	564								
4	10356	53	43	34									
5	10412	2	3										
6	11342	12											
7	<i>etc.</i>												
500										

(all cells are filled with **integer** data)

You may assume that no two months have the same sales figures for a given salesman. The first column of the array contains the 5-digit ID code for each salesman and the remaining columns contain the sales figures with column 2 being January sales, column 3 being February sales and so on.

- (a) State the number of mobile phones sold by salesman 10343 in the month of May. [1 mark]
- (b) Construct an algorithm to output the following information for each salesman in the array.

ID Code

Month number with maximum sales (1-12)

Average (mean) sales for all 12 months

[9 marks]

A function `BEST` exists which returns the month number (1-12) in which any given salesman achieved their maximum sales.

- (c) (i) State why `BEST` could be a function rather than a procedure. [1 mark]
- (ii) Identify a parameter that has to be passed to `BEST` and state whether it is passed by value or by reference. Assume that the array is a global variable. [2 marks]

(This question continues on the following page)

(Question 1 continued)

A parallel one-dimensional array `NAMES [500]` holds the names of the salesman as follows:

1	JONES
2	AZEM
3	ODDO
4	DUPAIX
5	BRENTA
6	MACKAY
	:
500	:

- (d) (i) State the ID Code for ODDO. [1 mark]
- (ii) Identify the name of salesman 10412. [1 mark]
- (e) Construct an algorithm for a procedure `DISPLAYBESTMONTH` that takes in the ID Code of a salesman and outputs the name of the salesman and the month in which the maximum sales were made. Make use of the function `BEST` in your procedure. [9 marks]

A temporary array, `TEMP [500, 2]` holds the ID Code and month number of maximum sales for each salesman. It is sorted into order of month.

For example:

	1	2
	10343	1
	20456	1
	:	:
	:	:
	10168	2
	01663	2
	:	:
	:	:

- (f) Construct an algorithm `DISPLAYLIST (val MONTH integer)` to produce a list of the ID Codes of all those salesmen whose maximum was achieved in a given month. [6 marks]
- `DISPLAYLIST (6)` would list those whose maximum sales were in June.

This question requires the use of the Case Study.

2. (a) State **one** reason why the CT numbers are stored in 2 **bytes** even though only 12 **bits** are required for storage. [1 mark]
- (b) “Filtering tasks are processed in *batch mode*...” (page 3 paragraph 4 of the Case Study). Explain why *batch processing* is appropriate for this task. [2 marks]
- (c) (i) Identify **one** situation in the Case Study where *data integrity* is important. [2 marks]
- (ii) Outline **one** method which could be used to ensure *data integrity*. [2 marks]
- (d) Explain any **two** ethical issues related to the Case Study. [4 marks]
- (e) Outline any **two** precautions that a researcher should take to ensure his or her username and password are not used by *hackers*. [4 marks]
- (f) Outline **one** advantage and **one** disadvantage of the *world-wide-web* as a medium for sharing scientific data such as the cranial reconstructions described in the Case Study. [4 marks]
- (g) Explain why such high-power workstations are needed to process the image files. [2 marks]
- (h) Discuss **two** ways in which the job of a researcher in this field might have changed since the introduction of CT. [4 marks]

3. (a) (i) Define the following terms:

analog data format;

[2 marks]

digital data format.

[2 marks]

An optical page scanner is used to input data printed on a sheet of paper. Scanned text is transmitted as a graphic image to the computer.

- (ii) Outline the need for *analog* to *digital* conversion of data for computer processing.

[2 marks]

Scanned data should be saved in a format suitable for editing.

- (iii) Explain the software required for converting a scanned page of text into a text file.

[3 marks]

- (b) Outline the function of each of the following components within a central processing unit (CPU):

(i) Arithmetic and logic unit (ALU);

(ii) Control unit (CU);

(iii) Bus.

[6 marks]