



ADVANCED SUBSIDIARY GCE COMPUTING

Programming Techniques and Logical Methods

F452

* C U P / T 6 4 0 1 6 *

Candidates answer on the question paper

OCR Supplied Materials:

None

Other Materials Required:

None

**Monday 12 January 2009
Afternoon**

Duration: 1 hour 30 minutes



Candidate Forename					Candidate Surname				
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Centre Number						Candidate Number			
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **100**.
- This document consists of **20** pages. Any blank pages are indicated.

- 1 A Computing student has written a program which stores and prints recipes. The program has a graphical user interface (GUI).

- (a) Describe how a good design of the GUI can make the program easier to use.

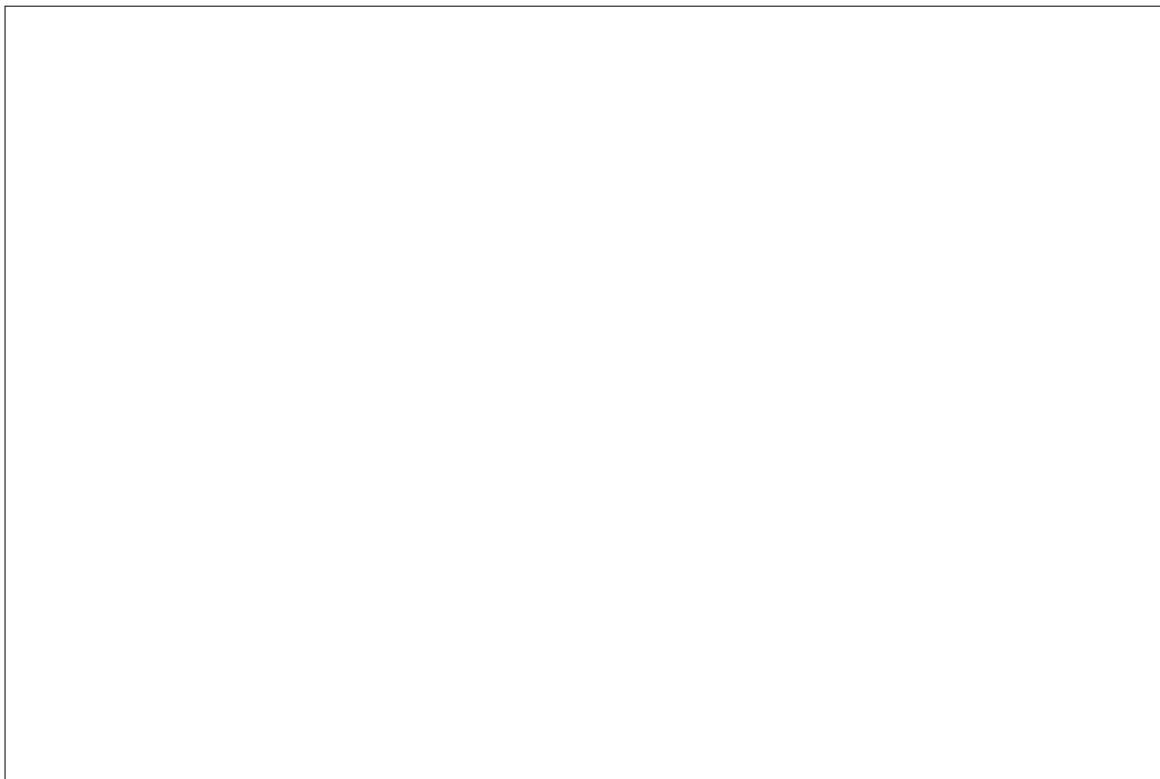
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[4]

- (b) The data entry screen allows the user to enter the following data about each recipe.

- The name of the recipe (e.g. Sponge Cake)
- The number of people the recipe caters for (e.g. 6)
- A table of the ingredients of the recipe with 3 columns
 - the name of the ingredient (e.g. flour)
 - the quantity required (e.g. 300)
 - the units in which the quantity required is measured (e.g. grams).

On the blank screen below, show a suitable layout for the data entry screen.



[8]

(c) Each recipe is saved as a separate serial file.

(i) Describe what is meant by a serial file.

.....
.....
.....
..... [2]

(ii) State **two** reasons why a serial file is better than a sequential file for storing the data about a recipe.

Reason 1

.....
..... [2]

The student has written the following algorithm for creating the serial file.
(In this algorithm a *WRITE* command writes a string into a text file and moves to the next line.)

```
OPEN OutputFile in Write Mode  
WRITE RecipeName to OutputFile  
WRITE NumberOfPeople to OutputFile  
FOR each ingredient  
    WRITE NameOfIngredient,";",Units,";",Quantity to OutputFile  
NEXT ingredient  
CLOSE OutputFile
```

- (d) The student plans to test this algorithm with the following recipe.

Pasta Bake (for 4 people) <i>Ingredients:</i> 200 g pasta bows 500 ml milk 150 g cheese

Write down how this recipe will be stored in the output file using the algorithm given.

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..... [4]

- (e) The program can be used to calculate the quantities necessary to cater for different numbers of people.

 - The user inputs the new number of people.
 - The data for the recipe is read one line at a time.
 - For each ingredient the new quantity is calculated ...
 - ... the data is output to a new file.

Write an algorithm for this process.

[8]

2 A software company is producing software for a city council.

- (a) The company uses Rapid Application Development (RAD) to develop software.

Describe RAD and state **one** advantage of using it.

RAD

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Advantage

..... [4]

- (b) Before releasing the software, it is tested using a variety of strategies.

Describe the following test strategies.

(i) Black box testing

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..... [2]

(ii) Alpha testing

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..... [2]

(iii) Acceptance testing

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..... [2]

- (c) The software calculates the cost of parking at the city council's car parks as follows.
- Free from 5am to 8am
 - £3 per hour or part of an hour between 8am and 5pm
 - Free from 5pm to 12 midnight
 - No parking from 12 midnight to 5am

Fill in the table below with test data for **three** different tests that can be used to test whether the program charges the correct amount when given **valid** start and finish times.

For each set of data, state the purpose of that test and the expected outcome.

Test data		Reason for test	Expected outcome
Start time	Finish time		

[9]

- (d) When the program is completed, an executable version is delivered on a CD-ROM with an installation routine which installs the software onto the computers of the city council.

Explain what the installation routine does.

The quality of written communication will be assessed in your answer to this question.

[6]

[6]

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PLEASE TURN OVER FOR THE NEXT QUESTION

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- 3 A computer program is used to monitor a printer and display its status via an LCD display in the front panel. The program includes the following algorithm.

```

01 IF NOT(PaperTrayEmpty) AND (FilesWaiting > 0) THEN
02   OUTPUT "PRINTING..."
03 ELSE
04   OUTPUT "PLEASE ADD PAPER"
05 END IF

```

- (a) The algorithm is tested when the values of the variables are
 PaperTrayEmpty = TRUE FilesWaiting = 3

- (i) State the value of NOT(PaperTrayEmpty)

..... [1]

- (ii) State the value of (FilesWaiting > 0)

..... [1]

- (iii) State the value of NOT(PaperTrayEmpty) AND (FilesWaiting > 0)

..... [1]

- (iv) State the output of the algorithm

..... [1]

- (b) State the output of the algorithm when the values of the variables are as follows.
 Justify your answer in each case.

- (i) PaperTrayEmpty = FALSE FilesWaiting = 1

Output

Justification

.....

.....

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[4]

- (ii) PaperTrayEmpty = FALSE FilesWaiting = 0

Output
.....

Justification

.....
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[4]

- (c) Rewrite the algorithm so that when PaperTrayEmpty is False and FilesWaiting is 0, the output is "STATUS OK".

(The output in other cases should not change.)

[4]

- 4 The following algorithm finds the total of all the digits in a number.
You do not need to trace this algorithm.

```

01 INPUT N
02 T = 0
03 WHILE N > 0
04 L = N MOD 10
05 R = N DIV 10
06 T = T + L
07 N = R
08 END WHILE

```

- (a) Explain the purpose of the instruction in line 02.

.....
.....
.....
..... [2]

- (b) Explain why it would be incorrect to rewrite line 06 as $T + L = T$

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..... [2]

- (c) One way to improve the readability of the algorithm is to include comments.

Describe **two** other ways to improve the readability of the algorithm.

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..... [4]

- (d) Explain why a programmer should use good programming techniques when writing code.

The quality of written communication will be assessed in your answer to this question.

[6]

[6]

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- 5 (a) A computer program consists of many statements which are sometimes organised into subroutines such as functions.

(i) Explain what is meant by a statement.

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[2]

(ii) Explain what is meant by a function.

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[2]

- (b) A coin-operated vending machine has 2 slots. Slot A is for 10p coins, and slot B is for 5p coins.

The software of the machine has a function called CoinValue which takes a single character "A" or "B" and returns the value of a coin which has dropped in that slot as an integer. Any other character will produce an error.

State the result of evaluating each of the following expressions.

(i) CoinValue("A")

.....

[1]

(ii) CoinValue("B") = 5

.....

[1]

(iii) CoinValue("AA")

.....

[1]

- (c) The machine records the coins that have been entered using a string of the characters A and B. (So "ABB" means that a 10p coin was entered followed by two 5p coins.)

The software in the machine uses the following recursive function.

```

01 BEGIN Function Calculate(CoinString)
02     IF Length of CoinString = 1 THEN
03         Calculate = CoinValue(CoinString)
04     ELSE
05         First = First Character in CoinString
06         Rest = All the characters in CoinString after the first
07         Calculate = CoinValue(First) + Calculate(Rest)
08     END IF
09 END Function

```

- (i) State what is meant by recursion.

..... [1]

- (ii) In which line of the algorithm does the recursion happen?

..... [1]

- (d) State the result of the function if it is called with the following arguments.

- (i) Calculate("AA")

..... [1]

- (ii) Calculate("BABAA")

..... [1]

- (e) The function Calculate is called with the argument "AB".

Trace the execution of Calculate("AB") indicating clearly

- each time the function is called
 - the value of the argument in each call
 - the lines of the algorithm that are executed
 - the value that is returned from each function call.

You may use a diagram in your answer.

END OF QUESTION PAPER

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