GCE A level

1103/01

COMPUTING CG3

A.M. THURSDAY, 23 June 2011

3 hours

1103
010001

ADDITIONAL MATERIALS

In addition to this examination paper, you will need a 12 page answer book.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball point pen. Do not use pencil or gel pen. Do not use correction fluid.

Answer **all** questions.

Use both sides of the paper. Write only within the white areas of the book.

Write the question number in the two boxes in the left hand margin at the start of each answer.

Leave at least two line spaces between each answer.

The intended marks for questions or parts of questions are given in brackets [ ]. You are advised to divide your time accordingly. The total number of marks available is 100.

You are reminded of the necessity for good written communication and orderly presentation in your answers. The quality of written communication will be assessed in the last question.

Question A. Pupils in a school are encouraged to use a *search engine* and a *virtual learning environment* during lessons.

0 1 Describe what is meant by each of the terms *search engine* and *virtual learning environment* and give an example of how each might sensibly be used during school lessons. [4]

Question B.

0 2 What name is given to processes, such as *face recognition* or *fingerprint recognition* when used for security purposes. [1]

0 3 Describe a situation where *face recognition* might be used for security purposes, and describe a possible concern which people might have over the use of face recognition in this situation. [3]

Question C.

0 4 Explain the terms *serial transmission* and *parallel transmission* in a computer system and give one advantage of each type of transmission. [4]

0 5 Data can be transmitted using *simplex, half duplex* or *full duplex*. Describe each of these transmission methods. [3]

0 6 Why are network protocols necessary? [1]

Question D.

0 7 Explain what is meant by the term *linked list* and describe one benefit and one drawback of using a linked list compared with using an array. [4]

0 8 In a certain implementation, a linked list of integers is actually stored in a table form as shown below. The integers are to be accessed in ascending numerical order. A variable points to the address 852, which contains the lowest integer, 2415.

Complete the pointer column in the table below.

Address	Integer	Pointer
851	4811	
852	2415	
853	3599	
854	4166	
855	2567	
856	5218	
857	3100	

[3]

Question E.

0 9 Describe **in detail** what is meant by a *random access file.* Your answer should include a description of:

- the purpose of a hashing algorithm
- the need for an overflow area
- the need for the random access file to be re-organised on occasions. [6]

1 0 Describe what is meant by an *archive file.* [2]

Question F. Computers often *round* or *truncate* numbers.

1 1 Explain each of these terms and give **one** example which clearly shows the difference between *rounding* and *truncating.* [3]

1 2 Describe why *rounding* is generally more appropriate than *truncating*. [1]

1 3 Explain how *rounding* or *truncating* may cause a problem when a computer program is run. [1]

Question G.

1 4 A computer process may be in one of three different states: *running, ready* or *blocked.* Briefly explain the **two** terms *ready* and *blocked.* [2]

1 5 Describe what is meant by the term *scheduling* in a computer's operating system. [2]

Question H.

1 6 Describe **in detail** a suitable application which might use *batch processing,* making it clear why batch processing is the most appropriate approach in this case. [4]

Question I.

A computer system uses a particular logical operation and a *key* to encrypt data before it is transmitted along a network.

The truth table for this logical operation is shown below:

Input 1	Input 2	Output
0	0	0
0	1	1
1	0	1
1	1	0

17 What is the name of this logical operation and what is the essential characteristic of a *key*? [2]

18 An 8-bit number is encrypted and the **result** is 10111010. The key used was 11001011. **Showing your working**, determine the original 8-bit number. [2]

Question J.

19 Define the term *data mining.* Describe how a supermarket chain might use data mining. [3]

20 Outline the role of a *database administrator.* [1]

21 Security is very important in database applications, and in many cases, it is not desirable that every user should be able to access all the data in the database. Explain how a database management system can handle security in this situation. [2]

Question K.

The following algorithm performs a calculation on the number **Num**, producing a number as output:

```
1   function CalcF (Num: integer) : integer
2   if Num = 1
3           then CalcF = 1
4           else CalcF = Num * CalcF(Num-1)
```

2 2 There is a feature in line 4 above which make this a special type of algorithm.

State the name of this special type of algorithm and state one other feature such an algorithm must have. Name a sort which uses this special type of algorithm. [3]

2 3 Showing your working, dry-run the above algorithm with **Num = 3**, to demonstrate what the value of the function will be when the algorithm terminates.

Describe or name the calculation this algorithm performs. [3]

Question L.

2 4 Describe why a database designer might wish to *normalise* a database and explain what is meant by *third normal form.* [4]

2 5 A small theatre company performs plays, each of which is performed on several dates. Customers are able to book tickets for performances.

Each play has a title and a director.
Each customer has a customer number, a name and an address.
Each booking is made for one performance by one customer for a number of seats.

Design a database for the above situation in third normal form. [6]

Question M.

2 6 The email addresses of staff at the *Royal Cymru Bank* are made up of a first name, followed by a full stop, followed by a surname, followed by a single digit, followed by the @ sign, followed by **rcb.co.uk**

All the letters used are in lower case. Assume that all first names and surnames consist of letters only, and can be of any length.

An example of a valid email address at the bank is: **david.evans3@rcb.co.uk**

Produce an appropriate Backus-Naur Form (BNF) definition for an email address at *Royal Cymru Bank*. [4]

Question N.

There are various types of computer programming language.

2 7 Explain the difference between a *procedural* and *non-procedural* language. [2]

2 8 *Visual programming languages* are currently very popular. Describe the benefits of using a visual programming language. [3]

2 9 Some application packages have programming capabilities. Describe one advantage of having a programming capability within the package. [1]

3 0 Explain why careful *version control* is important when developing computer programs. [1]

3 1 Give one reason why it is useful to standardise computer languages. [1]

Question O.

3 2 A bus company wishes to analyse passenger numbers on its buses during *on-peak* periods (weekday mornings 7:00 to 9:30) and *off-peak* periods (all other times).

The number of passengers on a sample of *on-peak* and *off-peak* buses is counted and the means calculated and compared.

Design an algorithm, using pseudo-code or a high level programming language with inputs:

- the number of buses in the *on-peak* sample
- the number of passengers on each of the *on-peak* buses
- the number of buses in the *off-peak* sample
- the number of passengers on each of the *off-peak* buses

The outputs need to be:

- the mean number of passengers on the *on-peak* sample
- the mean number of passengers on the *off-peak* sample
- which mean is higher
- the difference between the two means

For instance, if the inputs are:

5
30 31 19 20 41
4
12 11 9 16

the outputs should be similar to:

Mean number of passengers on on-peak buses = 28.2
Mean number of passengers on off-peak buses = 12.0
The type of bus with the higher mean = on-peak
The difference in the means = 16.2

(Note: you do <u>not</u> need to consider the possibility of the means being equal) [6]

Question P.

3 3 A programming team is developing a new computer system and needs to consider the type of human computer interface (HCI) to use.

Possible approaches to the HCI include a *text based interface,* a *graphical user interface, speech recognition* and *forms dialogue.*

Discuss the features of these four types of HCI, making clear the benefits and drawbacks of the different types of HCI in different situations. [12]