GCE A level

1103/01

COMPUTING CG3

P.M. THURSDAY, 26 January 2012

3 hours

1103
010001

ADDITIONAL MATERIALS

In addition to this examination paper, you will need a 20 page answer book.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or 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 part 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.

Quality of written communication will be assessed in question 36.

Handwriting recognition and *speech recognition* are two methods now commonly used as input to a computer system.

0 1 Describe **two** benefits of *handwriting recognition* over a traditional keyboard and mouse input method. [2]

0 2 Describe **two different** benefits of *speech recognition* over a traditional keyboard and mouse input method. [2]

0 3 Explain what is meant by the term *web log (or "blog")* and outline how a politician might use a web log. [2]

0 4 Briefly describe **one** feature which any web page should include to make it easy to use. [1]

Arrays and *records* are types of *data structures.*

0 5 Explain what is meant by the term *data structure* and give one **other** example of a data structure. Why are data structures useful in computing? [3]

An organisation keeps data about its sales on a computer system.

0 6 State the essential features of an *array* and give one example of a situation where the organisation might use a **two-dimensional** *array* in connection with its sales data. [3]

0 7 Explain what is meant by the term *record* and give one example of a situation where the organisation might use a *record* in connection with its sales data. [3]

0 8 *Routers* are used in computer networks. Explain what is meant by the term *router* and describe the function of a *router* in a computer network. [2]

0 9 Explain what is meant by *circuit switching* and *packet switching* in a computer network and give **two** advantages of *packet switching* over *circuit switching.* [4]

1 0 Each packet normally contains source and destination addresses. State **two** other items of data you would expect a packet to contain. [1]

1 1 Explain what is meant by a *sequential file*, and describe how records are added and how records are deleted from a sequential file.
Why is an *indexed sequential file* often used in preference to a standard sequential file? [6]

1 2 Computer files can be encrypted. What is the purpose of encryption and how does it operate? [2]

13 It is necessary in a certain application to discover the value of the **third** bit of an eight bit binary number, counting from the most significant bit. (The example below shows which bit is required.)

1 0 1 1 1 0 1 0
↑

Describe how *masking* could achieve this, stating the 8 bit number required as the mask and the logical operation required for this process. Draw the truth table for this logical operation. [3]

14 Describe a security situation where *voiceprint recognition* might be used, explaining how it operates. Describe **one** possible drawback of voiceprint recognition. [3]

15 Explain what is meant by the term *buffering* in a computer system. Your answer should cover the difference between *single buffering* and *double buffering* and the benefits of *double buffering*. Give an example of double buffering. [4]

16 Giving an example, explain what is meant by the term *multi-tasking*. [2]

Interrupts in computer systems arise for a number of different reasons.

17 Give **two** examples of an interrupt generated by *software*. [2]

18 Give **one** example of an interrupt generated by a *hardware device*. [1]

A software development company specialises in developing computerised automatic train braking systems.

19 Why would the development of this type of software be a highly specialised field? [2]

20 When the company develops such a system, a *design validation* is carried out. Describe how a design validation should be carried out. [2]

2 1 Describe what is meant by a *primary key* and a *foreign key* in a database. [2]

2 2 Why is an *index* often used by a database management system? [1]

2 3 A vehicle rental company has a number of branches across the country. Each of these branches has a number of vehicles available for rent and each branch has an address, and a manager. Each vehicle has a unique registration number and is based at one branch only. Each vehicle has a weekly rental charge. Customers of the rental company have a Customer ID, name and address. Bookings are made by customers to rent vehicles for a fixed period of time.

The rental company wishes to develop a database to contain all relevant information about branches, vehicles, customers and bookings.

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

2 4 Describe why *distributed databases* are often used and describe one difficulty associated with using distributed databases. What is actually **distributed** in a *distributed database*? [3]

2 5 Convert the hexadecimal number **6E** to binary, and explain why hexadecimal is often used to represent binary numbers. [2]

2 6 In a certain computer, real numbers are stored in floating point form using 20 bits as shown below:

Mantissa (16 bits in two's complement form. The binary point in the mantissa is immediately after the left bit.)	**Exponent** (4 bits in two's complement form)

Convert the number **22.75** to this floating point form. [2]

2 7 Name **two** methods of defining algorithms. [1]

2 8 *Parameters* are often passed to and from procedures by *reference.* Explain what is meant by the term *parameter* and explain how passing parameters by *reference* works. Name and describe **one other** method by which you can pass parameters to and from a procedure.

Give **one** disadvantage of passing parameters by reference, compared with the method you have named. [5]

2 9

What is the purpose of Backus-Naur Form (BNF)? [1]

3 0

Each member of staff in a large company is given a unique identification code, which is made up of their surname and a two digit number.

Two examples of an identification code are:

MORGAN32
O'DONNELL18

You may assume that surnames contain one or more letters and may contain apostrophes('). The first character must be a letter.

Produce an appropriate BNF definition for the identification code. [4]

3 1

A manufacturer produces car windscreens. The machines which produce the windows are not completely accurate and sometimes produce windscreens which are slightly too wide to fit in the particular car.

(You may assume that the windscreens produced are never **under** width.)

Tests are made on a sample of windscreens: in each case the width of the windscreen is measured. (All widths are in mm.)

Design an algorithm using pseudo-code with the following inputs:

- the required width
- the number of windscreens to be sampled
- the width of each of the windscreens in the sample

The outputs for the program should be (for each windscreen found to be over the required width):

- the windscreen number (1, 2, 3, etc) and the width of that windscreen

The program should also output:

- the total number of windscreens sampled
- the number of windscreens in the sample which were of satisfactory width

All outputs should contain suitable messages where helpful.

For instance, if the inputs are:

1320
7
1321 1320 1320 1322 1320 1320 1320

the outputs should be similar to:

Over width windscreen: 1 1321
Over width windscreen: 4 1322
Total number of windscreens tested: 7
Number of satisfactory windscreens: 5 [6]

3 2	Explain what is meant by the term *relocatable code* in a computer system.	[1]
3 3	Explain why it is often useful to use *subprogram libraries*.	[1]
3 4	Explain why it may be useful to compile modules of a program separately.	[1]
3 5	Explain the role of a *link loader* and give one example of a *linking error*.	[2]

3 6 A programming team is developing a new, complex suite of programs.

Various types of programming languages are available to the team:

- visual languages
- fourth generation languages
- object oriented languages

The team might also decide to use:

- computer packages with programming capabilities

Discuss the features of the four approaches highlighted above which the team might consider. [12]