



**GCE A level**

1103/01

**COMPUTING – CG3**

A.M. MONDAY, 21 January 2013

3 hours

1103  
010001

### **ADDITIONAL MATERIAL**

You will need a WJEC 20 page answer booklet (pink), which has been specifically designed for the examination paper. No other style of answer booklet should be used. Should you run out of space, use a standard 4 page continuation booklet.

### **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.

The quality of written communication will be assessed in the last question.

Pupils in a school are encouraged to use the school's *intranet* and its *virtual learning environment (VLE)*. The school also has a web site.

0 | 1 Describe what is meant by the term *virtual learning environment* and give one example of information which could sensibly be held on the school *VLE*. [2]

0 | 2 Describe what is meant by the term *intranet* and give **one** example of information which could sensibly be held on the school *intranet*. [2]

0 | 3 Give **one** example of information which would not normally be held on the school *VLE* or *intranet*, but which could sensibly be available on the school web site. [1]

0 | 4 Explain what is meant by *multi-tasking* in a personal computer. [2]

0 | 5 *Standalone* computers are sometimes used. Give **one** benefit and **one** drawback of using standalone computers, compared with computers which are networked. [2]

0 | 6 Give one advantage of transmitting data in digital form rather than analogue form. [1]

0 | 7 Data may be transmitted through a computer network using *simplex*, *half duplex* or *full duplex*. Describe each of these transmission methods. [3]

0 | 8 Explain what is meant by the term *switching* in a computer network. Why is switching useful in a computer network? [2]

0 | 9 Explain what is meant by a *router*. Describe the main function of a *router*. [2]

1 | 0 When developing a new computer system, programmers often use a software package with *programming capabilities*, rather than a traditional programming language. Describe **two** possible benefits and **one** possible drawback of this package-based approach compared with the use of a programming language. [3]

1 | 1 Why might a programmer wish to use a *special purpose language*? Give an example of a situation where a *special purpose language* might be used. [2]

1 | 2 Outline what is meant by a *scripting language*. Give an example of a situation where a *scripting language* might be used. [2]

1 | 3 Explain the term *data mining*. Describe in detail how an insurance company might use *data mining*. [4]

1 | 4

In a certain application, a linked list of names is stored in table form as shown below. The names are to be accessed in alphabetical order. A variable points to address 505, which contains the first name alphabetically, Abbott.

Address	Name	Pointer
501	Lindsey	
502	Markowicz	
503	Wong	
504	Edgeley	
505	Abbott	
506	Farooq	

Copy and complete this table.

[3]

1 | 5

**M** is the sixteen-bit binary number 1000000000000000.

**M** is used in a *masking* process with another sixteen-bit binary number.

Name the logical operation which would be used in this masking process and state the effect of the process. [2]

1 | 6

Explain the terms *indexed sequential file* and *multilevel index*. Draw a diagram to demonstrate the operation of a **three-level** index. Describe the main advantage of an *indexed sequential file* over a standard *sequential file*. [7]

1 | 7

Describe the purpose of a *transaction log*, making it clear when it is used. [2]

1 | 8

*Towy* is a large on-line retailer which sells books and computer games. *Towy* carries out *disaster planning* for its computer systems. Discuss the importance of disaster planning and describe how effective disaster planning would allow *Towy* to recover quickly following a disaster. [6]

1 | 9

In a computer program data can be passed to a procedure by *value*. State the name used for an item of data passed in this way and explain how passing by *value* works. State another method by which data can be passed to a procedure and explain how this method works. Describe **one** benefit of passing data by value compared with this other method. [5]

2 | 0

A computer process may be *blocked*. Describe, giving an example, what is meant by the term *blocked*. [2]

2 | 1

*Partitioning* is often used in computer memory. Explain what is meant by the term *partitioning*. Why does program code need to be *relocatable* if partitioning is used? [3]

2 | 2

State **two** advantages of a *relational database* over a *flat file system*. [2]

2 | 3

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

2 | 4

An array should contain **eight** positive integers. An algorithm is designed to locate the first incidence of a particular integer in the array.

**Test data** is required to test the algorithm as fully as possible.

The table below shows two suitable examples of test conditions and test data:

Condition being tested	Array data	Search integer
Search integer not present	5 8 5 9 2 3 9 4	7
Array contains an incorrect amount of integers	2 3 5 6 4 8 1	9

Copy the above table headings and write down **two more** conditions which should be tested, providing suitable test data in **each** case. [4]

2 | 5

Each student at a college can enrol on a number of courses. Some courses run several times a year. Each course is taught by one and only one teacher, although teachers may teach a number of courses.

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

Backus-Naur Form (BNF) is often used when defining the syntax of a programming language.

2	6
---	---

 Explain why BNF is preferable to a natural language for this purpose. [1]

2	7
---	---

 A *word* may be defined as containing one or more characters and must:

- begin with a letter
- end with a letter
- be made up of letters and hyphens (-) only

You may assume that all letters are in lower case.

Produce an appropriate **BNF definition** for a *word* as defined above. [4]

2	8
---	---

 Suppose that the definition of a word is modified so that the word has to be of length three or more characters. Produce an appropriate **syntax diagram** for a *word* as defined in this way. [3]

2	9
---	---

 Each student at a college is allowed **two** attempts at sitting a college examination in a certain subject.

If the student is taking the examination for the **first** time:

- a mark of 60 or more is awarded a **merit**
- a mark of 50 or more (but less than 60) is awarded a **Pass**
- any other mark results in a **Fail**

If the student is taking the examination for the **second** time:

- a mark of 50 or more is awarded a **Pass** and the mark is set to 50
- any other mark results in a **Fail**, and the mark is unchanged

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

- the student's name
- the mark
- whether the attempt was for the first (**F**) or second (**S**) time

The outputs should be:

- the student's name
- the mark (reduced if necessary)
- the grade

For instance:

- if the input is **Evans 64 F** the output should be **Evans 64 Merit**
- if the input is **Evans 13 F** the output should be **Evans 13 Fail**
- if the input is **Evans 64 S** the output should be **Evans 50 Pass**
- if the input is **Evans 44 S** the output should be **Evans 44 Fail**

Note: you are **not** expected to include any input validation. [6]

3 | 0

Assuming overflow does not occur, what would be the effect of carrying out **an arithmetic shift left by one place** on a positive binary number. [1]

3 | 1

Describe what are meant by the terms *overflow* and *underflow* in connection with storing numbers in a computer. [2]

3 | 2

One advantage of storing numbers in *floating point form* in a computer is that it can be used to store very large (positive or negative) numbers. State **one** other advantage of using floating point form rather than integer form. State **one** advantage of storing numbers in integer form. [2]

3 | 3

In a certain computer, real numbers are stored in floating point form using 16 bits as shown below:

<b>Mantissa</b> (12 bits in two's complement form. The binary point in the mantissa is immediately after the left bit.)	<b>Exponent</b> (4 bits in two's complement form)
--	--

Convert the number **24.25** into this floating point form. [2]

3 | 4

A programming team is developing a new computer system, and it is very important that this particular system is usable by a wide range of users, including those with various types of physical disability.

The system will have a graphical user interface (GUI) but this may be specially adapted, and other facilities may be added to make the system more suitable for users with physical disabilities.

Discuss the types of input and output methods which are particularly suitable for users with various types of physical disability. [8]