GCE A level

1103/01

S16-1103-01

COMPUTING – CG3

A.M. WEDNESDAY, 22 June 2016

3 hours

1103
010001

ADDITIONAL MATERIALS

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 question **30**.

0 1 A politician uses a web log (or *"blog"*).

Explain what is meant by a web log and outline how the politician might use the web log. [2]

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0 2 Describe what is meant by *ecommerce* and explain one concern which might be expressed about ecommerce. [3]

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0 3 Data in computer systems is usually transmitted in *digital* form. Explain why computer systems sometimes need to deal with data in *analogue* form. [1]

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0 4 Explain the difference between *rounding* and *truncating* and give **one** example which gives a different result when it is rounded from when it is truncated. [3]

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0 5 File backup systems often involve three generations of files. Explain what is meant by generations of files. Explain why a backup system of this type would be useful. [2]

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0 6 A particular organisation is very dependent on its computer systems and plans carefully how it would deal with the situation if, for instance, a major fire destroyed most of its premises. Give the name for this type of planning.

The organisation regularly backs up its data. Describe other actions which the plan should contain. [4]

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0 7 Draw the truth table for the **XOR** logical operator. A computer system uses the **XOR** logical operator to encrypt data before it is transmitted. Use a worked example (using 8 bits) to demonstrate how data is encrypted and decrypted using this method. [3]

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0 8 A large warehouse contains thousands of items, each with a unique ID number. A *random access file* is used to store information about these items, with the ID number being used as the key field.

Explain in detail how a random access file operates, using the situation described above as an example. [6]

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0 9 Explain what is meant by the term *computer interrupt* and give **two** examples of situations where an interrupt will arise. Explain what will happen if, while an interrupt is being processed, another interrupt with a higher priority arises. [6]

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1 0 Giving an example, explain what is meant by the term *multi-tasking*. [3]

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1 1 A binary tree data structure is designed to contain integers and uses the following rules:

- the left pointer indicates the condition “smaller or the same size”
- the right pointer indicates the condition “larger”

The integer **47** is placed in the top node of the tree.

What is the name of the top node of a binary tree? [1]

1 2 Draw the binary tree diagram using the rules above, containing the integer **47** in the top node, then the following six integers: **40, 35, 42, 50, 47, 48** in that order. [3]

1 3 If the following integers were now added to the binary tree in this order, the appearance of the tree would alter significantly: **34, 30, 30, 28, 25, 20, 15, 12**. State the effect this would have on the tree and describe one difficulty which will result. **There is no need to add these integers to the tree you have drawn.** [2]

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1 4 State why Backus-Naur Form (BNF) is preferable to ordinary English or Welsh when defining the syntax of a computer language. [1]

1 5 The email addresses of students at *Midshire University* 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 a department, followed by a full stop, followed by **mid.ac.uk**

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

An example of a valid email address at Midshire University is:
lee.davies7@computing.mid.ac.uk

Produce an appropriate Backus-Naur Form (BNF) definition for a student email address at Midshire University. [4]

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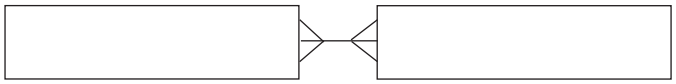
1 6 Entity-relationship diagrams (ERDs) are often used in data analysis.

Explain the problem when part of an ERD looks like the diagram below, and explain the steps that can be taken to solve the problem:



[2]

1 7 Explain what is meant by data normalisation in a relational database. Your explanation should include references to the benefits of data normalisation. [4]

1 8 Explain how first, second and third normal forms are derived from a set of un-normalised data. [3]

1 9 *Aberhols* runs walking holidays in different parts of the country. *Aberhols* employs a number of holiday leaders. Each time a holiday takes place it has a unique ID number and a single leader. *Aberhols'* customers make a booking for a specific holiday.

Design a database system for this situation in third normal form using four tables. [6]

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2 0 *Pseudo-code* is often used to define algorithms. Name **two** other methods of defining algorithms. [1]

2 1 Describe how an *insertion sort* works. [3]

2 2 Two types of people use *WJ Gym* - **members** and **guests**. The owners of *WJ Gym* want to investigate the use of the gym by these two different groups on one particular day. Each time someone enters the gym, the following data is captured:

- type of visitor (**M** or **G**)
- how many minutes each person stays in the gym

Design an algorithm, using pseudo-code, with pairs of inputs as described above. Its outputs should be:

- the number of members who have attended the gym that day
- the mean length of stay (in minutes) of members that day
- the number of guests who have attended the gym that day
- the mean length of stay (in minutes) of guests that day
- for the longest staying person, the duration of their visit and whether they were a member or a guest

The values **Z 0** are used as a data terminator at the end of the day.

For instance if the inputs are:

M 55
M 65
G 40
M 30
G 20
Z 0

The outputs should be similar to:

Number of member visits: 3
Mean duration of member visits: 50
Number of guest visits: 2
Mean duration of guest visits: 30
Longest stayer: 65 M

[6]

2 3 Explain the difference between a *procedural* and *non-procedural* programming language. [2]

2 4 Two types of programming language are:

- fourth generation language
- visual language

In each of the above cases, describe a situation where this type of language might sensibly be used and give **one** reason why its use would be suitable in this case. [4]

2 5 Another type of language is a *scripting language*. State when a scripting language might be used. [1]

2 6 Explain why careful *version control* is necessary when developing computer programs. [1]

2 7 Explain the role of a *break point*, *variable watch* and *store dump* when debugging a program. [3]

2 8 Explain what is meant by the term *parallel processing* and give an example of an application where parallel processing might be useful. [2]

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2 9 Discuss the differences between the use of *circuit switching* and *packet switching* in communication systems. Explain why packet switching is generally the preferred method.

You do **not** need to describe the contents of a packet. [6]

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3 0 It is essential to give serious consideration to the human computer interface (HCI) when a new computer system is being developed. Various types of HCI are available. These include:

- text-based interface
- graphical user interface
- speech recognition
- speech synthesis
- handwriting recognition

Explain why the HCI is so important and discuss the features of these five types of HCI which might influence a programmer's choice of HCI. [12]

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