GCE A level

1103/01

COMPUTING – CG3

A.M. MONDAY, 20 January 2014

3 hours

1103
010001

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Answer **all** questions.

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 that assessment will take into account the quality of written communication used in your answers.

The quality of written communication will be assessed in question **31**.

A gap-year student is working for a charity in an underdeveloped country.

0 1 The student decides to create a *web log* (or *"blog"*). Explain what is meant by a *web log* and outline how the student might use the web log. [2]

0 2 While in the same country, the student wishes to *download music* and use *on-line banking*. Outline what is meant by each of these terms, and explain a **different** difficulty the student may experience in each case. [4]

0 3 Describe **two** features that any web page should have in order to make it easy to use. [2]

0 4 Describe the differences between *circuit switching* and *packet switching* in a network. A typical packet contains the source and destination addresses. State **two** other data items that the packet is likely to contain. [4]

0 5 Many computer systems use *speech recognition* as a means of input. Describe **three** benefits of speech recognition as an input method and also describe **two** possible ambiguity problems associated with speech recognition. [5]

0 6 Another method of input is *forms dialogue*. Outline what is meant by *forms dialogue* and explain how this approach can provide input validation. [2]

0 7 A *linked list* is an example of a data structure.

State **two** other examples of data structures.

Draw and label a diagram to show the structure of a linked list. [3]

0 8 The truth table for a particular logical operation is shown below:

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

Name the logical operation represented by this truth table and, using an example, explain how it might be used for *masking*. [3]

0 9 A *random access file* uses a hashing algorithm, and uses an overflow area for when data collisions occur. From time to time the file needs re-organising. Describe **in detail** how a random access file operates. [6]

1 0 Outline how an *insertion sort* operates. [2]

1 1 Describe the difference between *rounding* and *truncation* in computer programs. [2]

1 2 Describe a serious error that can arise as a result of rounding in computer programs. [1]

1 3 Expert systems are sometimes used by doctors to assist with a diagnosis. Explain what is meant by the term *expert system* and describe any benefits and drawbacks of the use of an expert system to the doctor. [6]

1 4 Discuss the benefits of biometrics for enhancing security, and discuss any concerns people may have about their use. [5]

1 5 A supermarket chain uses *data mining* techniques on data gathered from its customer loyalty card scheme. Explain what is meant by *data mining* and discuss how the supermarket could use data mining in this case. [4]

1 6 When a high speed device such as a computer is attached to a low speed device such as a printer, one or two temporary storage areas are often used to improve the efficiency of the data transfer. Give the name of a temporary area of storage of this type and explain **in detail** how this approach assists with data transfer between the devices. [4]

1 7 Explain what is meant by the term *interrupt* in a computer system and explain what happens after the interrupt is dealt with. Describe **two** situations which might give rise to an interrupt, making it clear in each case whether the situation is an example of an interrupt generated by a *hardware device* or by *software*. [4]

1 8 State the main difference between a flat file system and a relational database. [1]

1 9 Explain the role of a database management system in allowing authorised access to data. [2]

2 0 Explain why an *index* is often used in a database management system. [1]

2 1 Carry out an **arithmetic shift left by three places** on the eight-bit positive integer **00001011** and state the effect of this operation on the number. [2]

2 2 What is the difference between an **arithmetic shift** and a **logical shift**? [1]

Turn over.

2 3 The table below represents part of a database which is **not** in *first normal form*.

Explain why this is not in first normal form. [1]

StudentID	StudentName	StudentSubjects
23784	Chang	English, Mathematics, Computing
23821	Brown	Welsh, History, Computing
24059	Jones	Physics, Chemistry, Biology
.....	.....	.....

2 4 *Goodfilm* is an organisation which rents copies of films to its members on DVD. The copy is sent to the member by post and returned by the member after use.

Some films are very popular so there may be several copies of some films and each individual copy has an id-number. Each copy was purchased on a particular date.

Goodfilm need to keep track of which copy of a film is loaned to which member.

Each film has a film id-number, a title, a genre, (for instance, action, romance, horror) and a year of release, for instance 2013.

Each member of *Goodfilm* has an id-number, name and address.

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

2 5 What is the purpose of Backus-Naur Form (BNF)? Explain why BNF is often used in preference to a natural language such as English or Welsh. [2]

2 6 In a certain application, decimal numbers are defined as follows:

- no sign or a plus sign
  followed by
- one or more digits
  followed by
- a decimal point
  followed by
- exactly four digits

For instance, the following are covered by this definition:

+23.0000 23.0000 –0.5256 –127.3000

Produce an appropriate BNF definition for a decimal number as defined above. [4]

2 7 A manufacturer produces many different items, each of which has a five digit item number.

A **check number**, between 0 and 99 inclusive is calculated from each item number as follows:

- The first (left) digit is multiplied by 5
- The second digit is multiplied by 6
- The third digit is multiplied by 7
- The fourth digit is multiplied by 8
- The fifth digit is multiplied by 9

The five numbers produced are then added together.

If the resulting number is:

- less than 100, it becomes the **check number**
- 100 or more, it is reduced by 100 one or more times until it is less than 100 – it then becomes the **check number**

For instance:

- if the item number is **41521**, the **check number** is **86**
  (4 × 5 + 1 × 6 + 5 × 7 + 2 × 8 + 1 × 9 = 86)

- if the item number is **41642**, the **check number** is **18**
  (4 × 5 + 1 × 6 + 6 × 7 + 4 × 8 + 2 × 9 = 118)
  (This is greater than 100 so subtract 100)

- if the item number is **97999**, the **check number** is **03**
  (9 × 5 + 7 × 6 + 9 × 7 + 9 × 8 + 9 × 9 = 303)
  (This is greater than 300 so subtract 300)

Design an algorithm, using pseudo-code, as follows:

- It should allow for a series of item numbers to be input, each consisting of five digits
- The item number 00000 should act as a data terminator (rogue value)

For each item number, the output should be the five digits of the item number followed by the check number.

For example if the inputs are:

41521
41642
97999
00000

The outputs should be:

41521 86
41642 18
97999 03

[5]

2 8 Explain why careful version control is necessary when developing computer programs. [1]

2 9 Explain the difference between a *procedural* and *non-procedural* programming language. [2]

3 0 Explain the role of a *link loader* and give an example of a *linking error*. [2]

3 1 A software developer uses two software tools amongst others while developing a new software system.

These two software tools are:

- a *compiler*: used to translate a computer program into a form ready for execution on a computer
- a *debugger*: used to detect errors during the development of a program

Describe in detail the operation of these two software tools in developing software systems. [11]

END OF PAPER

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