



**GCE A level**

**1103/01**

**COMPUTING – CG3**

**A.M. TUESDAY, 23 June 2015**

**3 hours plus your additional time allowance**

## **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 or your usual method.**

**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 33.**

Many computer systems now use **SPEECH RECOGNITION** as an input method.

0	1
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Describe **TWO** benefits of **SPEECH RECOGNITION** over a traditional keyboard and mouse input method. [2]

0	2
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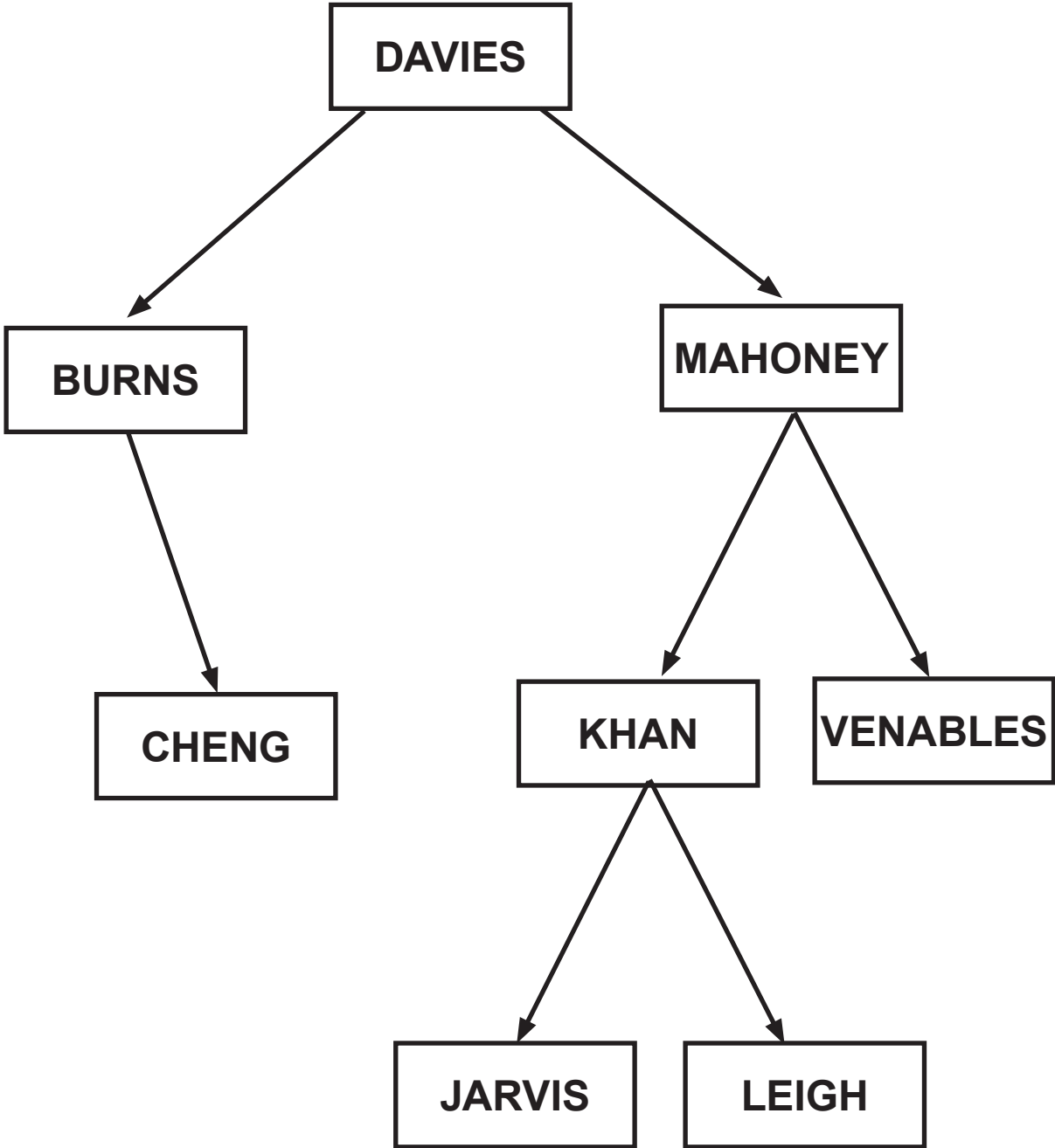
Describe **TWO** possible ambiguity problems associated with using speech recognition in this way. [2]

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The diagram opposite represents a data structure containing a number of names.

In each case:

- the left pointer indicates the condition “earlier or at the same position in the alphabet”
- the right pointer indicates the condition “later in the alphabet”



0	3
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State the name given to this type of data structure. [1]

0	4
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Name the type of node that contains DAVIES.

[1]

0	5
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Describe ONE ADVANTAGE and ONE DISADVANTAGE of using this data structure to store ordered data compared with using an array. [2]

0	6
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Another name, also KHAN, needs to be added to the data structure. Copy the diagram and show where the name KHAN should be added. (You can abbreviate names if you wish.) [1]

0	7
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Redraw the left hand side of the diagram to show how it would look if CHENG had been inserted before BURNS. [2]

0	8
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Describe, giving a reason, a situation in which it would be more suitable to use a DIRECT (RANDOM) ACCESS FILE rather than an INDEXED SEQUENTIAL FILE. [2]

0	9
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A direct (random) access file normally uses a hashing algorithm to allocate a storage location for each record. Describe what happens when a hashing algorithm allocates a record to a storage location which is already occupied, and what happens when this record is accessed later. [2]

1	0
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Computer files are often ENCRYPTED. State the purpose of file encryption and describe how it operates. [2]

1	1
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Describe what is meant by the term **ALGORITHM** and name **TWO** methods of defining algorithms. [4]

1	2
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In a computer program, a parameter may be passed to a procedure by **VALUE**. Explain how this method works.

Name another method by which you can pass a parameter to a procedure and explain how this method works. Describe **ONE** benefit of **EACH** of the two methods. [5]

1	3
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In a certain computer, **SIGN/MAGNITUDE FORM** is used to represent integers using eight bits, with the left bit being set to zero for a positive number.

Show how the negative number **-13** will be represented. [1]

1	4
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In another 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.)
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Convert the number **23.125** into this floating point form. [2]

1	5
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In another computer, **TWO'S COMPLEMENT FORM** is used to represent negative numbers.

Using 8 bits and **SHOWING ALL YOUR WORKING**, demonstrate that  $-5_{10}$  is the result of the binary addition of  $4_{10}$  and  $-9_{10}$  [2]

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1	6
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An intruder alarm system in an office block is connected to the local police station. A signal is sent to the police station if at least one of the following conditions is true:

- the system detects a possible intruder
- the system is malfunctioning

Name the logical operation required in this case and draw a truth table for this logical operation. [2]

1	7
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The heating system in this office block switches on when both of the following conditions are true:

- the temperature is below a pre-set value
- the timer is set to be on at that particular time

Name the logical operation required in this case and draw a truth table for this logical operation. [2]

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**A software developer specialises in developing fully automated computerised level-crossing gate systems for train companies worldwide.**

1	8
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**Explain why the development of this type of software would be a highly specialised field.**

**[2]**

1	9
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**Describe ONE benefit and ONE drawback of a fully-automated level-crossing gate system of this type. [2]**

2	0
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**When the company develops such a system, a design VALIDATION is carried out. Describe how a design validation should be carried out in this case. [2]**

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2	1
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**Discuss the possible drawbacks to the customer of ON-LINE SHOPPING. [6]**

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2	2
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**Explain in detail how a MULTIPROGRAMMING computer system works. Your answer should include an explanation of SCHEDULING and PARTITIONING. [6]**

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2	3
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**Describe the function of a ROUTER in a computer network and explain, giving an example, why PROTOCOLS are necessary in computer networks. [4]**

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2	4
---	---

In a particular programming language, variable names are made up of letters (which can be upper or lower case), digits or the underscore character (\_). The first character and the last character of the name must be a letter. All variable names must consist of TWO or more letters.

Produce a Backus-Naur Form (BNF) definition for a variable name in this language. [4]

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2	5
---	---

Outline the role of a database administrator.

[1]

2	6
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Explain the term DATA MINING.

Supermarkets and insurance companies both use data mining.

Outline how a supermarket chain and how an insurance company might use data mining.

[4]

2	7
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**A college uses a database to store details of part-time teachers it employs to teach some of its modules.**

**TEACHERS have different SKILLS and so can only teach certain MODULES. Each time a teacher is employed, he or she is given a CONTRACT which includes the module, a start date and the hours worked. It is permissible for a teacher to be employed teaching more than one module, and a teacher may teach the same module many times.**

**Design a FOUR TABLE database system for the above situation, in third normal form. [7]**

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2

8

During a university course, a number of students give individual presentations which are marked by a panel of eight judges. Each judge awards a mark (0 to 10) to each student. The student's final mark is the sum of SIX of the eight marks, with the (possibly equal) highest and (possibly equal) lowest marks being excluded.

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

- the total number of students
- the eight marks for each student

The algorithm should output

- the final mark for each student
- the highest final mark for all the students

For instance, if the inputs are:

```
2
9 9 9 9 9 9 7 9
4 8 5 7 8 6 5 5
```

the outputs should be similar to:

**Final Mark = 54**

**Final Mark = 36**

**Highest Mark = 54**

2	9
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**Give one reason why it is useful to standardise computer languages. Briefly describe an issue associated with standardising computer languages. [2]**

3	0
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**Describe the purpose and give a benefit of using subprogram libraries. [2]**

3	1
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**Computer programs are often split into modules which can be compiled separately, or the whole program can be compiled in one operation. Describe the disadvantage of compiling the whole program in one operation.**

**[1]**

3	2
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**Describe the features of an OBJECT ORIENTED LANGUAGE. Your description should include a brief outline of what is meant by:**

- **A CLASS**
  - **A METHOD [4]**
-

3
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3
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**A number of software tools are available when a new suite of computer programs is being written.**

**These include:**

- **CASE (Computer Aided Software Engineering) tools**
- **compilers**
- **debuggers**

**Describe these software tools and discuss their role in developing software. [12]**

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**END OF PAPER**