



GCE A level

1103/01

COMPUTING – CG3

P.M. TUESDAY, 11 June 2013

3 hours

1103
010001

ADDITIONAL MATERIALS

You will need a WJEC 20 page answer booklet (pink), which has been specifically designed for this 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 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.

Stacks and *queues* are examples of *data structures*.

0	1
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 What is meant by the term *data structure*? [1]

0	2
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 State a computer application where a stack is the most appropriate data structure and explain why it is the most appropriate data structure in this case. [2]

0	3
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Other than a printer queue, state a computer application where a *queue* is the most appropriate data structure and explain why it is the most appropriate data structure in this case. [2]

0	4
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 Giving an example, explain why *network protocols* are necessary. [2]

0	5
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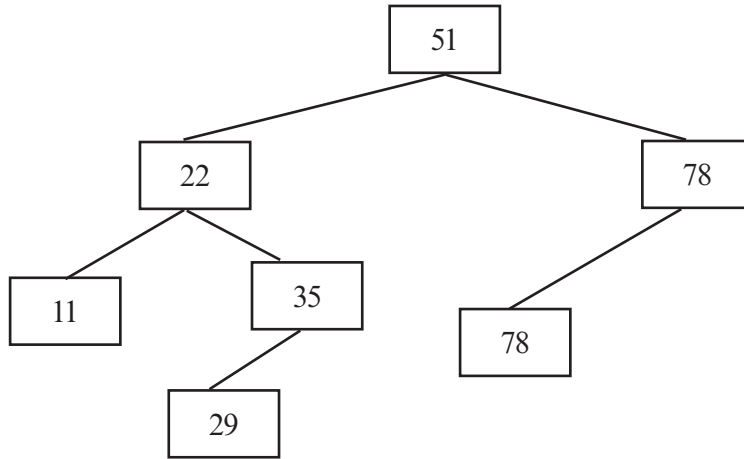
 Data can be transmitted using *serial transmission* or *parallel transmission*. Explain these two methods of transmission, giving one benefit of each method. [4]

0	6
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 Data in a computer system is normally transmitted in *digital* form. Why do computer systems sometimes need to deal with data in *analogue* form? [1]

The following diagram contains a number of integers. In each case:

- the left pointer indicates the condition “less than or equal to”
- the right pointer indicates the condition “greater than”



0	7
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 What name is given to this type of *data structure*? [1]

0	8
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 Write down the integer in the *root node*. [1]

0	9
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 State one advantage and one disadvantage of using this data structure to store ordered data compared with using an array. [2]

1	0
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 Copy the diagram to show where a new node also containing the integer 35 would be added. [1]

1	1
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 The integer 67 is not in the diagram. Write down the stages that would be followed if a search was made for the integer 67. [2]

1	2
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 State the name given to processes such as *retinal scanning* when used for security purposes.

Retinal scanning is sometimes used to control access to secure government buildings. Explain how retinal scanning might work in this case, describing any drawbacks to using this system. [5]

1	3
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 One method of input to a computer is via a *forms dialogue*. Describe what is meant by a forms dialogue and give one benefit of this approach. [2]

1	4
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 A *touchpad* is often used as a computer input device. Give one advantage of a touchpad over a conventional mouse. [1]

1	5
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When a computer system is being developed, a *design validation* is often carried out.
Describe what should happen during a design validation. [2]

1	6
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A certain database includes a field which contains a person's current age. Describe one disadvantage of using current age as a field in a database, and state a field which would be preferable in this situation. [2]

1	7
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Explain the advantages of different users of a database system having different *views* of the database. [2]

1	8
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An operating system on a multiprogramming computer system carries out many functions. Explain what is meant by the term *multiprogramming* and explain **in detail** the functions provided by the operating system which allow the system to achieve multiprogramming. [8]

The following algorithm performs a calculation on the integer **Num**, returning an integer as output:

1	function Fvalue (Num: integer) : integer
2	if Num = 1 then
3	set Fvalue = 0
4	else
5	if Num = 2 then
6	set Fvalue = 1
7	else
8	set Fvalue = Fvalue(Num-2) + Fvalue(Num-1)
9	endif
10	endif
11	endfunction

1	9
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There is a feature in line 8 which makes this a special type of algorithm.

State the name of this special type of algorithm, and state one other feature which such an algorithm must have, giving an example from the algorithm above. [3]

2	0
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Showing your working, dry-run the above algorithm using **Num = 4**, to demonstrate what the value of the function will be when the algorithm terminates.

Describe or name the calculation this algorithm performs. [3]

2	1
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State what is meant by the term *foreign key* in a relational database system, and explain why foreign keys are important. [2]

2	2
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If a database is already in *second normal form*, describe the step necessary to ensure that it is in *third normal form*. [1]

2	3
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Testpasser is a driving school with a number of branches in different towns (only one branch per town). Each branch has an address and a telephone number. *Testpasser* employs a number of driving instructors, each of whom works at just one branch. Pupils of *Testpasser* are taught by just one instructor. Bookings are made by pupils for a certain time and date.

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

Assemblers, interpreters and compilers are all used to translate a computer program for execution by a computer.

2	4
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Explain the function of an *assembler* making its input and output clear. [2]

2	5
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Explain the difference between an *interpreter* and a *compiler*. [2]

2	6
---	---

Describe **in detail** the main stages of compilation. [8]

2	7
---	---

In a car factory, a number of operations, such as welding and painting, are carried out by robotic equipment.

Describe the benefits and other implications of automation of this type. [6]

2	8
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What is the purpose of Backus-Naur form (BNF)? Why is BNF normally preferred over the use of a natural language such as English or Welsh? [2]

2	9
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In some applications, *amounts of money* are always displayed using exactly two decimal places. Negative amounts are shown in parentheses.

For instance, -27 would be displayed as (27.00)

Other examples are:

1.00 23.48 (23.48) 0.25 65.70 (1273.71) 0.00

Produce an appropriate BNF definition for an *amount of money* as described above. [4]

A control system in a chemical reactor controls the amount of power which heats the reactor and monitors the temperature in the reactor, producing an alarm signal if the temperature is too high or too low. In certain circumstances, the supervisor is able to switch on a manual override system to prevent the alarm signal from sounding.

3	0
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The control system is required to increase the power if both of the following conditions are true:

- the temperature in the reactor is too low
- the reactor is required for a new job

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

3	1
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The control system is required to sound an alarm signal if one (and only one) of the following conditions are true:

- the temperature in the reactor is too high
- the manual override system is switched on

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

3	2
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People suffering from a certain medical condition are given a blood test each month for a year.

The mean of the twelve values resulting from the test is calculated.

The range of values (highest minus lowest) is calculated.

- If the **mean** is greater than 75, further treatment is undertaken
- If the **range** is greater than 25, further treatment is undertaken
- If neither of the conditions is true, the patient is not given any treatment (Note: if **both** conditions are true, further treatment is undertaken)

For instance:

If the twelve monthly figures are:

55 55 55 55 60 70 40 55 65 45 55 60
then **further treatment** is undertaken
(since the range is greater than 25)

If the twelve monthly figures are:

80 85 75 60 80 75 95 75 80 85 85 80
then **further treatment** is undertaken
(since the range is greater than 25 **and** the mean is greater than 75)

If the twelve monthly figures are:

50 55 65 60 60 65 65 55 50 55 65 60
then **no treatment** is given
(since neither condition is true)

Design an algorithm, using pseudo-code, whose inputs are the twelve monthly readings.

Its output should be the **mean** and **range** then either **further treatment** or **no treatment**. [6]

3	3
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 Access to computer files may be *sequential*, *indexed sequential* or *random*.

Describe **in detail** each of these three types of access, including how records are added or deleted, and discuss their relative advantages and disadvantages. [10]