WJEC
CBAC

GCE MARKING SCHEME

COMPUTING
AS/Advanced

JANUARY 2012

INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2012 examination in GCE COMPUTING. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

CG3

01 Handwriting recognition: **any 2 of:**
- Is quicker / easier for user than typing 2x1
- There is no need to learn to type / is a more "natural" form of input
- Avoids the use of a bulky keyboard / useful in confined spaces

02 Speech recognition: **any 2 of:**
- Speeds up text input / faster than typing 2x1
- Can be used by someone who is unable to type / not a skilled typist / disabled
- May help to avoid RSI
- Allows user to simultaneously do some other task

03 A web log is a set of entries / diary on the world wide web (which is accessible to any web user.) 1

A politician could add items to keep their readers up-to-date with current political news / events / opinions / legislation proposals etc 1

04 **Any 1 of:**
- Should comply with established web standards 1
- Should be easily navigable / should be (hyper)links (accept buttons) to allow nav'n **Not** "hyperlinks" alone
- All links should be correct
- The page should be as accessible as possible for user with visual impairment etc
- It should make sensible/imaginative used of colour, graphics, fonts etc

Not Help screen / function

05 A data structure is a group / set / collection of related data items / elements 1

Any of:
- queue 1
- stack
- (linked) list
- (binary) tree

[Not array or record] [Not table]

Why data structures: **Any 1 of:**
- convenient / best way of organising data relating to a real problem 1
- may be efficient to deal with various elements as one item

06 Any two of: an array (is a data structure which):

- is a set of data elements of the same type 1+1
- has its elements accessed via index(es), subscript(s), row/column names
- has a fixed/pre-determined number of elements

Example (may be by diagram or text):

Either:

	Jan Feb Mar Apr …	
Product 153	|	1
Product 156	|	
…..	|	

Or

Sales of each product number by month etc

07 A record is a set of data items all related to a single individual / entity etc 1+1
It can contain data of different types

Example (data about one product)
Either:
Product Id, Product Description, Product Price, Number in Stock etc…
Or:
153, Hard Disc Drive, £74.99, 23, etc… 1

08 A router is a device in a network which holds information about the addresses of computers in the network (or other networks) … 1

Any 1 of:
… and can direct data to the correct computer
… and can direct data around network in (most) efficient way 1
… and act as a gateway connecting to a larger network.

09 Circuit switching: 1

- Path is set up between the sender and receiver
- All data follows the same path, in order
- Path cannot be used by any other data

Packet switching:
Any 2 of **for one mark total**: 1

- Data split into packets
- Each packet may be transmitted by different routes
- Packets may arrive out of order and are re-assembled

Packet switch preferred: any 2 of **for one mark each** 1+1

- Better security as it is very difficult to intercept
- Makes more efficient use of data lines as there is no waiting during gaps
- Less likely to be affected by network failure because multiple paths used

An example of an extended answer worth four marks is:

Circuit switching is where a path is set up between the sender and receiver before the start of transmission and is kept open until the end of transmission. All data follows the same path, in order. The path cannot be used by any other data during the transmission.

Packet switching is where the data is split into packets before transmission. Each packet may be transmitted by different routes through network. They may arrive out of order and are re-assembled on arrival.

Packet switching is usually preferred because it results in better security as it is very difficult to intercept and reconstruct the packets. Packet switching also promotes the more efficient use of data lines as there is no waiting during gaps. It is also less likely to be affected by network failure because multiple paths are used.

10 **Any 2 of (both needed for the one mark):**

- the actual data 1
- the order number of the packet
- control signals / bit(s)
- error control signals / bit / check sum etc

[Not source and destination addresses]

11 In a sequential file records are stored in key sequence order (or key field order). 1

Addition of one record:
Make a new copy of the records until in the correct place to add the new record 1

Add the new record to the new copy) 1
Continue until the end of the file)

(If multiple records to be added, these should preferably be sorted before the above process to avoid multiple updates – **not expected**)

OR

Addition of one record:
Record added (probably at end of file) 1
Then file sorted 1

Deletion of one record
Make a new copy of the records until in the correct place for deletion 1

Do not copy the record to be deleted) 1
Continue until the end of the file)

(If multiple records to be deleted, these should preferably be sorted before the above process to avoid multiple updates– **not expected**)

An indexed sequential file allows serial access to the records but also access directly via the index, (which will be much quicker). 1

Not just quicker

An example of an extended answer worth eight marks is:

In a sequential file record are stored in key sequence order. They can be stored on disc or tape.

When a record needs to be added, the process is to make a new copy of the records on to a new tape, until in the correct place to add the new record, which should be added to the new copy. This should be continued until the end of the file. If multiple records are to be added, these should preferably be sorted before the above process to avoid multiple updates.

When a record needs to be deleted, the process is to make a new copy of the records on to a new tape, until in the correct place to delete the record, which should simply not be coped to the new copy. This should be continued until the end of the file. If multiple records are to be deleted, these should preferably be sorted before the above process to avoid multiple updates.

An indexed sequential file allows serial access to the records but also allows access directly via the index, which will be much quicker.

12 Files are often encrypted to safeguard the data … 1

… by making it impossible to read without the encryption key / algorithm / code etc. 1

13 The eight bit binary number **`00100000`** should be used as the Mask. 1

(It should be combined with original number) by using the **AND** logical operation. 1

Truth Table for **AND**:

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

Alternatively:

Input	*Output*
0 0	*0*
0 1	*0*
1 0	*0*
1 1	*1*

1

14 An example could be (eg) access to a room / building by speaking person's name (or a standard word) at the door. 1

(The person's voice needs to have been recorded previously and) it needs to be <u>compared / matched</u> (with original) 1

Any 1 of the following could stop the system working effectively

- High background noise 1
- Cold / sore throat, etc, affecting the voice
- Recording and playing back of the original voice/word for unauthorised access

15 Buffering: using an area of memory to store data while transferring to/from a (slower) peripheral/device. 1

Double buffering: while one buffer is being emptied, another can be filled. 1

Double buffering is quicker (as it avoids waiting for the data transfer.) 1

An example of where double buffering is useful is in a printer queue / video stream etc. 1

An example of an extended answer worth four marks is:

A buffer is an area of computer memory where data is held while transferring it to or from a (slower) peripheral. With double buffering, while one buffer is being emptied, another can be filled. This avoids waiting for the data transfer. An example is a printer queue double buffering system - one buffer can be filled while another one is being emptied to the printer whereas a single buffer is adequate for a keyboard.

16 Multi-tasking occurs when more than one task or application is available to the user at the same time / can run at the same time. (The operating system/user can switch quickly from one task to another.) 1

Example: Could be using e.g. a spreadsheet and an internet browser at the same time on a single computer. 1

17 Interrupt generated by software: **any 2 of:**

- May arise from a run time error (or eg: division by zero/array index exceeded etc)
- May arise from input/output request 2x1
- May arise from a user request
- May arise from a software fault

18 Interrupt generated by hardware: **any 1 of:**

- May arise from a peripheral eg keyboard key pressed 1
- May arise from a peripheral eg printer run out of paper
- May arise from eg a timer pulse
- May arise from a hardware fault / power failure

19 A system like this will be safety-critical – human life is at risk if the software fails (has to fail safe) 1

It is also likely to be highly complex/specialised software (and hardware) – there would probably be multiple inputs, has to work in real time (with a fast moving train), has to fail safe, etc. 1

20 **Any 2 of:**

- check the correspondence between the actual design and its specification / user requirements / objectives / safety issues 2x1
- confirm that the most appropriate techniques have been used
- confirm the HCI is appropriate
  not cost related

21 A primary key (is a field which) uniquely identifies a record in a database. 1

A foreign key is a PK from one table, included in another table to form a link 1

22 Any one of: An index is used to …

- improve (read) access times to records. 1
- sort the records (for viewing/output)

23

VEHICLE (RegNumber, VehicleMake, VehicleModel, VehicleWeeklyCost, BranchID)
Note: VehicleMake, VehicleModel, need not be included

CUSTOMER (CustID, CustName, CustAddress)

BOOKING (BookingID, RegNumber, CustID, BookingStart, BookingDuration)

BRANCH (BranchID, BranchAddress, BranchManagerName)

[**Marking:** Four suitable named tables 1
Each of four table with suitable PK shown as such (**1 mark if 2 or 3 PKs**) 2
Each FK shown as such 3x1

Remove only 1 for any number of incorrect fields / FKs)
Ignore irrelevant / additional fields]

24 (Databases often contain huge amounts of data.) It is often more efficient to store data on a number of different computers (probably in different locations) to maximise performance. 1

Not: improves security
Not: will still work if one computer fails etc

It is difficult to ensure that all the data in all the computers is always up-to-date / maintain integrity. 1

Both processing and data are distributed. 1

25 6E = 0110 1110 1

Any 1 of:
- acts as shorthand for binary 1
- is less confusing / fewer characters required than binary

Not take up less space

26 **0101101100000000101** or
0101 1011 0000 0000 0101 or
010110 11 00000000 0101 etc (spacing unimportant) 1+1

22 -> 10110
.75 -> .11

[**Marking**: 1 for correct exponent, 1 for mantissa]

27 **Any 2 of** (both needed for the mark): 1
- structured English
- flowcharts
- pseudo-code **Condone** sequence of steps

(Accepted not expected)
- annotated code
- formal language e.g. Z

NOT flow diagram / data flow diagram / system flowchart/diagram/flow diagram

28 A parameter is a variable / value that can be passed to / from the procedure 1

When passing by reference, the address of the required data is passed to the procedure (rather than the actual value of the data) 1

The other method is by value: 1
local copy of the data is created for the procedure (discarded later) 1

Passing by reference may lead to unintended side effects where the parameter has its value changed in the main program as well as in the procedure 1

29 BNF is used to describe (unambiguously) the syntax / grammar / rules of a programming / computer language (**Condone** program) 1

30

<letter>	::=	A|B|C| …..|Z (**Condone** any lower case)	) **≥ 2 must** 1
<apostrophe>	::=	’	) **be correct**
<digit>	::=	0|1|2| ….|9 (**Condone** no indication of zero)	) **for mark**

<name_char>	::=	<letter>|<apostrophe>	1
<name_chars>	::=	<name_char>|<name_char><name_chars>	1
<idcode>	::=	<letter><digit><digit>|<letter><name_chars><digit><digit>	1

[Marking: one mark for attempted recursion even if incorrect:
- same item Left and Right + other item(s) on Right are needed
Can’t get 4 unless completely correct
Notation error max 1 mark lost]

31 One solution is shown below. Other correct approaches will receive credit.

```
1   set OverWidthCount = 0
2   input RequiredWidth
3   input SampleSize
4   for Count = 1 to SampleSize
5       input WindscreenWidth
6       if WindscreenWidth > RequiredWidth then
7           output “Over width windscreen:”, Count, WindscreenWidth
8           set OverWidthCount = OverWidthCount +1
9       endif
10  endfor
11  output “Total number of windscreens tested:” , SampleSize
12  output “Number of satisfactory windscreens:” ,SampleSize -  OverWidthCount
```

Marking:

Initialisation and both initial inputs	1
Loop	1
Correct output in loop	1
Increment OWCount	1
Output total number	1
Calc and output satis	1

32 Relocatable code is program code which can be moved (by the operating system) from one area of computer memory to another. 1

33 Subprogram libraries contain (well-tested) utilities / common tasks, etc and can be used by any user, avoiding re-writing. 1

34 Any one of:
- Modules do not need to be compiled each time they are required.
- Modules can become a part of a subprogram library (or can be used again in another program). 1
- Each can be (thoroughly) tested before using in the whole program

35 A link loader is a software tool which combines already compiled modules/subprograms into the executable program. 1

Example of error - **any 1 of:**

- link editor cannot find a compiled module/subprogram / it doesn't exist 1
- the number or type of parameters provided is wrong

36 Visual programming language

- is a high level language (once only)
- might be used for developing in a GUI / Windows / event driven environment
- such applications lend themselves naturally to VP - would be very difficult in a text based programming environment
- enables production of objects / buttons / icons etc

Fourth Generation Language

- is a high level programming language (once only)
- would be useful in a database query / manipulation situation
- has many features such as query, manipulation features
- may have report generators and possibly application generators
- may attempt to produce natural language interface
- requires less programming skill

OO Language

- uses objects / classes etc - include both data and associated processing
- enables production of buttons / icons, etc - useful in a visual environment
- uses features such as inheritance, encapsulation, etc (Accepted not expected)

Package with Programming Capabilities

- requires less / no programming skill
- is probably cheaper / quicker since most facilities are provided by the package
- can import / export from / to other packages
- is less likely to contain errors "bugs" / package has already been well tested
- more help is available in the package
- users are probably familiar with interface

[**Marking**: The description of any of the points could be extended with more detail and/or a good example to gain extra marks.

Maximum of 10 marks if only 3 of the 4 sections attempted
Maximum of 8 marks if only 2 of the 4 sections attempted
Maximum of 6 marks if only 1 of the 4 sections attempted]

10-12 Candidates give a clear, coherent answer fully and accurately describing and explaining all areas. They use appropriate terminology and accurate spelling, punctuation and grammar.

6-9.1 Candidates describing and explaining a range of a least three of the areas, but responses lack clarity. There are a few errors in spelling, punctuation and grammar.

1-5 Candidates simply list a range of points or give a brief explanation of one or two of the areas. The response lacks clarity and there are significant errors in spelling, punctuation and grammar.]

0 No valid response.

[End of Paper]

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