



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.

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CG1

1.

- (a) Reasons - any two of: 2x1
- The club can save paper / resources by sending emails (environmental)
 - Email arrives same day / email arrives quicker than letter NOT just faster alone
 - Send same email to many people at same time - Make members' email addresses a group and send the same email to the group / use of address book / send to all
 - Members can reply very easily with questions / request health or fitness sessions
 - Additional information e.g. video, hyperlink, etc (about health or fitness sessions) could be embedded or sent as an attachment
 - Confirm receipt of delivery / read

- Problem for the club – any one of: 1x1
- Could spread virus(es)
 - Member may not access email regularly
 - Not all members have access to email
 - Members may not read email as assume it is spam / might be filtered as spam

- (b) DPA – Any four of: 4x1
1. Data must be adequate, relevant and not excessive
 2. Personal data stored for no longer than necessary
 3. Processed in line with your rights – individual can check and amend data
 4. Data can only be transferred outside EC to countries with adequate DPA
 5. Data is fairly and lawfully processed
 6. Held securely

NOT

Data must be accurate and up to date

Data is processed for limited purposes

[Question total 7]

2. One mark for **method** and one mark for **justification**. 2x2

Method - give out information on CD/DVD

Justification – any one of:

- Easy to access and use as teachers are familiar with CD/DVD technology
- these are very cheap per unit of storage
- can easily be carried and are robust

Method - give out information on a pen drive (or teacher copy to their own pen drive)

Justification – any one of:

- can hold large amount of data
- quite cheap per unit of storage
- can easily carried and are robust

Method - upload information to the Internet

Justification – any one of:

- this can be done in teacher's own time after the conference
- can be free in school or cheap at home
- teachers do not need to carry and possibly lose a physical medium

Method - connect wirelessly to network at conference and download or FTP

Justification – any one of:

- no cost to teacher
- no device to carry and possibly lose but will need laptop computer

[Question total 4]

3.

String

Integer

Character

Boolean

Real

[Question total 5]

4.

- (a) One mark for problem, one mark for solution. Solution **must** follow problem. 2x2

Other possible problems with the current paper-based system:

- A. Difficult and/or time consuming to find client details NOT just 'difficult to search' alone
- B. Paper based systems are difficult and/or time consuming to back up as each piece of paper will have to be copied NOT just 'difficult to back up' alone
- C. Time consuming to amend or create client details
- D. Difficult to sort client details (into a useable order) NOT just 'difficult to sort alone
- E. Writing on paper can be difficult to read due to poor hand writing or paper degradation

Solution (which **must** follow problem described above)

- A. Database would be easy to and quick to search for a client details
- B. Easy to back up a computerised database
- C. It is easy to type data into a database or more likely use data previously stored data
- D. Database can quickly sort data into any order required
- E. Database on screen always consistent and does not degrade

- (b)(i) One mark for check correctly ~~named~~ or described. 1
 One mark for an example of invalid data that the check described would detect. 1

Client date of birth

Suitable checks	Example of invalid data
Format check – check date is in correct format ##/##/#### Length check – check data has 10 characters	21/A2/1984 or 2/3/84 2/3/84 or 21/123/1984
Presence check to reject data where required fields have been left blank (there has to be something input)	There is nothing in the box
Range check to ensure data is between sensible limits day between 1 and 31 month between 1 and 12 year for example between 1900 and 2010 Any one or all of above NOTE – not other random limits or description of a length check which is a contradiction	42 13 1842
Type check to ensure that a item is of integer type; all entries should be digits or /	Bob or 160j

NOTE - For the second mark - The checks must be described correctly with enough detail so that it is clear that the invalid data would be detected by the check described.

- (b)(ii) Email address is entered twice and they are **compared** ~~/email address is entered and proof read~~ – must have **compared** idea for two marks 1
 If match email address is verified if no match then email address is rejected 1

[Question total 8]

5.

- (a) Candidates are expected to give full answers possibly with examples to support their reasons why the use of voice input for commands is used by some car drivers and not by others.

Reason some car drivers find for voice input for commands useful:

- Car driver can operate audio device without hands leaving the steering wheel / touching device
- Car driver can operate audio device without eyes leaving the road / looking at device
- System would have a limited set of commands so easy for car driver to learn
- System would not have any commands that sound the same so would recognise most commands
- System would allow car driver to create their own distinct commands and contact names for the mobile phone so driver can use system all the time not just for some functions
- Allows mobile phone to used legally while driving / not have to stop car to make a call

Reason why many car drivers might never use the system:

- The driver will have to learn the pre-existing commands which will take time
- The driver will have to teach the system to understand new commands which will take time
- The driver will have to learn how to set up the system which might be difficult or will take time
- Some drivers have used poor systems or are scared of new technology and feel that it is not worth the effort
- The software may not recognise commands as background noise is more likely to interfere with words in a car
- The driver might have a cold or sore throat and the system will not recognise the commands
- The driver might have a speech impediment and will not be confident to use the system or it may not recognise the commands

4 - 6 marks Candidates give clear reasons why some car drivers find for voice input for commands useful **and** why many car drivers might never use the system. (one mark each)

1 - 3 marks Candidates give clear reasons why some car drivers find for voice input for commands useful **or** why many car drivers might never use the system. (one mark each).

0 marks No appropriate response.

Example answer worth 6 marks

Some car drivers find for voice input for commands useful because they do not have any commands that sound the same and would therefore recognise all the driver's commands and there would only be a few commands for the car driver to learn such as 'dial', 'volume' or 'off'. Also the system would allow the car driver to create their own distinct commands like contact names to telephone people so the driver can use the system all the time and not just for some functions. This has the obvious advantage that the car driver can operate the sound system or telephone without their hands leaving the steering wheel and they can concentrate on the road.

Other car drivers might never use the system because they perceive it as a hassle to set up and it will take time to learn the commands and many drivers just will not bother. Some drivers will never teach the system to understand new commands as again this will take time and car driver already knows how to operate their phone and push buttons on the audio system. Also thee are the usual problems that even when the system is all set up the software may not recognise commands as background noise is likely to interfere with words in a car and if driver might have a cold or sore throat and the system will not recognise the commands

(b)

Handshake is the exchange of signals between devices to establish their readiness to communicate 1

Protocol is a standard set of rules to ensure the proper transfer or information 1

[Question total 8]


6.

Four risks on a user's and a different method of reducing the risk in each case – **both** required for one mark.

- RSI – use ergonomically / well designed keyboard / wrist rest or straps
- Eye strain or headaches - frequent eye checks / safety screen / correct lighting / correct distance from monitor / looking at something else other than monitor regularly
- Back or neck problems – sitting correctly / ergonomically / well designed chair, desk, etc...
- Radiation from monitors - use of safety screens / frequent breaks (fears of radiation from monitors)
- Possible epileptic fit – warnings on software or avoid games, web sites, packages etc... that could trigger a fit
- Could become addicted – limit access / go out more / do something else

[Question total 4]

7.

- (a) Data Flow Diagram (CAO, Do not accept DFD) 1
- (b) External entity (CAO) 1
- (c)  1
- (d) customer enquiry / request / requirements (must be suitable noun) 1
- (e) availability or dealer enquiry / query / painting details (must be suitable noun) 1
- (f) availability report / result of query / suitable items details (must be suitable noun) 1

[Question total 6]

8.

- (a) Any annotation clearly indicated with a rectangle – must not include any other code 1
- (b) Example of a self documenting identifiers – must not include any other code – any one from: 1x1
- FindEvenNumbers
 - NumberOutput
 - HighestEven

self documenting identifiers are used to make programs easier to read (1) by different programmer / same programmer at a later date (1) 2

- (c) Example of repetition 1

```
repeat
    NumberOutput = NumberOutput + 2
output NumberOutput
until (NumberOutput = HighestEven)
```

Purpose of repetition is to repeatedly execute selected code (1) until a condition is satisfied (1) 2

[Question total 7]

9.

- (a) Program will enter endless loop (1) or Program will crash because NumberRemaining will overflow (1)
because (NumberRemaining = 0) will never become true (1) 2

Note – No marks for ‘program will crash’ without reason.

- (b) Several possibilities exist to fix **this** problem – algorithm may still not work correctly for ALL input (7 for example)

repeat

```
    NumberRemaining = NumberRemaining - 10
    NumberTens = NumberTens + 1
```

until (NumberRemaining < 10)

Alternatively

repeat

```
    NumberRemaining = NumberRemaining - 10
    If NumberRemaining >= 0 Then
        NumberTens = NumberTens + 1
    End If
```

until NumberRemaining < 0

Alternatively (possibly a better solution)

```
while NumberRemaining >= 10 do
    NumberRemaining = NumberRemaining - 10
    NumberTens = NumberTens + 1
end while
```

[Question total 4]

10.

W	X	Y	Z
	0	0	0
5	5	1	0
7	12	2	0
2	14	3	0
2	16	4	0
4	20	5	0
-1	20	5	4

One mark for each correct row in table

NOTE – deduct one mark if any additional rows are completed but condone last row with X and Y empty.

[Question total 5]

11.

- (a) Serial file is the most suitable because meter readings are not taken in any order 1
 Sequential file is the most suitable because customer records are processed in order or it is easier/quicker to search a sequential file for a record 1
- (b) One mark for each correct row – maximum three marks 3

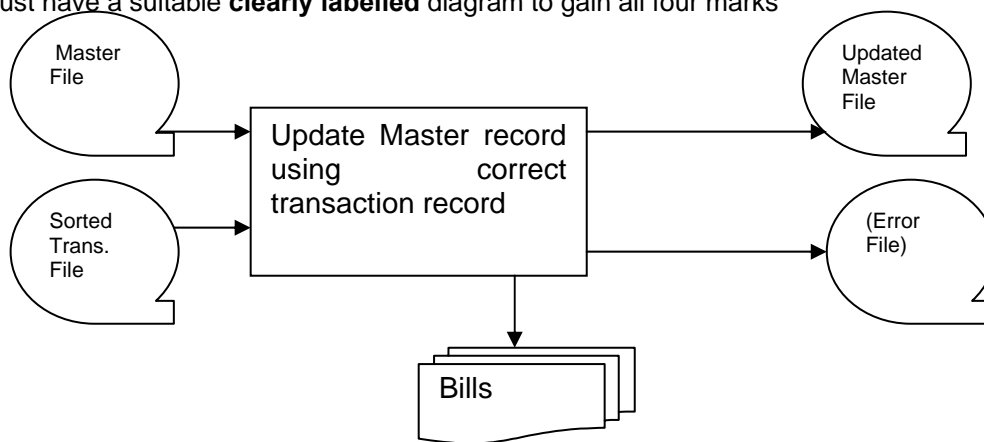
Description of field not required if field name is meaningful such as Last Bill date name but could help answer if field name is not clear.

Field Name	Field type	Field description
Customer Number	Text or numeric	Primary key field
Last Bill Date	String or date	Date of last bill
Payment method	String	How customer pays
Gas used last bill	Integer or real	Amount of gas used last bill
Price plan	String	Customer current price plan
Previous meter reading	Integer or real	(Previous meter reading)
Bill amount	real	Last bill total

NOTE Do not accept any personal information. Data **MUST** relate to historical/previous gas used or payments

- (c) Sequential file update - Diagram must clearly show the following: 4x1
 - Two input files: (old/current) master file and sorted transaction file
 - Explanation of update process i.e. comparison, record by record, with update where appropriate
 - Updated (new) master file as output
 - Bills as output

Must have a suitable **clearly labelled** diagram to gain all four marks



[Question total 9]

12.

- (a) Typical roles of the user interface provided by the operating system
- Provides user interface with meaningful icons / avoid text input / drop-down menus
 - Provides a command line interface
 - Allows customisation of interface e.g. change desktop colours / layout
 - Allows access to system settings such as hardware
 - Allows copying / deleting / moving / sorting / searching of files or folders
 - Allows creation of shortcuts
 - Controls security using passwords or access permissions
 - Allows user to have more than one window open / run more than one program
 - Allows user to switch between tasks (programs/windows)
 - Provides user with error/warning/help messages

The description of any of the points could be extended with examples and/or more detail and gain extra marks.

4 - 6 marks Candidates give a clear, coherent answer fully and accurately describing how the operating system provides a user interface with relevant examples.

1 - 3 marks Candidates simply list features of the user interface provided by the operating system.

0 marks No appropriate response

Example answer worth three marks – create shortcut with extension and example

One feature of the user interface provided by the operating system is to allow the creation of shortcuts. The user can create a shortcut to a commonly used application or visited web site on the desk top. If you use Google as your search engine you could create a shortcut to Google on your desktop

Example answer worth three marks – meaningful icons with extension and example

Another feature is to provide the user interface with meaningful icons. Most applications will have a unique icon, for example Mozilla Firefox has its own which is a fox on a globe and IKEA will have their logo as an icon. This makes the web site or application easily recognisable and distinguishable from other icons

- (b) Real time control processing could be used by a chemical plant to control temperature by **continuously monitoring** (1) the temperature which is input to the system. These Inputs are processed **immediately** (1) and the output is adjusted accordingly this means that **accidents can be avoided** (1).

3

[Question total 9]

13.

- (a) Feature of a high-level language that would make it suitable for creating web pages and reason
One mark for feature and one mark for reason

2x2

- Ability to insert hyperlinks because navigation between pages will be required
- Ability to format text and graphics or ability to create style sheets to make the pages more interesting / appealing / ensure web site meets client specification
- Ability to include platform independent code to allow code to be run on any machine that displays the web page
- Ability to include/embed video and/or animation to make web site more interesting / appealing / ensure web site meets client specification / view immediately
- Ability to include/embed sound to make web site more interesting / appealing / ensure web site meets client specification / play music

- (b) Feature of a high-level language that would make it suitable for creating graphical user interface and reason

- Ability to add buttons, menus, frames, etc.. to allow creation of easy to use interface / attractive interface / familiar interface / meet client specification
- Ability to use colours, icons, images, etc... to create GUI that looks or attractive / familiar / meet client specification
- Ability to create or use events for buttons, menus, etc... as GUIs are event driven

[Question total 4]

14.

People working in the music industry and people who download music are affected in many ways including:

Ethical and legal issues

- Many of the files are corrupt when music is downloaded illegally without payment
- people who download music may download a virus along with the music file when music is downloaded illegally without payment
- The people who download the music illegally without payment are criminalised as they are committing an offence and can be fined or possibly imprisoned

Effects on employment

- Record shops lose business and make less money and might have to reduce staff numbers
- Employment in the record companies that promote the artists changes as they will require employees to set up and maintain web sites where music is legally purchased and downloaded
- Employment in the record companies that promote the artists will be reduced as their income is reduced when music is downloaded illegally without payment
- Free downloads can benefit artists as it is publicity
- New artists can promote themselves without using record company by making music legally available for free download
- New artists will need users to legally purchase and download some music to survive
- Established artists can promote an album with one free download or samples of songs
- The artists who produce the music do not receive any revenue which is particularly difficult for new artists when music is downloaded illegally without payment

Social and economic changes

- Downloads can be cheaper than buying CDs
- Record companies save cost of producing media such as CD – songs are cheaper than traditional media
- All artists can give away a song and receive feedback and reviews
- ~~People who download music get free music which saves them money when they legally download for free~~
- People who download music can download in a format suitable for portable players – do not need to 'rip' (convert) CDs
- Artists can release new albums quickly for example before a tour for legal download purchase
- People who download music can hear sample of music before buying
- People who download music illegally might then buy some or attend a concert
- People who download music do not have a physical copy of music if computer crashes and all data is lost
- Music can easily be copied and made available for others to copy

The description of any of the points could be extended with examples and/or more detail and gain extra marks.

5 - 9 marks Candidates give a clear, coherent answer fully discussing the effect that the different types of music download have on people working in the music industry **and** people who download music

1 - 4 marks Candidates simply list the effects that the different types of music download have on people working in the music industry **or** people who download music

0 marks No appropriate response

[Question total 9]

15.

Different methods of investigation available to the analysts and benefits and drawbacks of each method:

Study the existing system documentation - This is suitable for investigating current data storage requirements or data flow

Benefits

- Team can see how current system 'should' be operating
- Inexpensive method of gather lots of information fairly quickly
- Can identify storage requirements

Drawbacks

- Staff may not be following procedures in documentation and may be using system in their own way
- Documentation may be out of date and not updated to reflect system changes

Carry out a questionnaire of staff - This is suitable because the bank staff are spread over a wide geographical area and there are many of them.

Benefits

- Relatively cheap to produce for a large number of people
- Can be distributed worldwide
- Results can be available very quickly / could be completed on-line so

Drawbacks

- Have to be designed by experts or information could be unusable
- People are 'too busy' and may not complete
- People may not give correct answers
- Cannot collect detailed information / only limited answers

Interview staff - This is suitable when the analysts require a lot of information from a small number of people such as key staff

Benefits

- Can gather large amount of detailed information
- Can make judgements on validity of information from personal contact or body language
- Can ask 'follow up' or 'open ended' questions to gather more detailed information in selected areas
- Staff can suggest or request improvements

Drawbacks

- Time consuming and expensive to carry out
- Has to be carried out by trained interviewer or closed questions written by experts
- Difficult to analyse large amount of information
- Difficult to analyse wide variety of information

Observe the current system in practice - This is suitable for gathering information first hand

Benefits

- Can actually see what is really happening / first hand and do not have to rely on what people tell you what they think is happening

Drawbacks

- Very time consuming and therefore expensive to carry out
- Staff may feel like they are being watched and therefore behave differently so do not actually see what goes on every day
- Cost of sending analysts around the world.

The description, benefits or drawbacks of any of the methods could be extended with more detail and gain extra marks

Advantages of using a team of analysts compared with using an individual:

- Job should get done quicker
- Different levels of experience and expertise so can carry out different tasks like a junior analyst would not interview a senior manager
- More people have a more varied experience of businesses, computer systems and ideas

The description of any of the advantages of using a team of analysts points could be extended with more detail and/or examples and gain extra credit.

- 8 - 11 Candidates give a clear, coherent answer fully and accurately describing and explaining all of the sections. They use appropriate terminology and accurate spelling, punctuation and grammar.
- 4 - 7 Candidates describe and explain a range of at least two of the sections, but responses lack clarity. There are a few errors in spelling, punctuation and grammar.
- 1 - 3 Candidates simply list a range of points or give a brief explanation of one of the sections. The response lacks clarity and there are significant errors in spelling, punctuation and grammar.
- 0 No appropriate response.

[Question total 11]

End of Paper

CG3

- 01 Handwriting recognition: **any 2 of:** 2x1
- Is quicker / easier for user than typing
 - 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:** 2x1
- Speeds up text input / faster than typing
 - 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:** 1
- Should comply with established web standards
 - 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:** 1
- queue
 - stack
 - (linked) list
 - (binary) tree
- [Not array or record] [Not table]**
- Why data structures: **Any 1 of:** 1
- convenient / best way of organising data relating to a real problem
 - 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:

	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>...</u>	
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: 1
- Any 2 of **for one mark total:**
- 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):** 1
- the actual data
 - 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 copied 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		<i>Alternatively:</i>	<i>Input</i>	<i>Output</i>	
	0	1				
Input 2	0	0		0 0	0	1
	1	0		0 1	0	
	1	1		1 0	0	
				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 compared / matched (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 1 at the same time / can run at the same time. (The operating system/user can switch quickly from one task to another.)

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

- 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:** 1
- May arise from a peripheral eg keyboard key pressed
 - 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:** 2x1
- check the correspondence between the actual design and its specification / user requirements / objectives / safety issues
 - 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 ... 1
- improve (read) access times to records.
 - 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 <u>processing</u> and <u>data</u> are distributed.	1
25	6E = 0110 1110	1
	Any 1 of:	
	<ul style="list-style-type: none"> • acts as shorthand for binary • is less confusing / fewer characters required than binary 	1
	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
	<ul style="list-style-type: none"> • structured English • flowcharts • pseudo-code Condone sequence of steps 	
	(Accepted not expected)	
	<ul style="list-style-type: none"> • 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 <u>value</u> :	1
	local <u>copy</u> 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.

<pre> 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 </pre>	<p>Marking:</p> <p>Initialisation and both initial inputs 1</p> <p>Loop 1</p> <p>Correct output in loop 1 Increment OWCount 1</p> <p>Output total number 1 Calc and output satis 1</p>
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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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