

C206/SQP238

Computing
Higher

NATIONAL
QUALIFICATIONS

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Course Assessment Specification

Computing Higher

The purpose of this document is to provide:

- ◆ Details of the structure of the Question Paper for this Course
- ◆ Details of the structure of the Practical Coursework task that contributes to this Course
- ◆ Guidance to centres on how to use information gathered from the Question Paper and the Practical Coursework task in this Course to estimate candidate performance.

Part 1

This part of the Course Assessment Specification details the structure of the Question Paper for this Course

The Question Paper

- ◆ consists of 3 sections
- ◆ has a mark allocation of 140 marks
- ◆ has a time allocation of 2 hours 30 minutes.

Section I – 30 marks

- ◆ consists of objective and short response questions
- ◆ samples across the content statements of the two mandatory units (Software Development and Computer Systems)
- ◆ approximately 20 marks will be for knowledge and understanding
- ◆ approximately 10 marks will be for problem solving
- ◆ the problem solving will be based in familiar contexts and be of a fairly straightforward nature
- ◆ candidates will be expected to tackle all questions in the section.

Section II – 60 marks

Questions within this section

- ◆ require extended responses demonstrating structuring and reasoning
- ◆ have varying mark allocation and therefore do not have to be of the same length. Most questions will be subdivided into a number of connected parts with the marks for each part clearly indicated.
- ◆ involve both knowledge and understanding and problem solving, and will be set in less familiar and more complex contexts than those in Section I.

- ◆ will sample across the content statements associated with the mandatory units (Software Development and Computer Systems)
- ◆ or parts of questions, will require integration of knowledge from the two mandatory units

The marks for this section will be split so that:

- ◆ approximately 20 marks will be for knowledge and understanding
- ◆ approximately 40 marks will be for problem solving

Candidates will be expected to tackle **all** questions in the section.

Section III – 50 marks

- ◆ this section has three sub-sections, one for each of the optional units (Artificial Intelligence, Computer Networking and Multimedia Technology)
- ◆ candidates will be expected to tackle all the questions within **one** sub-section

Questions in each sub-section

- ◆ require extended responses demonstrating structuring and reasoning
- ◆ have varying mark allocation and therefore do not have to be of the same length. Most questions will be subdivided into a number of connected parts with the marks for each part clearly indicated.
- ◆ involve both knowledge and understanding and problem solving, and will be set in less familiar and more complex contexts than those in Section I
- ◆ will sample across the content statements associated with the appropriate optional unit

Some questions, or parts of questions, will require integration of knowledge from the mandatory units.

The marks for this section will be split so that:

- ◆ approximately 17 marks will be for knowledge and understanding
- ◆ approximately 33 marks will be for problem solving

Part 2

This part of the Course Assessment Specification details the structure of the Practical Coursework Task in this Course.

- ◆ The Practical Coursework Task has a mark allocation of 60 marks
- ◆ There is no set time allocation, but the task has been designed to be completed by a typical candidate in 8-10 hours

- ◆ The task provides the candidate with the opportunity to demonstrate and integrate practical skills and knowledge they have developed within the mandatory units (Computer Systems and Software Development) in a more complex and less familiar context than is possible within the units

- ◆ A new practical coursework task will be provided by SQA in Autumn each year
- ◆ The task is only valid for the session in which it is issued

- ◆ The task may be undertaken in “open book” conditions, but under supervision of the teacher / lecturer, to ensure that the work presented is the candidate’s own work
- ◆ The task will be marked by the teacher / lecturer, using a marking scheme provided by SQA, but be subject to moderation
- ◆ The marking scheme will provide a mark out of 60, which will be submitted directly to SQA without scaling
- ◆ The teacher or lecturer may give the candidate hints and/or help if requested. Any such help should be reflected in the marks awarded
- ◆ Once the task has been completed and marked, it should **not** be returned to the candidate for further work.

Part 3

This part of the Course Assessment Specification provides guidance on how to use assessment information gathered from the Question Paper and the Practical Coursework task to estimate candidate performance

Component	Mark Range
Question Paper	0-140
Practical Coursework	0-60
Total Marks	0-200

The mark range for each component takes account of the weighting of each component.

In National Qualifications cut-off scores should be set at approximately 70% for grade A and 50% for grade C with grade B falling midway.

For a total mark range of 0-200, the following gives an indication of the cut-off scores based on the candidate's **total** score.

Grade	Band	Mark Range
A	1	170-200
A	2	140-169
B	3	130-139
B	4	120-129
C	5	110-119
C	6	100-109
D	7	90-99
NA	8	80-89
NA	9	0-79

These cut-off scores may be lowered if question paper component turns out to be more demanding or raised if less demanding.

Worked example

- ◆ In a centre's own prelim, a candidate scores 88/140, and the candidate scores 37/60 in the practical coursework
- ◆ The two marks are added together, giving a total of 125/200
- ◆ The centre's view is that their own prelim is slightly less demanding than SQA examination.
- ◆ Using the mark range, a realistic estimate may be **band 5** rather than band 4.

[C206/SQP238]

Computing
Higher
Specimen Question Paper
for use in and after 2005

Time 2 hours 30 minutes

NATIONAL
QUALIFICATIONS

Attempt **all** questions in Section I.

Attempt **all** questions in Section II.

Attempt **one** sub-section of Section III.

Part A	Artificial Intelligence	Page 10	Questions 18 to 22
Part B	Computer Networking	Page 14	Questions 23 to 26
Part C	Multimedia Technology	Page 16	Questions 27 to 30

For the sub-section chosen, attempt **all** questions.

Read all questions carefully.

Do not write on the question paper.

Write as neatly as possible.

SECTION I

Attempt all questions in this section.

Marks

1. A processor has a 16 bit address bus. The processor is to write to memory location 800.
 - (a) Describe the purpose of the address bus. 1
 - (b) Calculate the binary number that will be placed on the address bus. 2
 - (c) A register will hold the address of the location to be written to.
Describe **one** other function of a register. 1

2. A computer company has decided to use Unicode to replace ASCII.
Describe **one** advantage of the use of Unicode over ASCII. 1

3. Lauren buys a new digital camera. It stores its images on a flashcard and has a standard interface.
 - (a) Describe **two** benefits of using a camera with a flashcard. 2
 - (b) The software distributed with the camera allows the photos to be saved in a number of different *standard file formats*. Name a “standard file format” suitable for this application and give **one** advantage and **one** disadvantage of its use. 3

4. Declan notices that his computer’s hard drive is running out of free space and that files take longer to load than they used to.
 - (a) Name a utility program that could improve the speed at which files load. 1
 - (b) Describe how this software works. 1
 - (c) Explain how it improves loading time. 1

5. What is a bootstrap loader? 2

6. State **two** tasks carried out by the project manager during the development of software. 2

7.
 - (a) Describe what is meant by *top down design* and *stepwise refinement*. 2
 - (b) Describe **one** benefit of using top down design and stepwise refinement. 1

8. Programs are required to be *robust* and *reliable*. Explain both of these terms. 2

SECTION I (continued)

9. (a) The software development process can be described as *iterative*.
What is meant by the term “iterative”? 1
- (b) Give **one** example of iteration which may take place within the analysis stage. 1
10. A program has been produced to store and process names and the times of competitors in a 100 metres sprint. A section of the data is shown below:
- | <u>Name</u> | <u>Time (secs)</u> |
|----------------------|--------------------|
| Ali Kidd | 12.13 |
| Roberta Young | 13.67 |
| Molly O’Neill | 12.34 |
- (a) What data structure and data type could be used within the program to store the runners’ times? 2
- (b) The fastest runner has to be found. Which of the following algorithm would be used within the program in order to find the fastest runner?
- Counting Occurences
 - Finding the maximum
 - Finding the minimum
 - Linear Search 1
11. (a) Describe what is meant by a *scripting language*. 1
- (b) Give **two** benefits of using a “scripting language”. 2
- (30)**

[END OF SECTION I]

SECTION II

Attempt all questions in this section.

12. Helen is trying to buy a new computer. She will be creating and using several very large spreadsheet files with complex calculations. She has been reading the following two advertisements.

<p>Lynx 983 3.1 GHz AthleteII Processor 512 Mb RAM 120 Gb Hard Disk 1.44 Mb Floppy Drive DVD-ROM Drive (CD-ROM compatible)</p>	<p>Ruath CM 2.9 GHz MDA4 Processor 512 Mb RAM 32 Mb Cache 100 Gb Hard Disk DVD/CD-RW Combination Drive</p>
--	--

- (a) If the ability to back-up data is the most important factor for choosing a new computer, which computer would you suggest Helen buys? Give **two** reasons for your choice. 2
- (b) Explain the effect of a *cache* on the performance of a computer. 2

Helen thinks that the Lynx 983 will be the faster computer because “it has a faster *clock speed*”.

- (c) (i) Describe **two** weaknesses of “clock speed” as a measure of processor performance.
- (ii) Name and describe **one** other measure of processing power. 4

13. A school classroom has a local area network consisting of twenty computers and three servers. The teacher says that the network is a *client-server network*.

- (a) The network could have been a *peer-to-peer network*.
- (i) Describe **two** main differences between client-server and peer-to-peer networks.
- (ii) Give **two** reasons why a client-server network is more suitable for a school classroom. 4
- (b) One of the servers on the network is a *fileserver*. Name **one** other type of server that might be connected to the network and describe its purpose. 2

A computer which is connected to a network can be more liable to virus infections than others. Because of this an anti-virus utility has been installed on all network stations.

- (c) Name and describe **one** class of virus that an anti-virus utility might detect. 2

SECTION II (continued)

13. (continued)

(d) Being connected to a network is one reason why one computer might be more liable to virus infection than others.

Give **two** other reasons why one computer might be more liable to virus infection than others. 2

14. Describe the stages of the *fetch execute cycle*.

Your answer should refer to appropriate buses and control lines. 5

15. A multimedia catalogue to help identify and record sightings of birds common to the UK is being constructed. The software will contain colour pictures and recordings of bird calls. It will allow users to browse through the existing information and to print off selected items.

(a) (i) Name a suitable class of application package to produce the catalogue.

(ii) Justify your answer in terms of the objects and operations involved. No credit will be given for naming proprietary software. 3

(b) The photographs of the birds will aid identification. Each photograph is 200 by 200 pixels and is stored in 32 bit colour. What is the file size of a single image?

Show all your working and give your answer in appropriate units. 4

(c) Part of the program will ask the user for the name of a bird and search a list of names to see if it exists. What data structure and data type will be used to hold the list? 2

(d) The part of program described in part (c) will display the **position** of the name in the list. For example, if the name is third in the list, the number 3 is displayed. If the name is not in the list a zero is displayed.

Use *pseudocode* to show how this section of program will search the list and display the appropriate value on screen. 6

SECTION II (continued)

16. A game is being designed and the following pseudocode has been produced for part of the program.

Level 1 Algorithm

```

1  Initialise variables
2  Set up screen
3  Get user details
4  Start game loop
5    Get user move
6    Check for user win
7    Generate computer move
8    Check for computer win
9  End loop when win = true
10 Display message
11 End game

```

Refinement of Step 6

```

6.1 If number of counters in play = 0 then
6.2   Set win = true
6.3   Display player's name has won
6.4 End if statement

```

- (a) Some of the variables that will be initialised in line 1 of the algorithm are *global variables*. Explain **one** problem that the developers might have if they only use global variables in the program. 2
- (b) The three variables used by the “Check for user win” subroutine are **counters**, **win** and **name**. These variables can be either *called by reference* or *called by value*.
- (i) Explain the meaning of the two terms *called by reference* and *called by value*.
- (ii) For **each** of the three variables, state if the variable is “called by reference” or “called by value”.
- Give a reason for **each** of your choices. 5

SECTION II (continued)

17. A new payroll system is being written by a software design company
- (a) The first stage of the project provided the client with a formal specification document for the planned software. Give **two** reasons why the software company needs this document. 2
- (b) The software company has decided to make use of module libraries.
Give **two** benefits to the software company of using module libraries. 2
- (c) During the production of the payroll system the software developers use both an *interpreter* and a *compiler*. Describe when each of these translator programs are used and give a reason for its use. 4
- (d) Part of the program will manipulate the details of each employee to produce an employee code. The code is produced by taking the first five letters of the surname then adding on their initial and the year they joined the company as follows:
- Set stem to first five characters of surname
Set initial to first character of firstname
Set employee code to stem + initial + year
- Firstname: **Gayle**
Surname: **Dorward**
Year Joined Company: **1999**
- (i) What is the employee code generated for Gayle Dorward?
- (ii) The name Joseph Li generates an error message. Using pseudocode like that above, rewrite the algorithm that creates the employee code to prevent this error from occurring. 3
- (e) After the payroll system has been in place for a few weeks the client asks the software company to carry out *adaptive* maintenance.
- (i) What is adaptive maintenance? Give an example to illustrate your answer.
- (ii) Who is most likely to meet the cost of the adaptive maintenance?
Justify your answer. 4
- (60)**

[END OF SECTION II]

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SECTION III

Attempt ONE sub-section of Section III

Part A	Artificial Intelligence	Page 10	Questions 18 to 22
Part B	Computer Networking	Page 14	Questions 23 to 26
Part C	Multimedia Technology	Page 16	Questions 27 to 30

For the sub-section chosen, attempt all questions.

SECTION III

Part A—Artificial Intelligence

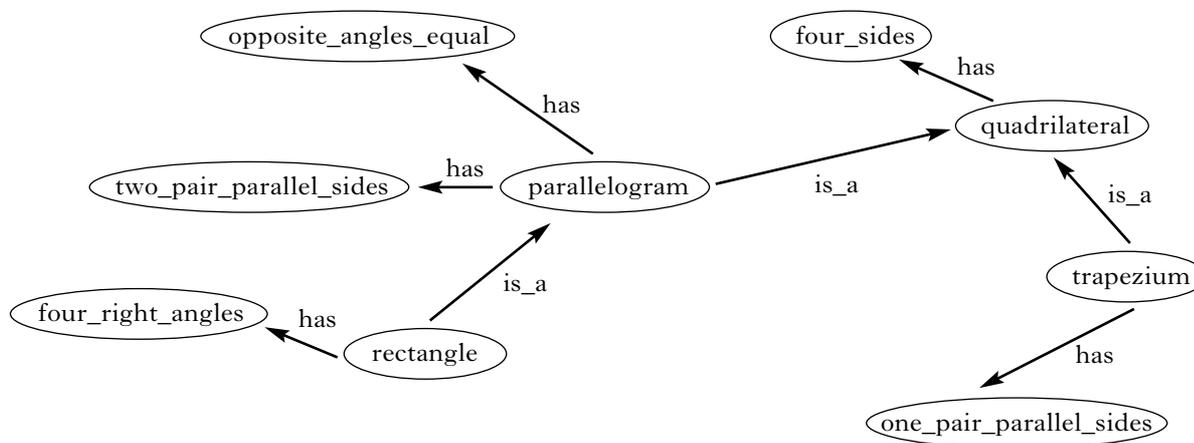
Attempt all questions.

- 18.** A computer that is capable of understanding natural language is intelligent.
- (a) Do you agree with this statement? Make **two** clear points to justify your answer. 2
- (b) The Turing test was proposed as a test for artificial intelligence.
- (i) Describe the Turing test.
- (ii) Describe **two** limitations of the Turing test. 4
- (c) Describe **two** difficulties of natural language processing giving examples to illustrate your answers. 4
- (d) Practical applications of natural language processing include natural language database interfaces and natural language search engines. Describe **two** advantages of using natural language in these applications. 2
- (e) Embedded technology is considered to be a growth area particularly in domestic appliances. The “smart” fridge may have a number of features including communication with its manufacturer.
- (i) Suggest **one** advantage for the customer of a fridge which has communication links to the manufacturer.
- (ii) Suggest **one** advantage for the manufacturer of this feature.
- (iii) Describe **one** other use for embedded technology in a fridge. 3
- 19.** An online car sales company decides to introduce an expert system to advise customers about the most suitable type of car for them.
- (a) Is this a suitable domain for the creation of such an expert system? Give **two** reasons for your answer. 2
- (b) Consideration was given to creating the expert system using a procedural language or an expert system shell.
- (i) Explain **fully** the difference between an expert system and an expert system shell.
- (ii) Give **two** reasons to support implementation using a procedural language. 4
- (c) The company insists that the expert system should be capable of *justification*. Describe **two** advantages of including this feature. 2

SECTION III

Part A—Artificial Intelligence (continued)

20. (a) A mathematician draws the following diagram.



- (i) What is the name for the type of diagram drawn by the mathematician? 4
- (ii) Which stage of the software development process would result in such a diagram? Justify your answer.
- (iii) Describe **two** benefits of representing the knowledge in this way. 4
- (b) The mathematician decides to add the following information.
 A rhombus is a kind of parallelogram. It has four equal sides.
 Show how this information would be added to the diagram. You do not need to redraw the entire diagram. 2

SECTION III

Part A—Artificial Intelligence (continued)

21. The following knowledge base was created using the information from the mathematician's diagram.

```

1  is_a (parallelogram, quadrilateral)
2  is_a (trapezium), quadrilateral)
3  is_a (rectangle, parallelogram)

4  has (quadrilateral, four_sides)
5  has (trapezium, one_pair_parallel_sides)
6  has (parallelogram, two_pair_parallel_sides)
7  has (parallelogram, opposite_angles_equal)
8  has (rectangle, four_right_angles)

9  has (X, Y) if
    is_a (X, Z) and
    has (Z, Y)

```

- (a) Assuming a depth-first search is used to find the solution to the following query.

```
? has (rectangle, Y)
```

State the **four** solutions to the query in the order in which they would be found.

4

- (b) Trace the steps in the search as far as the third solution.

5

- (c) (i) What is the solution to the following query?

```
?-not (is_a (trapezium, quadrilateral))
```

- (ii) Explain how this query would be evaluated.

2

- (d) Rule 9 gives this knowledge base a feature known as *inheritance*.

- (i) What is inheritance?

- (ii) Give **one** advantage of inheritance.

2

SECTION III

Part A—Artificial Intelligence (continued)

22. Chess has been successfully implemented by Artificial Intelligence programmers. To decide which move to make the computer generates all the legal moves from certain position and chooses the one which gives the greatest advantage. In one particular implementation the program looks three moves ahead.
- (a) When searching for the winning move a depth-first or breadth-first search could be used.
- Give **one** advantage and **one** disadvantage of using a depth-first search rather than a breadth-first search. 2
- (b) The choice of a good move can be made using a heuristic.
- (i) Describe the use of a heuristic for selecting a move in chess.
- (ii) Describe **two** advantages of using a heuristic over exhaustive search techniques. 4
- (c) Define the term *combinatorial explosion* in relation to search techniques. 2
- (50)**

[END OF SECTION III—PART A]

SECTION III

Part B—Computer Networking

Attempt all questions.

23. Jamie has a Wireless Application Protocol (WAP) enabled communication device and is considering writing his own version of a currency converter program, in Wireless Markup Language (WML), for the device. He has already written web pages in HTML.
- (a) Describe **two** tags used in HTML. 2
- (b) Jamie is designing the screens for his currency converter. WML does not have a full range of text formatting features. Describe one similarity and one difference when changing the font size in WML compared with HTML. 2
- (c) Jamie asked one of his friends to test his currency converter program. His friend said that he had got confused by Jamie's use of the headline facility provided in WML. Why might his friend have been confused? 1
- (d) Jamie believes that the Regulation of Investigatory Powers Act 2000 is in direct contradiction to other laws which guarantee individuals the right to privacy.
- (i) Describe **one** implication of this Act.
- (ii) Explain **one** argument in favour of the Regulation of Investigatory Powers Act 2000 and **one** against it. 6
24. Network performance is important to both the network manager and network users. There are many factors which can affect the network performance.
- (a) Some local area networks operate a system called CSMA/CD.
- (i) What does CSMA/CD stand for?
- (ii) Describe fully how using CSMA/CD affects network performance. 5
- (b) (i) Describe fully how packet switching operates in a wide area network.
- (ii) Explain why packet switching may be used in preference to circuit switching. 5
- (c) Network performance is poor if there are errors in received data. Parity checking is a simple method of detecting errors.
- (i) Explain how **odd** parity checks work. Use an example to illustrate your answer.
- (ii) Describe one problem that might arise when using odd parity checking. Use an example to illustrate your answer. 5
- (d) A cyclic redundancy check (CRC) is another method for checking for transmission errors.
- (i) Explain how a cyclic redundancy check works.
- (ii) Explain the effect of cyclic redundancy checking on the *speed* and *accuracy* of a network. Justify your answer. 5

SECTION III

Part B—Computer Networking (continued)

25. An increasing number of companies are now subject to the “Denial of Service attack”.
- (a) Explain what happens when a company is the subject of a Denial of Service attack. 3
- (b) Describe **three** features of a firewall that might prevent a Denial of Service attack. 3
26. The Open System Interconnection (OSI) model breaks the operation of a computer network into seven layers.
- (a) Which layer provides basic error detection and correction to ensure that data sent is the same as data received? 1
- (b) The Presentation Layer can apply compression techniques to data before it is sent over the network. Which layer decompresses the data? 1
- (c) Describe the structure of a Class A IP address. 2
- (d) A school has a local area network with one hundred computers connected to it.
- (i) Why is Class A IP addressing **not** suitable for this network?
- (ii) Which Class of IP address would you suggest that the school uses? Justify your answer. 3
- (e) E-commerce uses OSI network protocols. A small Highland company has recently won an award for its Internet-based mail order business. Their web site offers a multimedia guide to their products and they can receive orders via the web site. Creating the web site was a considerable financial investment for the company.
- (i) Give **two** benefits to the company of having the web site.
- (ii) Some potential customers of the company might be cautious of buying the goods across the Internet. Explain why this might be so.
- (iii) Suggest **two** actions that the company could have taken to reassure their customers. 6
- (50)**

[END OF SECTION III—PART B]

SECTION III

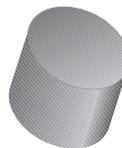
Part C—Multimedia Technology

Attempt all questions.

27. When creating web pages many different elements of multimedia can be used. One example is 2D graphics.
- (a) Name **one** item of hardware that can be used to capture a 2D graphic and **explain clearly** how it converts the graphic into digital data. 3
- (b) Some graphics are stored as JPEGs. However it has been decided that these graphics must be used for animation purposes and so they are converted to GIFs.
- (i) Explain why *dithering* is used in this situation.
- (ii) Describe how dithering works in this case. 3
- (c) The GIF file could be stored as *interlaced* or *non-interlaced*.
- (i) Explain how each of these two types of GIFs are displayed.
- (ii) Explain **one** advantage of using interlaced compared with non-interlaced graphics for web pages. 4
- (d) A GIF image of 640×480 resolution needs to be stored. Calculate its file size. 3
28. Picture A shows an image of a cylinder. This image has been changed to look like Picture B.



Picture A



Picture B

- (a) Describe **two** features of 3D software which have been used to change Picture A into Picture B. 2
- (b) Virtual Reality Mark Up Language (VRML) could be used to create Picture B (above). An example of the code is given below:
- ```
Cylinder {
radius 1.0
height 2.0
}
```
- (i) Write down the VRML for a sphere.
- (ii) Give **two** benefits of using VRML when creating 3D images.
- (iii) Explain the need for the VRML header when using a browser. 4

## SECTION III

## Part C—Multimedia Technology (continued)

## 28. (continued)

The use of multimedia technologies and its applications has increased dramatically over the past decade.

(c) Explain how the following have increased multimedia capabilities.

(i) CODEC hardware/software

(ii) Data communications

4

(d) Describe the term “streaming” when used within multimedia.

1

29. When recording video for multimedia presentations, the method used for storing the video frames is important to reduce the file size and aid compatibility.

(a) Describe how video is stored using:

(i) MPEG

(ii) AVI.

4

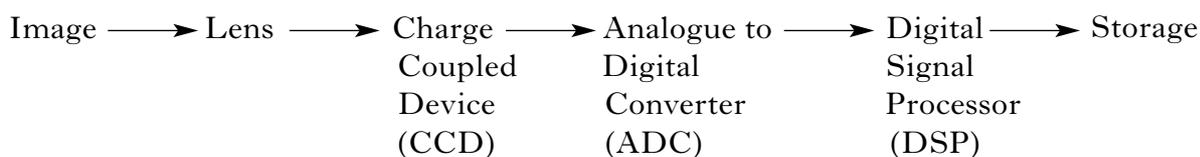
(b) Apart from compression, describe **two** methods which could be used to reduce the size of a video data file.

2

(c) Calculate the file size of a 4 second video clip captured at a resolution of  $800 \times 600$  at a frame rate of 25 frames per second with a 24 bit colour depth. Show all working and express your answer in appropriate units.

3

(d) The way video is recorded works like this:



(i) Explain the role of the CCD.

(ii) Explain the role of the DSP.

(iii) Explain the benefit of using a digital camera which has three CCDs instead of a single CCD.

6

(e) Describe **two** types of **transition** that can be used to link video clips.

2

## SECTION III

## Part C—Multimedia Technology (continued)

30. A sound recording studio uses various techniques to record and store sound.
- (a) State **two** different functions a sound card could perform when capturing sound. 2
  - (b) Describe how RAW data files are stored. 2
  - (c) Name and describe **one** file format other than RAW for storing sound. 2
  - (d) Calculate the amount of storage required to store a 2 minute stereo sample at 16 bit resolution sampled at 44.1 kHz. 3
- (50)**

[END OF SECTION III—PART C]

[END OF QUESTION PAPER]

**[C206/SQP238]**

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Computing  
Higher  
Specimen Marking Instructions

NATIONAL  
QUALIFICATIONS

**Higher Computing Specimen Paper Marking Scheme**  
**Section I Computer Systems - Short response, 2:1 KU:PS, Grade C type questions - 15 Marks**

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                       |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------------|
| <p><b>1.</b></p> | <p>A processor has a 16 bit address bus. The processor is to write to memory location 800.</p> <p>(a) Describe the purpose of the address bus.</p> <p>Pinpoints the address of the memory location to be accessed (<b>1 mark</b>)<br/>         {Content Statement: Computer Structure - Description of the function of data and address buses }</p>                                                                                                                      | <p>1 mark</p>    | <p><b>1 mark</b></p>  |
|                  | <p>(b) Calculate the binary number that will be placed on the address bus.</p> <p>000 0011 0010 0000 <b>1mark</b> for correct binary value for 800, <b>1 mark</b> for 16 bit answer.<br/>         {Content Statement: Data representation - Representation of positive numbers in binary .... up to and including 32 bits }</p>                                                                                                                                          | <p>2x1 marks</p> | <p><b>2 marks</b></p> |
|                  | <p>(c) A register will hold the address of the location to be written to. Describe <b>one</b> other function of a register.</p> <p>Hold data to be processed.<br/>         Hold the instruction being executed.<br/>         Hold flags for the result of arithmetic or logic. (<b>1 mark</b> for <b>one</b> valid answer)<br/>         Other possible answers.<br/>         {Content Statement: Computer Structure - Description of the purposes of registers.... }</p> | <p>1 mark</p>    | <p><b>1 mark</b></p>  |
| <p><b>2.</b></p> | <p>A computer company has decided to use Unicode to replace ASCII. Describe <b>one</b> advantage of the use of Unicode over ASCII.</p> <p>Larger range of characters i.e. 65 536<br/>         Can cope with the characters of all languages. (<b>1 mark</b> for <b>one</b> valid answer)<br/>         {Content Statement: Data representation - Description of Unicode and its advantages over ASCII }</p>                                                               | <p>1 mark</p>    | <p><b>1 mark</b></p>  |

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|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------------|
| <p><b>3.</b></p> | <p>Lauren buys a new digital camera. It stores its images on a flashcard and has a standard interface.</p> <p>(a) Describe <b>two</b> benefits of using a camera with a flashcard.</p> <p>It is removable and can be read directly by an appropriate computer system or printer. <b>(1 mark)</b><br/> More than one flashcard could be carried allowing more photos on one trip. <b>(1 mark)</b><br/> {Content Statement: Peripherals - Description of features ... and advantages of solid state storage devices }</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p>2x1 marks</p> | <p><b>2 Marks</b></p> |
|                  | <p>(b) The software distributed with the camera allows the photos to be saved in a number of different <i>standard file formats</i>.<br/> Name a “standard file format” suitable for this application and give <b>one</b> advantage and <b>one</b> disadvantage of its use.</p> <p>JPEG Advantage – uses compression to reduce file size, supports millions of colours<br/> Disadvantage – lossy compression means loss of detail<br/> BMP Advantage – no loss of detail, Windows standard, true colour pictures stored so no decoder required<br/> Disadvantage – large file size, resolution dependent, cross platform incompatibility<br/> GIF Advantage – lossless compression, animation, transparency<br/> Disadvantage – limited to 256 colours<br/> TIFF Advantage – any number of colours available<br/> Disadvantage – tends to be a large file format<br/> <b>1 mark</b> for the name, <b>1 mark</b> for the advantage, <b>1 mark</b> for the disadvantage<br/> {Content Statement: Computer Software - Description of the standard file formats for graphic files }</p> | <p>3x1 marks</p> | <p><b>3 Marks</b></p> |

|           |                                                                                                                                                                                                                                                                                          |           |         |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------|
| <b>4.</b> | Declan notices that his computer's hard drive is running out of free space and that files take longer to load than they used to.                                                                                                                                                         |           |         |
|           | (a) Name a utility program that could improve the speed at which files load.<br>Defragmentation – (1 mark)                                                                                                                                                                               | 1 mark    | 1 mark  |
|           | (b) Describe how this software works.<br>Moves the component parts of a file to physically adjacent blocks. (1 mark)                                                                                                                                                                     | 1 mark    | 1 mark  |
| <b>5.</b> | (c) Explain how it improves loading time<br>As a disc spins the next part of a file will be on the same track where possible, reducing the need to move read/write heads (1 mark)<br>{Content Statement: Computer Software - Description of utility programs including ...defragmenter } | 1 mark    | 1 mark  |
|           | What is a bootstrap loader?<br>Program held in ROM (1 mark) that initiates the loading of the operating system (1 mark)<br>{Content Statement: Computer Software - Description of the function of a bootstrap loader}                                                                    | 2x1 marks | 2 marks |

**Section I SDP - Short response, 2:1 KU:PS, Grade C type questions - 15 Marks**

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |                |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|
| 6. | <p>State <b>two</b> tasks carried out by the project manager during the development of software. Oversees whole project. Makes sure correct personnel is involved, time limits are not overrun, communication with the client, any other valid (<b>1 mark each for two</b> valid tasks.)</p> <p>{Content Statement: SD Process – Identification of the personnel at each stage(..project manager..)and brief description of their roles.</p>                                                                                                                                                                                                                                                                                                                                       | 2x1 marks | <b>2 marks</b> |
| 7. | <p>(a) Describe what is meant by <i>top down design</i> and <i>stepwise refinement</i>.</p> <p>Complete problem broken down into sub problems from top to bottom (<b>1 mark</b>) and each sub problem broken down further in order to solve whole problem (<b>1 mark</b>)</p> <p>{Content Statement: SD Process – Description and exemplification of top down design and stepwise refinement. }</p>                                                                                                                                                                                                                                                                                                                                                                                | 2x1 marks | <b>2 marks</b> |
| 8. | <p>(b) Describe <b>one</b> benefit of using top down design and stepwise refinement.</p> <p>Easier to code, one to one mapping with the code, more manageable (eg program can be split more easily for a team of programmers) (<b>1 mark for one</b> valid benefit)</p> <p>{Content Statement: SD Process – Description and exemplification of top down design and stepwise refinement. }</p> <p>Programs are required to be <i>robust</i> and <i>reliable</i>. Explain both of these terms.</p> <p>Robust – can cope with any user input without failing (<b>1 mark</b>)</p> <p>Reliable – expected results are given every time the program is run (<b>1 mark</b>)</p> <p>{Content Statement: SD Process – Evaluation of software in terms of robustness, reliability..... }</p> | 1 mark    | <b>1 mark</b>  |
|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2x1 marks | <b>2 marks</b> |

| <p><b>9.</b></p>  | <p>(a) The software development process can be described as <i>iterative</i>. What is meant by the term “iterative”?<br/>Repeating earlier stages in the SDP to make changes in order to produce correct results (<b>1 mark</b>)<br/>{Content Statement: SD Process – Explanation of the iterative nature of the SD Process.}</p>                                                                                                                              | <p>1 mark</p>    | <p><b>1 mark</b></p>  |          |       |               |       |               |       |  |  |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------------|----------|-------|---------------|-------|---------------|-------|--|--|
|                   | <p>(b) Give <b>one</b> example of iteration which may take place within the analysis stage.<br/>Analysis – re-interviewing client to gather further information, going back to check current workplace etc<br/>(<b>1 mark for one</b> valid example)<br/>{Content Statement: SD Process – Explanation of the iterative nature of the SD Process.}</p>                                                                                                          | <p>1 mark</p>    | <p><b>1 mark</b></p>  |          |       |               |       |               |       |  |  |
| <p><b>10.</b></p> | <p>A program has been produced to store and process names and the times of competitors in a 100 metres sprint. A section of the data is shown below:</p> <table border="1" data-bbox="746 1406 869 1883"> <thead> <tr> <th><u>Name</u></th> <th><u>Time (secs)</u></th> </tr> </thead> <tbody> <tr> <td>Ali Kidd</td> <td>12.13</td> </tr> <tr> <td>Roberta Young</td> <td>13.67</td> </tr> <tr> <td>Molly O’Neill</td> <td>12.34</td> </tr> </tbody> </table> | <u>Name</u>      | <u>Time (secs)</u>    | Ali Kidd | 12.13 | Roberta Young | 13.67 | Molly O’Neill | 12.34 |  |  |
| <u>Name</u>       | <u>Time (secs)</u>                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                       |          |       |               |       |               |       |  |  |
| Ali Kidd          | 12.13                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                       |          |       |               |       |               |       |  |  |
| Roberta Young     | 13.67                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                       |          |       |               |       |               |       |  |  |
| Molly O’Neill     | 12.34                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                       |          |       |               |       |               |       |  |  |
|                   | <p>(a) What data structure and data type could be used within the program to store the runners’ times?<br/>Array (<b>1 mark</b>) of Real (<b>1 mark</b>)<br/>{Content Statement: HL programming language constructs – Description and exemplification of real .....1D arrays}</p>                                                                                                                                                                              | <p>2x1 marks</p> | <p><b>2 marks</b></p> |          |       |               |       |               |       |  |  |

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |                |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------|
|            | <p>(b) The fastest runner has to be found. Which of the following algorithm would be used within the program in order to find the fastest runner?</p> <ul style="list-style-type: none"> <li>• Counting Occurrences</li> <li>• Finding the maximum</li> <li>• Finding the minimum</li> <li>• Linear Search</li> </ul> <p>Finding the minimum(<b>1 mark</b>)</p> <p>{Content Statement: Standard Algorithms – Description and exemplification of the following standard algorithms.....•finding minimum.....}</p>                                                                                                                                                                                                                                                                                                            | 1 mark    | <b>1 mark</b>  |
| <b>11.</b> | <p>(a) Describe what is meant by a <i>scripting language</i>.</p> <p>The High Level Language embedded within an application package (<b>1 mark</b>)</p> <p>{Content Statement: Languages and Environments – Description of the features and uses of scripting language.....}</p> <p>(b) Give <b>two</b> benefits of using a “scripting language”.</p> <p>Complex tasks can be set up and initiated by a single key press or can save time going through endless menus (MACROS), user can customise the package to particular needs or features and functions which may not be given within the normal working of the package can be added (<b>1 mark</b> each for <b>two</b> valid benefits.)</p> <p>{Content Statement: Languages and Environments – Explanation of the need for and benefits of scripting languages }</p> | 1 mark    | <b>1 mark</b>  |
|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2x1 marks | <b>2 marks</b> |

**Section II - Extended response questions (Grade B, Grade A) - 1:2 KU:PS 30 Marks Computer Systems and 30 Marks Software Development**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                     |  |                       |
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| <p><b>12.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>Helen is trying to buy a new computer. She will be creating and using several very large spreadsheet files with complex calculations. She has been reading the following two advertisements.</p> |  |                       |
| <p><b>Lynx 983</b><br/>         3.1 GHz AtheloteII Processor<br/>         512 Mb RAM<br/>         120 Gb Hard Disk<br/>         1.44 Mb Floppy Drive<br/>         DVD-ROM Drive (CD-ROM compatible)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p><b>Ruath CM</b><br/>         2.9 GHz MDA4 Processor<br/>         512 Mb RAM<br/>         32 Mb Cache<br/>         100 Gb Hard Disk<br/>         DVD/CD-RW Combination Drive</p>                  |  |                       |
| <p>(a) If the ability to back-up data is the most important factor for choosing a new computer, which computer would you suggest Helen buys? Give <b>two</b> reasons for your choice.</p> <p>The Ruath should be chosen because ...</p> <ul style="list-style-type: none"> <li>• It has a dual DVD/CD-RW drive. This would allow regular backup to CD-R(W)</li> <li>• The Lynx has a floppy drive (too small for purpose) and a DVD-ROM (non-writable storage)</li> <li>• Other suitable.</li> </ul> <p><b>(1 mark</b> each for <b>two</b> valid reasons)<br/>         {Content Statement: CS Peripherals -Justification of the hardware selected in terms of appropriate characteristics...}</p> | <p>2x1 marks</p>                                                                                                                                                                                    |  | <p><b>2 marks</b></p> |
| <p>(b) Explain the effect of a <i>cache</i> on the performance of a computer.</p> <ul style="list-style-type: none"> <li>• The performance will be enhanced/improved/made faster</li> <li>• A cache will allow areas of main memory (RAM) to be held closer to the processor</li> <li>• Addressing the cache uses shorter addresses which are manipulated faster reducing processing time</li> </ul> <p><b>(1 mark</b> each for <b>two</b> valid reasons)<br/>         {Content Statement: CS Computer Structure - Description of effect of the following factors on system performance ..... cache memory ....}</p>                                                                              | <p>2x1 marks</p>                                                                                                                                                                                    |  | <p><b>2 marks</b></p> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                   |                       |
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|  | <p>Helen thinks that the Lynx 983 will be the faster computer because “it has a faster <i>clock speed</i>”.</p> <p>(c) (i) Describe <b>two</b> weaknesses of “clock speed” as a measure of processor performance.<br/> (ii) Name and describe <b>one</b> other measure of processing power.</p> <p>(i)</p> <ul style="list-style-type: none"> <li>• Clock speed may only be accurately used to compare processors of the same type</li> <li>• A more powerful processor may achieve more in a shorter number of pulses</li> <li>• other valid answers are possible</li> <li>• Clock speed is merely a measure of the frequency of timing pulses</li> </ul> <p><b>(1 mark each for two valid reasons)</b></p> <p>(ii)</p> <ul style="list-style-type: none"> <li>• MIPS – millions of instructions per second, actual number of machine instructions carried out in 1 second</li> <li>• FLOPS – number of floating point operations per second, actual number of calculations done in 1 second</li> <li>• benchmark testing – perform a series of standard tests designed to measure processor performance</li> <li>• other valid answers may be possible – avoid general answers about measuring throughput</li> </ul> <p><b>(1 mark for name, 1 mark for description)</b><br/> {Content Statement: CS Computer Structure - Description and evaluation of the following measures of performance: clock speed, MIPS, FLOPs and application based tests.}</p> | <p>2x1 marks</p> <p>2x1 marks</p> | <p><b>4 marks</b></p> |
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| <p><b>13.</b></p> | <p>A school classroom has a local area network consisting of twenty computers and three servers. The teacher says that the network is a <i>client-server network</i>.</p> <p>(a) The network could have been a <i>peer-to-peer network</i>.</p> <p>(i) Describe <b>two</b> main differences between client-server and peer-to-peer networks.</p> <p>(ii) Give <b>two</b> reasons why a client-server network is more suitable for a school classroom.</p> <p>(i) peer-to-peer: Each station has the same status on the network. All stations can share files.<br/>client-server: Some stations are clients some are servers. Only servers can share resources.<br/>(1 mark each for <b>two</b> differences.)</p> <p>(ii) All resources can be installed on a fileserver making classroom management easier. (1 mark)<br/>Files on server can be given appropriate access attributes to prevent accidental erasure of teaching materials. (1 mark).<br/>{Content Statement: CS Networks - Descriptive comparison of peer-to-peer networks and client-server networks }</p> | <p>2x1 marks</p> <p>2x1 marks</p> <p><b>4 marks</b></p> |  |
|                   | <p>(b) One of the servers on the network is a <i>fileserver</i>. Name <b>one</b> other type of server that might be connected to the network and describe its purpose.</p> <p>print server: to receive, store and prioritise print jobs from stations and print them on a shared printer.<br/>web server: to store web pages and send them to stations on request.<br/>mail server: to receive and store e-mail messages and forward them to their destinations</p> <p>(1 mark for name and 1 mark for description)<br/>{Content Statement: CS Networks - Description of the functions of file, print and web servers }</p>                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>2x1 marks</p> <p><b>2 marks</b></p>                  |  |

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |                |
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|            | <p>A computer which is connected to a network can be more liable to virus infections than others. Because of this an anti-virus utility has been installed on all network stations.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           |                |
|            | <p>(c) Name and describe <b>one</b> class of virus that an anti-virus utility might detect.</p> <ul style="list-style-type: none"> <li>• file virus: attaches to the code of a program. It is run when the program is executed.</li> <li>• boot sector virus: infects startup files, boot files, of the OS and is executed at startup time.</li> <li>• macro virus: a virus in the shape of a macro. It attaches itself to a document and runs when the document is opened. It often copies itself to the macro library as a step towards copying itself to other files.</li> </ul> <p>(1 mark each for two descriptions)<br/>{Content Statement: CS Computer Software - Classification of viruses by type ....}</p>                                                                                            | 2x1 marks | <b>2 marks</b> |
|            | <p>(d) Being connected to a network is one reason why one computer might be more liable to virus infection than others. Give <b>two</b> other reasons why one computer might be more liable to virus infection than others.</p> <ul style="list-style-type: none"> <li>• It doesn't have anti-virus software</li> <li>• Used by many people who use external storage devices to transfer work from home to office.</li> <li>• Virus writers target specific applications and operating systems</li> <li>• Using software with known security flaws</li> </ul> <p>(1 mark each for two valid reasons)<br/>{Content Statement: CS Computer Software - Description of virus code actions: replication ....}<br/>{Content Statement: CS Computer Software - Description of anti-virus software techniques ....}</p> | 2x1 marks | <b>2 marks</b> |
| <b>14.</b> | <p>Describe the stages of the <i>fetch execute cycle</i>.<br/>Your answer should refer to appropriate buses and control lines.<br/><b>One mark for each</b> bullet point</p> <ul style="list-style-type: none"> <li>• Set up the Address Bus</li> <li>• Activate the Read line on the Control Bus</li> <li>• Memory accesses the relevant location and places contents on Data Bus</li> <li>• Decode and Execute instruction</li> </ul> <p>{Content Statement: CS Computer Structure - A simple description referring to appropriate buses and registers of the steps in the fetch execute cycle}</p>                                                                                                                                                                                                           | 5x1 marks | <b>5 marks</b> |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |                       |
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| <p><b>15.</b></p> | <p>A multimedia catalogue to help identify and record sightings of birds common to the UK is being constructed. The software will contain colour pictures and recordings of bird calls. It will allow users to browse through the existing information and to print off selected items.</p> <p>(a) (i) Name a suitable class of application package to produce the catalogue. (1 mark)<br/> (ii) Justify your answer in terms of the objects and operations involved. No credit will be given for naming proprietary software.</p> <p>(i) Multimedia authoring package (or database) (1 mark)<br/> (ii) Reason must include <u>objects</u> (different types of data, text/sound/graphic) and <u>operations</u> (searching/sorting/playing sound/etc) (1 mark for inclusion of <b>each</b> underlined part.)<br/> {Content Statement: CS Description of a suitable selection of software to support typical tasks ...}</p> <p>(b) The photographs of the birds will aid identification. Each photograph is 200 by 200 pixels and is stored in 32 bit colour. What is the file size of a single image?</p> <p>Show all your working and give your answer in appropriate units.</p> <ul style="list-style-type: none"> <li>• <math>200 \times 200 = 40000</math> pixels (1 mark)</li> <li>• each pixel uses 4 bytes of memory (1 mark)</li> <li>• <math>40000 \times 4 = 160000</math> bytes (1 mark)</li> <li>• <math>160000 / 1024 = 156.25</math> Kb (1 mark)</li> </ul> <p>{Content Statement: CS Data Representation - Description of the bit map method of representing graphics using examples of colour/grey scale bit maps}</p> | <p>1 mark<br/>2x1 marks</p> | <p><b>3 marks</b></p> |
|                   | <p>(c) Part of the program will ask the user for the name of a bird and search a list of names to see if it exists. What data structure and data type will be used to hold the list?</p> <p>Array (1 mark) of Strings(accept char) (1 mark) Do not accept "of text".<br/> {Content Statement: SD HL programming language constructs - Description and exemplification of ...string ... ..1D arrays }</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <p>4x1 marks</p>            | <p><b>4 marks</b></p> |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <p>2x1 marks</p>            | <p><b>2 marks</b></p> |

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|  | <p>(d) The part of program described in part (c) will display the <b>position</b> of the name in the list.<br/>For example, if the name is third in the list, the number 3 is displayed. If the name is not in the list a zero is displayed.</p> <p>Use <i>pseudocode</i> to show how this section of program will search the list and display the appropriate value on screen.</p> <p>The algorithm may be expressed in a variety of ways, markers should exercise professional judgement in awarding marks where minor disparities occur.</p> <ul style="list-style-type: none"> <li>• set found to 0 (1 mark)</li> <li>• for each member of the array (1 mark)</li> <li>• if target = array(current) then set found = current (2 marks)</li> <li>• end loop (1 mark)</li> <li>• display found (1 mark)</li> </ul> <p>{Content Statement: SD Standard Algorithms - linear search }</p> | 6x1 marks | 6 marks |
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|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |                |
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| <p><b>16.</b></p> | <p>A game is being designed and the following pseudocode has been produced for part of the program.</p> <p><u>Level 1 Algorithm</u></p> <ol style="list-style-type: none"> <li>1 Initialise variables</li> <li>2 Set up screen</li> <li>3 Get user details</li> <li>4 Start game loop</li> <li>5 Get user move</li> <li>6 Check for user win</li> <li>7 Generate computer move</li> <li>8 Check for computer win</li> <li>9 End loop when win = true</li> <li>10 Display message</li> <li>11 End game</li> </ol> <p><u>Refinement of Step 6</u></p> <ol style="list-style-type: none"> <li>6.1 If number of counters in play = 0 then</li> <li>6.2 Set win = true</li> <li>6.3 Display player's name has won</li> <li>6.4 End if statement</li> </ol> |           |                |
|                   | <p>(a) Some of the variables that will be initialised in line 1 of the algorithm are <i>global variables</i>. Explain <b>one</b> problem that the developers might have if they only use global variables in the program.</p> <p>Through using the same variable name in several parts of the program (<b>1 mark</b>) there is a chance of overwriting a value accidentally (<b>1 mark</b>)<br/>         {Content Statement: SD High Level Programming Language Constructs - Description and exemplification of ... local and global variables}</p>                                                                                                                                                                                                   | 2x1 marks | <b>2 marks</b> |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                         |  |
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|                   | <p>(b) The three variables used by the “Check for user win” subroutine are <b>counters</b> , <b>win</b>, and <b>name</b>. These variables can be either <i>called by reference</i> or <i>called by value</i>.</p> <p>(i) Explain the meaning of the two terms <i>called by reference</i> and <i>called by value</i>.</p> <p>(ii) For <b>each</b> of the three variables, state if the variable is “called by reference” or “called by value”.<br/>Give a reason for <b>each</b> of your choices.</p> <p>(i) <b>Call by reference:</b> The actual variable is passed into subroutine where it may be updated and the new value passed out.<br/>(1 mark)<br/><b>Call by value:</b> The current value is passed into the subroutine, any changes made do not affect the rest of the program.<br/>(1 mark)</p> <p>(ii) <b>Counters and name are by value</b> as they should not be altered by the check.<br/><b>Win is by reference</b> as it must be altered if the game is to end</p> <p>(1 mark for each variable correctly identified <b>with the corresponding reason</b>)<br/>{Content Statement: SD High Level Programming Language Constructs - Description and exemplification of... call by reference and value }</p> | <p>2x1 marks</p> <p>3x1 marks</p> <p><b>5 marks</b></p> |  |
| <p><b>17.</b></p> | <p>A new payroll system is being written by a software design company.</p> <p>(a) The first stage of the project provided the client with a formal specification document for the planned software. Give <b>two</b> reasons why the software company needs this document.</p> <ul style="list-style-type: none"> <li>• The formal specification is a legal contract.</li> <li>• Gives a clear and unambiguous statement of what the required software has to do.</li> <li>• Defines boundaries of the problem.</li> </ul> <p>(1 mark each for <b>two</b> valid reasons)<br/>{Content Statement: SD Process - Description of the purposes of the software specification.... }</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <p>2x1 marks</p> <p><b>2 marks</b></p>                  |  |

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|  | <p>(b) The software company has decided to make use of module libraries. Give <b>two</b> benefits to the software company of using module libraries.</p> <ul style="list-style-type: none"> <li>• Faster implementation by using pre-written code</li> <li>• Code is pre-tested</li> <li>• Shorter design time</li> <li>• Code is already documented</li> </ul> <p>(1 mark each for <b>two</b> valid benefits)<br/>         {Content Statement: SD Languages and Environments - Description of the use of module libraries}</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2x1 marks | <b>2 marks</b> |
|  | <p>(c) During the production of the payroll system the software developers use both an <i>interpreter</i> and a <i>compiler</i>. Describe when each of these translator programs are used and give a reason for its use.</p> <p>Interpreter - Used during the writing of the software (1 mark)</p> <ul style="list-style-type: none"> <li>• May give better identification of location of error</li> <li>• Ability to test code despite presence of errors in code</li> <li>• Any other valid</li> </ul> <p>(1 mark for <b>one</b> valid reason)</p> <p>Compiler - Used after the software has been completed (1 mark)</p> <ul style="list-style-type: none"> <li>• Produces object code for specific chipset therefore no need for subsequent translations</li> <li>• Object code runs without translator being present</li> <li>• Any other valid</li> </ul> <p>(1 mark for <b>one</b> valid reason)<br/>         {Content Statement: SD Languages and Environments - Comparison of the functions, uses and efficiencies of compilers and interpreters}</p> | 2x1 marks | <b>4 marks</b> |

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|  | <p>(d) Part of the program will manipulate the details of each employee to produce an employee code. The code is produced by taking the first five letters of the surname then adding on their initial and the year they joined the company as follows:</p> <p style="padding-left: 40px;">Set stem to first five characters of surname<br/>Set initial to first character of firstname<br/>Set employee code to stem + initial + year</p> <p style="padding-left: 40px;">Firstname: <b>Gayle</b><br/>Surname: <b>Dorward</b><br/>Year Joined Company: <b>1999</b></p> <p>(i) What is the employee code generated for Gayle Dorward?<br/>(ii) The name Joseph Li generates an error message. Using pseudocode like that above, rewrite the algorithm that creates the employee code to prevent this error occurring.</p> <p>(i) Employee Code: DorwaG1999 (1 mark)<br/>(ii) IF length(Surname\$) &gt; 4 THEN (1 mark)<br/>Set stem to first five characters of surname<br/>Else<br/>Set stem to surname (1 mark)<br/>End if<br/>Set initial to first character of firstname<br/>Set employee code to stem + initial + year</p> <p>The solution must be in a suitable form. Other expressions of the correct answer are possible.<br/>Do not be too strict in terms of syntax.<br/>{Content Statement: SD High Level programming language constructs - Description and exemplification of the following constructs in pseudocode or HLL .... string operations....concatenation}</p> | 1 mark    | 3 marks |
|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2x1 marks |         |

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|  | <p>(e) After the payroll system has been in place for a few weeks the client asks the software company to carry out <i>adaptive</i> maintenance.</p> <p>(i) What is adaptive maintenance? Give an example to illustrate your answer.</p> <p>(ii) Who is most likely to meet the cost of the adaptive maintenance? Justify your answer.</p> <p>(i) Adapts software to new environment (<b>1 mark</b>) Example of new OS/printer/etc acceptable (<b>1 mark</b>)</p> <p>(ii) Adaptive is the responsibility of the client (<b>1 mark</b>) as it goes beyond original specification (<b>1 mark</b>)</p> <p>{Content Statement: SD Process - Description and exemplification of ... adaptive maintenance.}</p> | <p>2x1 marks<br/>2x1 marks</p> | <p><b>4 marks</b></p> |
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**Section III - Artificial Intelligence**

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| <p><b>18.</b></p> | <p>A computer that is capable of understanding natural language is intelligent.</p> <p>(a) Do you agree with this statement? Make <b>two</b> clear points to justify your answer.</p> <p>Yes Language constantly evolves and the ability to learn would suggest intelligence.<br/>Language is ambiguous and the ability to deal with such ambiguity demonstrates intelligence.<br/>Other possible answers.</p> <p>No Only emulates or mimics intelligent behaviour.<br/>It is only a success in one narrow facet of intelligence.<br/>(1 mark each for two valid points)<br/>{Content Statement: Development of AI - Descriptions of the aspects of intelligence.}</p> <p>(b) The Turing test was proposed as a test for artificial intelligence.</p> <p>(i) Describe the Turing test.<br/>(ii) Describe <b>two</b> limitations of the Turing test.</p> <p>(i) Human communicates with other human and a computer. (1 mark)<br/>If the subject cannot distinguish between them the test has been successfully overcome.(1 mark)</p> <p>(ii) Only a test of imitation of human discussion which is a very limited view of intelligence.<br/>If you cannot agree a definition of intelligence then you cannot agree a test for its existence.<br/>Other possible answers.<br/>(1 mark each for two valid points)<br/>{Content Statement: Development of AI - Explanation of the inherent flaws in the Turing test....}</p> | <p>2x1 marks</p>                  | <p><b>2 marks</b></p> |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <p>2x1 marks</p> <p>2x1 marks</p> | <p><b>4 marks</b></p> |

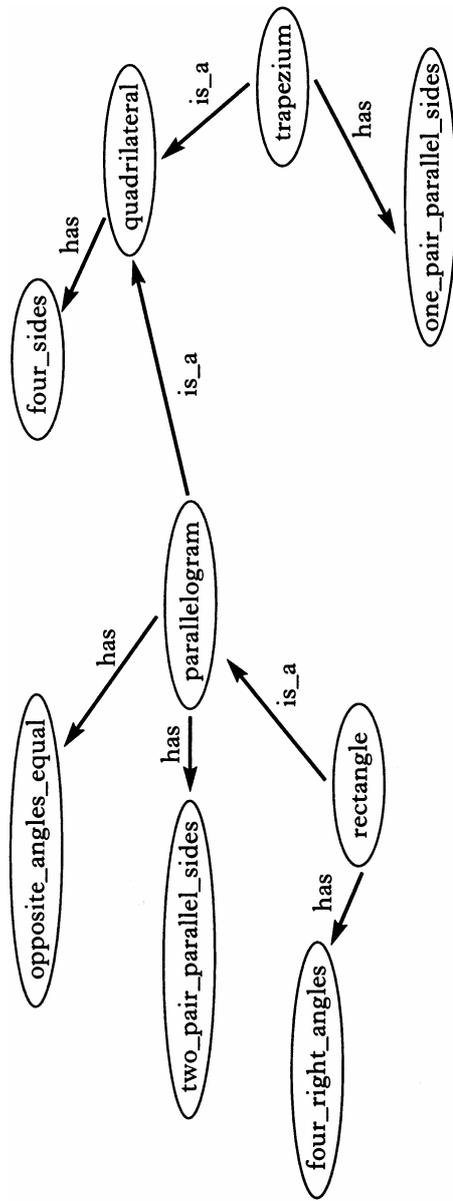


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| <p><b>19.</b></p> | <p>An online car sales company decides to introduce an expert system to advise customers about the most suitable type of car for them.</p> <p>(a) Is this a suitable domain for the creation of such an expert system? Give <b>two</b> reasons for your answer.</p> <p>No<br/>Car features are regularly upgraded giving constantly changing knowledge base.<br/>Too many different types of cars making domain too large.<br/>Other possible answers.<br/>Domain is not too large- the number of different types of cars is easily implemented on modern computers.<br/>Most cars have similar features allowing the easy creation of rules.<br/>Other possible answers.<br/>(1 mark each for two valid reasons)<br/>{Content Statement: Applications and Uses of AI - Disadvantages of an Expert System including narrow domain, inability to acquire new knowledge etc. }</p> <p>{Content Statement: Applications and Uses of AI - Explanation of need for restricted domain. }</p>                                                                      | <p>2x1 marks</p>                  | <p><b>2 marks</b></p> |
|                   | <p>(b) Consideration was given to creating the expert system using a procedural language or an expert system shell.</p> <p>(i) Explain <b>fully</b> the difference between an expert system and an expert system shell.<br/>(ii) Give <b>two</b> reasons to support implementation using a procedural language.</p> <p>(i) Expert System consists of KB –facts and rules<br/>Inference engine – uses pattern matching to match query to facts and rules<br/>User interface- provides interface through which to present dialogue boxes and questions and to provide solutions<br/>(1 mark)<br/>Expert system shell has empty or no KB. (1 mark)<br/>{Content Statement: Applications and Uses of AI - Distinction between an expert system and an expert system shell. }</p> <p>(ii) Greater ability to customize HCI with procedural. (1 mark)<br/>Greater access to mathematical functions, range of data types. (1 mark)<br/>{Content Statement: Software Development Languages - Comparison of procedural, declarative and event-driven languages }</p> | <p>2x1 marks</p> <p>2x1 marks</p> | <p><b>4 marks</b></p> |

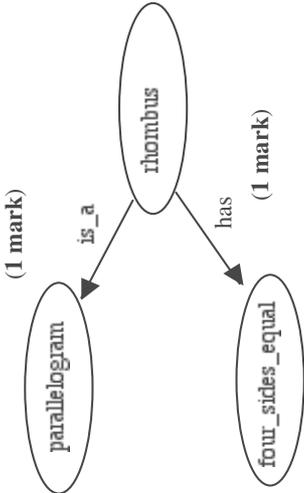
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|  | <p>(c) The company insists that the expert system should be capable of <i>justification</i>. Describe <b>two</b> advantages of including this feature.</p> <p>Explanation increases user confidence.<br/> Explanation will aid testing.<br/> (Content Statement: Applications and Uses of AI - Description of components of an Expert System (Knowledge Base, Interface with justification/explanation) }</p> | 2x1 marks | <b>2 marks</b> |
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20.

(a) A mathematician draws the following diagram.



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|  | <p>(i) What is the name for the type of diagram drawn by the mathematician?</p> <p>(ii) Which stage of the software development process would result in such a diagram? Justify your answer.</p> <p>(iii) Describe <b>two</b> benefits of representing the knowledge in this way.</p> <p>(i) semantic net (<b>1 mark</b>)</p> <p>(ii) analysis – The domain of the problem has been specified (narrowed) and understood correctly.<br/>design –it represents the solution in a suitable design notation (<b>1 mark</b>)<br/>no need to consider syntax of KRL,<br/>graphical representation is easier to understand<br/>aids coding by defining relationships of nodes to each other<br/>allows easy creation of rules using paths from node to node</p> <p>(<b>1 mark</b> each for <b>two</b> valid benefits)</p> <p>{Content Statement: Knowledge representation - Description of knowledge representation techniques including semantic nets.}</p> | <p>1 mark<br/>1 mark<br/>2x1 marks</p> | <p><b>4 marks</b></p> |
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|  | <p>(b) The mathematician decides to add the following information.<br/> A rhombus is a kind of parallelogram. It has four equal sides.<br/> Show how this information would be added to the diagram. You do not need to redraw the entire diagram.</p> <div style="text-align: center;">  <pre> graph TD     rhombus((rhombus)) -- is_a --&gt; parallelogram((parallelogram))     rhombus -- has --&gt; four_sides_equal((four_sides_equal)) </pre> </div> <p>{Content Statement: Knowledge representation - Creation of a semantic net .....}</p> | 2x1 marks | 2 marks |
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| <p><b>21.</b></p> | <p>The following knowledge base was created using the information from the mathematician's diagram.</p> <ol style="list-style-type: none"> <li>1 is_a (parallelogram, quadrilateral)</li> <li>2 is_a (trapezium, quadrilateral)</li> <li>3 is_a (rectangle, parallelogram)</li> <li>4 has(quadrilateral, four_sides)</li> <li>5 has(trapezium, one_pair_parallel_sides)</li> <li>6 has(parallelogram, two_pair_parallel_sides)</li> <li>7 has(parallelogram, opposite_angles_equal)</li> <li>8 has(rectangle, four_right_angles)</li> <li>9 has(X, Y) if<br/>is_a(X,Z) and<br/>has(Z, Y)</li> </ol> |                  |                       |
|                   | <p>(a) Assuming a depth-first search is used to find the solution to the following query.</p> <p>? has(rectangle, Y)</p> <p>State the <b>four</b> solutions to the query in the order in which they would be found.</p> <p>Y= four_right_angles (1 mark)<br/> Y= two_pair_parallel_sides (1 mark)<br/> Y=opposite_angles_equal (1 mark)<br/> Y= four_sides (1 mark)<br/> <b>Take off 1 mark if the order is wrong.</b></p>                                                                                                                                                                          | <p>4x1 marks</p> | <p><b>4 marks</b></p> |

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|  | <p>(b) Trace the steps in the search as far as the third solution.</p> <p>Matches at 8 Output Y=four_right_angles<br/> Matches at 9, X becomes rectangle, sub-goal kind_of(rectangle,Z)<br/> Matches at 3, Z becomes parallelogram, sub-goal has(parallelogram,Y)<br/> Matches at 6,Output Y = two_pair_parallel_sides;<br/> Matches at 7 Output Y = opposite_angles_equal;<br/> <b>(1 mark each point</b> of success in the search with appropriate <b>explanation.</b>)<br/> {Content Statement: Knowledge Representation - Perform complex manual trace: multiple level including backtracking}</p> | 5x1 mark         | <b>5 marks</b> |
|  | <p>(c) (i) What is the solution to the following query?<br/> ?- not (is_a (trapezium,quadrilateral))<br/> (ii) Explain how this query would be evaluated.</p> <p>(i) no <b>(1 mark)</b><br/> (ii) is_a(trapezium, quadrilateral) results in yes, therefore the not means this is negated to a no. <b>(1 mark)</b><br/> {Content Statement: Knowledge Representation - Description of ... Negation}</p>                                                                                                                                                                                                 | 1 mark<br>1 mark | <b>2 marks</b> |
|  | <p>(d) Rule 9 gives this knowledge base a feature known as <i>inheritance</i>.</p> <p>(i) What is inheritance?<br/> (ii) Give <b>one</b> advantage of inheritance.</p> <p>(i) Nodes adopt the properties of which they are a descendant. <b>(1 mark)</b><br/> (ii) Reduces the need for explicitly stating additional facts to establish the properties of a node. <b>(1 mark)</b><br/> {Content Statement: Knowledge Representation - Description of ... Inheritance}</p>                                                                                                                             | 1 mark<br>1 mark | <b>2 marks</b> |

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| <p><b>22.</b></p> | <p>Chess has been successfully implemented by Artificial Intelligence programmers. To decide which move to make the computer generates all the legal moves from certain position and chooses the one which gives the greatest advantage. In one particular implementation the program looks three moves ahead.</p> <p>(a) When searching for the winning move a depth-first or breadth-first search could be used.<br/>Give <b>one</b> advantage and <b>one</b> disadvantage of using a depth-first search rather than a breadth first search.<br/>Depth-first requires less memory. <b>(1 mark)</b><br/>Depth-first won't always find the shortest solution. <b>(1 mark)</b><br/>{Content Statement: Search Techniques - Comparison of depth-first etc.}</p> | <p>2x1 marks</p>               | <p><b>2 marks</b></p> |
|                   | <p>(b) The choice of a good move can be made using a heuristic.<br/>(i) Describe the use of a heuristic for selecting a move in chess.<br/>(ii) Describe <b>two</b> advantages of using a heuristic over exhaustive search techniques.</p> <p>(i) Use an evaluation function to score a node <b>(1 mark)</b> and move to the best score available from that node. <b>(1 mark)</b><br/>(Description of hill climbing)<br/>Exemplification of any heuristic would gain the marks.<br/>(ii) Narrows the search space. <b>(1 mark)</b><br/>Reduces the search time. <b>(1 mark)</b><br/>{Content Statement: Search Techniques - Description and exemplification of use of heuristic to reduce search time/space. }</p>                                            | <p>2x1 marks<br/>2x1 marks</p> | <p><b>4 marks</b></p> |
|                   | <p>(c) Define the term <i>combinatorial explosion</i> in relation to search techniques.<br/>The number of possible nodes grows extremely quickly. <b>(1 mark)</b><br/>Becomes unmanageable in all but the simplest of problems. <b>(1 mark)</b><br/>{Content Statement: Search Techniques - Description and exemplification of use of combinatorial explosion }</p>                                                                                                                                                                                                                                                                                                                                                                                           | <p>2x1 marks</p>               | <p><b>2 marks</b></p> |

**Section III - Computer Networking**

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| <p><b>23.</b></p> | <p>Jamie has a Wireless Application Protocol (WAP) enabled communication device and is considering writing his own version of a currency converter program, in Wireless Markup Language (WML), for the device. He has already written web pages in HTML.</p> <p>(a) Describe <b>two</b> tags used in HTML.</p> <p>Start                    &lt;html&gt;<br/> Header                &lt;head&gt; ... &lt;/head&gt;<br/> Body                   &lt;body&gt; ... &lt;/body&gt;<br/> Title                   &lt;title&gt; ... &lt;/title&gt;</p> <p>Style                   &lt;style&gt; ... &lt;/style&gt;<br/> Font Size             &lt;font&gt; ... &lt;/font&gt;</p> <p>Alignment           &lt;div&gt; ... &lt;/div&gt;</p> <p>Tag contains the entire document and identifies the page as valid HTML<br/> provides information to users and search engines<br/> contains the documents content<br/> the same name given to the web page; the &lt;title&gt; element is located in the<br/> &lt;head&gt; element and is displayed in the browser window title bar eg<br/> &lt;head&gt;&lt;title&gt;Specimen Paper&lt;/title&gt;&lt;/head&gt;<br/> incorporates an internal style sheet; located in the &lt;head&gt; element<br/> changes the font size and colour eg &lt;font size=5 color='purple' face="Times<br/> New Roman"&gt; ... &lt;/font&gt;<br/> The division element is used to add structure to a block of text eg &lt;div<br/> align="right"&gt;</p> <p><b>(1 mark for description of each of two valid tags, syntax alone is not sufficient )</b><br/> {Content Statement: Network Applications - Description of a web page using HTML tags }</p> | <p>2x1 marks</p> | <p><b>2 marks</b></p> |
|                   | <p>(b) Jamie is designing the screens for his currency converter. WML does not have a full range of text formatting features. Describe one similarity and one difference when changing the font size in WML compared with HTML.</p> <p>In both, &lt;big&gt;, &lt;small&gt; are used to produce a larger/smaller font. <b>(1 mark)</b><br/> Larger choices available in HTML such as &lt;font size=5&gt; to give one of the 7 sizes. <b>(1 mark)</b>.<br/> {Content Statement: Network Applications - Description of a web page using HTML tags }</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <p>2x1 marks</p> | <p><b>2 marks</b></p> |

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|  | <p>(c) Jamie asked one of his friends to test his currency converter program. His friend said that he had got confused by Jamie's use of the underline facility provided in WML. Why might his friend have been confused.</p> <p>Confusion with hyperlinks. (1 mark)<br/>         {Content Statement: Network Applications - Description of a web page using WML tags }</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1 mark  | 1 mark  |
|  | <p>(d) Jamie believes that the Regulation of Investigatory Powers Act 2000 is in direct contradiction to other laws which guarantee individuals the right to privacy.</p> <p>(i) Describe <b>one</b> implication of this Act.<br/>         (ii) Explain <b>one</b> argument in favour of the Regulation of Investigatory Powers Act 2000 and <b>one</b> against it.</p> <p>(i) "tapping" now applies to emails and mobile phone networks investigations / surveillance regulated<br/> <b>(1 mark</b> for the name only of the implication eg "tapping", <b>2 marks</b> for the extended response)</p> <p>(ii) Specific examples for and against are acceptable eg benefit fraud, CCTV activity, health and safety compliance with explanations. Candidates must make clear the "for" or "against"<br/> <b>(2 marks</b> for each of <b>2 full explanations</b> or <b>1 mark</b> if <b>not fully explained</b>)</p> <p>OR</p> <p>Offence for communications to be intercepted ( <b>1 mark</b>) without lawful authority (<b>1 mark</b>) {for }<br/>         More organizations will be eligible to "tap"(<b>1 mark</b>) which means personal data harder to safeguard (<b>1 mark</b>)<br/>         Eg <a href="http://www.spelthorne.gov.uk/web/council/committees">www.spelthorne.gov.uk/web/council/committees</a></p> <p>{Content Statement: Network Applications - Description of the implications of the RIP Act 2000; Description of the implications of the RIP Act 2000 }</p> | 2 marks | 6 marks |

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| <p><b>24.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>Network performance is important to both the network manager and network users. There are many factors which can affect network performance.</p> <p>(a) Some local area networks operate a system called CSMA/CD.</p> <p>(i) What does CSMA/CD stand for?</p> <p>(ii) Describe fully how using CSMA/CD affects network performance.</p> <p>(i) Carrier sense multiple access (<b>1 mark</b>) with collision detection (<b>1 mark</b>)</p> <p>(ii) A transmission may constantly collide (<b>1 mark</b>) with another when launched onto the network. Message will be resent after a random interval until it goes without collision(<b>1 mark</b>). User may see this as slow transmission. (<b>1 mark</b>)</p> <p>{Content Statement: Data transmission - Description of CSMA/CD and its implications for network performance}</p> | <p>2x 1marks</p> <p>3x 1marks</p>   | <p><b>5 marks</b></p> |
| <p>(b) (i) Describe fully how packet switching operates in a wide area network.</p> <p>(ii) Explain why packet switching may be used in preference to circuit switching.</p> <p>(i) Data split into packets (<b>1 mark</b>) ...</p> <p>Packets are individually routed (<b>1 mark</b>) ...</p> <p>Packets are re-assembled in correct sequence once all received (<b>1 mark</b>)</p> <p>(ii) improves communications (<b>1 mark</b>) when network is busy/running to capacity (<b>1 mark</b>)</p> <p>{Content Statement: Data transmission - Description of network switching (circuit and packet switching) and its implications for network performance }</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>3x 1 marks</p> <p>2x 1 marks</p> | <p><b>5 marks</b></p> |

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|  | <p>(c) Network performance is poor if there are errors in received data. Parity checking is a simple method of detecting errors.</p> <p>(i) Explain how <b>odd</b> parity checks work. Use an example to illustrate your answer.</p> <p>(ii) Describe one problem that might arise when using odd parity checking. Use an example to illustrate your answer.</p> <p>(i) a single bit is added to the binary string to make the string have an odd number of '1s' (<b>1 mark</b>). On receipt of data, the parity bit is checked, if check and actual agree transmission is assumed correct, if not error is reported (<b>1 mark</b>)</p> <p>Simple correct example eg odd parity for 1110110 would be 0 (<b>1 mark</b> for correct example)</p> <p>(ii) Double errors cancel each other out so error would not be spotted (<b>1 mark</b>)<br/> Eg if 1110011 with odd parity bit 0 is received as 1101011 parity check will not fail since the reversal of the 3<sup>rd</sup> and 4<sup>th</sup> bits leaves parity bit unchanged (<b>1 mark</b>)</p> <p>{Content Statement: Data transmission - Description of error checking in data transmission (parity and CRC)}</p> | <p>3x1 marks</p> <p>2x1marks</p> | <p><b>5 marks</b></p> |
|  | <p>(d) A cyclic redundancy check (CRC) is another method for checking for transmission errors.</p> <p>(i) Explain how a cyclic redundancy check works.</p> <p>(ii) Explain the effect of cyclic redundancy checking on the <i>speed</i> and <i>accuracy</i> of a network. Justify your answer.</p> <p>(i) calculation performed on packet or block of data (<b>1 mark</b>)<br/> data and result of calculation transmitted (<b>1 mark</b>)<br/> receiving computer redoes calculation and accepts data or requests re-transmission (<b>1 mark</b>)</p> <p>(ii) speed decreases because of calculations needed at each end of transmission (<b>1 mark</b>)<br/> accuracy of data increases because errors are discovered (<b>1 mark</b>)<br/> Marks are given for justification, not the effect on the network.</p> <p>{Content Statement: Data transmission - Description of error checking in data transmission (parity and CRC)}</p>                                                                                                                                                                                                                                    | <p>3x1marks</p> <p>2x1marks</p>  | <p><b>5 marks</b></p> |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                  |                       |
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| <p><b>25.</b></p> | <p>An increasing number of companies are now subject to the “Denial of Service attack”.</p> <p>(a) Explain what happens when a company is the subject of a Denial of Service attack.</p> <p>DoS attacks disable a computer by bombarding it with a high volume of information requests (<b>1 mark</b>) in a short time (<b>1 mark</b>)*, causing it to crash or become so overwhelmed that it grinds to a halt(<b>1 mark</b>).</p> <p>*Note : “high frequency” = 2 marks since covers volume and time, ‘swamped’ = 1 mark since doesn’t clearly indicate time and volume</p> <p>{Content Statement: Network Security - Description of denial of service hack }</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <p>3x1 marks</p> | <p><b>3 marks</b></p> |
| <p><b>26.</b></p> | <p>(b) Describe <b>three</b> features of a firewall that might prevent a Denial of Service attack.</p> <p>Will prevent unauthorized users accessing the LAN<br/>Filters data as it travels from Internet to LAN (packet filtering)<br/>IP masquerading hides individual computers to the Internet so will reduce chance of a hit<br/>Close/monitor ports<br/>(<b>1 mark</b> each for any <b>three</b> valid points )</p> <p>{Content Statement: Network Security - Description of how a firewall can protect a LAN with an internet connection from outside attacks }</p> <p>The Open System Interconnection (OSI) model breaks the operation of a computer network into seven layers.</p> <p>(a) Which layer provides basic error detection and correction to ensure that data sent is the same as data received?</p> <p>Data Link Layer.(<b>1 mark</b>)</p> <p>{Content Statement: Network protocols - Name and description of the 7 layers of the OSI model}</p> <p>(b) The Presentation Layer can apply compression techniques to data before it is sent over the network. Which layer decompresses the data?</p> <p>Transport Layer (<b>1 mark</b>)</p> <p>{Content Statement: Network protocols -Name and description of the 7 layers of the OSI model}</p> | <p>3x1 marks</p> | <p><b>3 marks</b></p> |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <p>1mark</p>     | <p><b>1 mark</b></p>  |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <p>1mark</p>     | <p><b>1 mark</b></p>  |

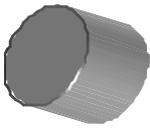
|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                    |                |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------|
|  | <p>(c) Describe the structure of a Class A IP address.</p> <p>The first octet is used to identify the network (1 mark)<br/> The last three octets are used to identify the individual machine (1 mark)<br/> {Content Statement: Network protocols - Description of an IP address (structure – 4 octets, classes – ABCD, limitations)}</p>                                                                                                                                                                                                                                                                                                                                                                 | 2x1marks           | <b>2 marks</b> |
|  | <p>(d) A school has a local area network with one hundred computers connected to it.</p> <p>(i) Why is Class A IP addressing <b>not</b> suitable for this network?<br/> (ii) Which Class of IP address would you suggest that the school uses? Justify your answer.</p> <p>(i) Class A is used for large networks and offers <math>2^{24}</math>-2 useable IP addresses which is too big for the school network. (1 mark)<br/> (ii) Class C (1 mark) uses 8 bits for local addressing, this gives 254 useable IP addresses which is sufficient for the school (1 mark)<br/> {Content Statement: Network protocols - Description of an IP address (structure – 4 octets, classes – ABCD, limitations)}</p> | 1mark<br>2x 1marks | <b>3 marks</b> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                    |                       |
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|  | <p>(e) E-commerce uses OSI network protocols. A small Highland company has recently won an award for its Internet-based mail order business. Their web site offers a multimedia guide to their products and they can receive orders via the web site. Creating the web site was a considerable financial investment for the company.</p> <p>(i) Give <b>two</b> benefits to the company of having the web site</p> <p>(ii) Some potential customers of the company might be cautious of buying the goods across the Internet. Explain why this might be so.</p> <p>(iii) Suggest <b>two</b> actions that the company could have taken to reassure their customers.</p> <p>(i) World wide customer base rather than local/larger customer base<br/> Catalogue up-to-date<br/> Catalogue easy to change<br/> Little/no paperwork/no salesman involved in collecting orders<br/> <b>(1 mark each for two valid reasons)</b></p> <p>(ii) Some companies, particularly small ones, do not comply with the laws relating to ecommerce<br/> Security of data transfer eg credit card numbers<br/> Problems generally associated with mail order eg returns policy, delivery time, unable to see goods<br/> Possibility of bogus company<br/> <b>(1 mark each for two valid points)</b></p> <p>(iii) Comply with Distance Selling Regulations<br/> Include a privacy statement<br/> Register with Information Commission<br/> Operate a secure site<br/> Payments linked to secure payment process eg "PayPal"<br/> <b>(1 mark each for two valid points)</b></p> <p>{Content Statement: Network Applications - Description of the advantages of e-commerce; description of the disadvantages of e-commerce and how they are overcome}</p> | <p>2x 1marks</p> <p>2x 1marks</p> <p>2x 1marks</p> | <p><b>6 marks</b></p> |
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**Section III – Multimedia Technology**

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| <p><b>27.</b></p> | <p>When creating web pages many different elements of multimedia can be used. One example is 2D graphics.</p> <p>(a) Name <b>one</b> item of hardware that can be used to capture a 2D graphic and <b>explain clearly</b> how it converts the graphic into digital data.</p> <p>Digital camera (or digital video camera with snap shot facility) <b>(1 mark)</b> – The camera has a bank of Charge Coupled Devices (CCD) which it uses to capture an image digitally and store it onto a miniature disk or RAM in the camera itself. The original image is therefore captured as a stream of pixel data and then the camera or memory card can be connected directly to the computer for input <b>(2 marks)</b></p> <p>Scanner <b>(1 mark)</b> – a hard copy of the graphic is scanned. Light is reflected onto light sensitive diodes that translate the light into a voltage. An A to D converter translates each voltage into a digital pixel and this information is transferred to a software application which the data can be read from <b>(2 marks)</b></p> <p>1 mark for name and 2 marks for full description</p> <p>{Content Statement: Graphic data – Description of the hardware used to capture still graphic data including .....}</p> | <p>3 marks</p>               | <p><b>3 marks</b></p> |
|                   | <p>(b) Some graphics are stored as JPEGs. However it has been decided that these graphics must be used for animation purposes and so they are converted to GIFs.</p> <p>(i) Explain why <i>dithering</i> is used in this situation.</p> <p>(ii) Describe how dithering works in this case.</p> <p>(i) JPEG uses 24 bit colour (16 million) and GIF only uses 8 bit (256) <b>(1 mark)</b></p> <p>{Content Statement: Graphic data – Explanation of the following image related terms: •dithering....}</p> <p>(ii) Colours which are not represented in the palette are displayed using a mix of pixels which are contained within the palette <b>(1 mark)</b>. This means that the missing colours can be represented.</p> <p><b>(1 mark)</b></p> <p>{Content Statement: Graphic data – Explanation of the following image related terms: •dithering.... }</p>                                                                                                                                                                                                                                                                                                                                                                                         | <p>1 mark</p> <p>2 marks</p> | <p><b>3 marks</b></p> |

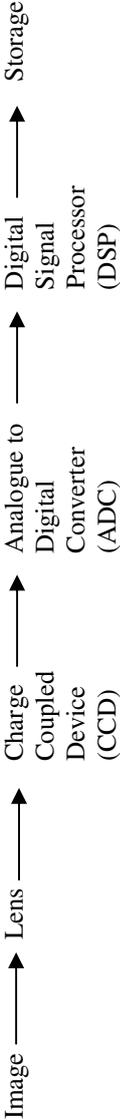
|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                    |                       |
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|  | <p>(c) The GIF file could be stored as <i>interlaced</i> or <i>non-interlaced</i>.</p> <p>(i) Explain how each of these two types of GIFs are displayed.</p> <p>(ii) Explain <b>one</b> advantage of using interlaced compared with non-interlaced graphics for web pages.</p> <p>(i) Non-interlaced – each line of the image is drawn one after the other (<b>1 mark</b>)<br/> Interlaced – every alternate line or bit (fuzzy to sharp) (<b>1 mark</b>) is drawn and then the rest after<br/> <b>(1 mark)</b><br/> <b>(2 marks for full answer to interlaced)</b></p> <p>(ii) With interlaced the user can see the graphic build up and decide whether they want to view it before the full image is complete (<b>1 mark</b>)<br/> {Content Statement: Graphic data – Description of the storage of graphic data in compressed and uncompressed file formats, including simple description of the techniques used within each file for compression and data storage including:....;•GIF (non)-interlaced.... }</p> | <p>3 marks</p> <p>1 mark</p> <p><b>4 marks</b></p> |                       |
|  | <p>(d) A GIF image of 640x480 resolution needs to be stored. Calculate its file size.</p> <p>8 (<b>1 mark</b>) x640x480 bits = 1x640x480 bytes (<b>1 mark</b>)<br/> =307 200 bytes/1024 = 300 Kb (<b>1 mark</b>)<br/> {Content Statement: Graphic data – Calculations using the relationship: file size=resolution x colour bit depth }</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <p>3 marks</p>                                     | <p><b>3 marks</b></p> |

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| <p><b>28.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>Picture A shows an image of a cylinder. This image has been changed to look like picture B.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Picture A</p> </div> <div style="text-align: center;">  <p>Picture B</p> </div> </div> |                  |                       |
| <p>(a) Describe <b>two</b> features of 3D software which have been used to change picture A into picture B<br/> Texture – mapping of flat image onto the cylinder (<b>1 mark</b>)<br/> Rotate – cylinder has been rotated so that it has a different position (<b>1 mark</b>)</p> <p>{Content Statement: Vector data – Text, Drawing, Midi and 3 D image – Description of common attributes of vector objects for the four media types:...•3D image (...;texture). }</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>2x1 marks</p> | <p><b>2 marks</b></p> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                              |                       |
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|  | <p>(b) Virtual Reality Mark Up Language (VRML) could be used to create Picture B (above). An example of the code is given below:</p> <pre>Cylinder{ radius1.0 height2.0 }</pre> <p>(i) Write down the VRML for a sphere.<br/> (ii) Give <b>two</b> benefits of using VRML when creating 3D images.<br/> (iii) Explain the need for the VRML header when using a browser.</p> <p>(i) Sphere{<br/> Radius 1.0 (any number)<br/> )<br/> or description eg name cylinder has to be changed to sphere and the correct dimensions given (<b>1 mark</b>)</p> <p>(ii) Sharing 3D images over the Internet, platform independent, browser plug-ins can be used to view images, files can be created using a simple text editor (<b>1 mark</b> each for <b>two</b> valid points)</p> <p>(iii) When a browser reads a file the first line will help the browser determine what to use to display the file. (<b>1 mark</b>)</p> <p>{Content Statement: Vector data – Text, Drawing, Midi and 3 D image – Description of basic features and structures of vector file types including methods used to implement common attributes listed above for these files types:....•VRML//WRL}</p> | <p>1 mark</p> <p>2x1 marks</p> <p>1 mark</p> | <p><b>4 marks</b></p> |
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|  | <p>The use of multimedia technologies and its applications has increased dramatically over the past decade.</p> <p>(c) Explain how the following have increased multimedia capabilities.</p> <p>(i) CODEC hardware /software<br/>(ii) Data communications</p> <p>(i) Files can be compressed and saved as smaller file sizes therefore less intensive on memory and storage requirements (1 mark), decompressing for playback so files can be viewed. edited etc (1 mark)</p> <p>(ii) Increased bandwidth allowing the transmission of large data files (1 mark), increasing number of client stations allowing accessibility to Internet etc (1 mark)</p> <p>{Content Statement: Implications of use of multimedia technology – Descriptions of trends and changes in contemporary technologies that facilitate the convergence of technologies in relation of multimedia capabilities including:....•communications (increasing bandwidth, accessibility) • codecs (improved algorithms, features, hardware implementations). }</p> | <p>2x1 marks</p> <p>2x1 marks</p> | <p><b>4 marks</b></p> |
|  | <p>(d) Describe the term “streaming” when used within multimedia.</p> <p>Multimedia content can be split up into separate parts for sound, video etc (1 mark)</p> <p>{Content Statement: Development Process For Multimedia Applications – Descriptions of the methodologies and requirements for the display of a multimedia application, including streaming of multimedia data and embedded files. }</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p>1 mark</p>                     | <p><b>1 mark</b></p>  |

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| <p><b>29.</b></p> | <p>When recording video for multimedia presentations, the method used for storing the video frames is important to reduce the file size and aid compatibility.</p> <p>(a) Describe how video is stored using:<br/> (i) MPEG<br/> (ii) AVI.</p> <p>(i) MPEG – lossy compression used (<b>1 mark</b>), only one full frame is stored in sets of 8 to 24 frames (<b>1 mark</b>)<br/> (ii) AVI – no compression (<b>1 mark</b>) so files are limited to 320x240 resolution and 30 fps, not adequate for full screen display, high backing storage and RAM requirements (<b>1 mark</b>)</p> <p>{Content Statement: Video Data – Description of the storage of video data in compressed and uncompressed files formats, including simple description of the techniques used within each file for compression and data storage and the inclusion of sound within the file, including:•uncompressed AVI • MPEG (description of factors involved)}</p> | <p>2x1 marks<br/> 2x1 marks</p> | <p><b>4 marks</b></p> |
|                   | <p>(b) Apart from compression, describe <b>two</b> methods which could be used to reduce the size of a video data file.</p> <p>Lower frame rate, reduce to 256 colours, use only a portion of the screen to display video (eg half screen size only needs half storage space. (<b>1 mark</b> each for <b>two</b> valid points)</p> <p>{Content Statement: Video Data – Description of the storage of video data in compressed and uncompressed files formats, including simple description of the techniques used within each file for compression and data storage and the inclusion of sound within the file, including:•uncompressed AVI • MPEG (description of factors involved)}</p>                                                                                                                                                                                                                                                     | <p>2x1 marks</p>                | <p><b>2 marks</b></p> |
|                   | <p>(c) Calculate the file size of a 4 second video clip captured at a resolution of 800x600 at a frame rate of 25 frames per second with a 24 bit colour depth. Show all working and express your answer in appropriate units.</p> <p>File size = resolution x frame rate x recording time x colour bit depth (<b>1 mark</b>)<br/> File size = 800x600x25x4x3 bytes (<b>1 mark</b>)<br/> = 14400000 bytes<br/> = 137.329 Mb (<b>1 mark</b>)</p> <p>{Content Statement: Video data – Calculations using the relationship: file size=resolution x colour bit depth x video time x frame rate}</p>                                                                                                                                                                                                                                                                                                                                               | <p>3x1 marks</p>                | <p><b>3 marks</b></p> |

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|  | <p>(d) The way video is recorded works like this:</p>  <pre> graph LR     Image --&gt; Lens     Lens --&gt; CCD[Charge Coupled Device (CCD)]     CCD --&gt; ADC[Analogue to Digital Converter (ADC)]     ADC --&gt; DSP[Digital Signal Processor (DSP)]     DSP --&gt; Storage   </pre> <p>(i) Explain the role of the CCD. (1 mark)<br/> (ii) Explain the role of the DSP. (1 mark)<br/> (iii) Explain the benefit of using a digital camera which has 3 CCDs instead of a single CCD. (1 mark)</p> <p>(i) CCD – collects and processes light (1 mark) coming in from the lens and converts it into an electrical signal (1 mark)</p> <p>(ii) DSP – adjusts signal for the optimum contrast (1 mark) and compresses data (1 mark)</p> <p>(iii) Light is split into three primary colours (RGB) and each is fed into a different chip (1 mark)<br/> This results in excellent colour and image quality (1 mark)</p> <p>{Content Statement: Video Data – Technical description of hardware required to capture digital and analogue video:<br/> •Digital video camera (array CCD)... • video capture card (..) and role of DSP to allow hardware encoding of data stream including into MPEG format.}</p> | <p>2x1 marks</p> <p>2x1 marks</p> <p>2x1 marks</p> | <p><b>6 marks</b></p> |
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|            | <p>(e) Describe <b>two</b> types of <b>transition</b> that can be used to link video clips.</p> <p>Wipe – screen divided into two sections by a line, 100% visible on one side. As line moves screen two appears<br/> Dissolve – fade in and fade out at same time<br/> Fade in – screen gradually lightens<br/> Fade out – screen gradually darkens<br/> <b>(1 mark each for two valid descriptions)</b></p> <p>{Content Statement: Video Data – Descriptions of the main features and applications of video editing software with multiple clips including:....•Transition.... }</p> | 2x1 marks | <b>2 marks</b> |
| <b>30.</b> | <p>A sound recording studio uses various techniques to record and store sound.</p> <p>(a) State <b>two</b> different functions a sound card could perform when capturing sound.</p> <p>Allows connection of input device (microphone), analogue to digital conversion, provides compression<br/> <b>(1 mark each for two valid descriptions)</b><br/> {Content Statement: Sound data – Description of sound card in its use to capture sound data including role of ADC }</p>                                                                                                          | 2x1 marks | <b>2 marks</b> |
|            | <p>(b) Describe how RAW data files are stored.</p> <p>No header used, PCM used to information convert from A to D signals, file's contents just a string of numeric data.<br/> <b>(1 mark each for two valid points)</b><br/> {Content Statement: Sound data – Description of the storage of sound data in compressed and uncompressed file formats, including simple description of the techniques used within each file for compression and data storage, including:<br/> •RAW(PCM)...•WAV (ADPCM) •MP3 (description of factors involved.) }</p>                                     | 2x1 marks | <b>2 marks</b> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |           |                |
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|  | <p>(c) Name and describe <b>one</b> file format other than RAW for storing sound.</p> <p>MP3 (<b>1 mark</b>) – this format uses compression which does not save sounds that are drowned out by other noises, cannot be heard by the human ear etc and hence files sizes are smaller (<b>1 mark</b>)</p> <p>WAV (<b>1 mark</b>) - contain numeric samples of the actual sound that was recorded. The recorded sound can be sampled at various rates and the samples can be recorded as values of 8-bits or 16-bits in size. (<b>1 mark</b>)</p> <p>RIFF (<b>1 mark</b>) – these files contain headers with textual information about the sound stored within the file (<b>1 mark</b>)</p> <p>(<b>1 mark</b> for name, <b>1 mark</b> for description)</p> <p>{Content Statement: Sound data – Description of the storage of sound data in compressed and uncompressed file formats, including simple description of the techniques used within each file for compression and data storage, including:<br/> •RAW(PCM)...•WAV (ADPCM) •MP3 (description of factors involved)}</p> | 2x1 marks | <b>2 marks</b> |
|  | <p>(d) Calculate the amount of storage required to store a 2 minute stereo sample at 16 bit resolution sampled at 44.1 kHz.</p> <p>File size = Frequency x time x bit resolution x no. of channels (<b>1mark</b>)</p> <p><math>F_s = 44100 \times 120 \times 16 \times 2 = 169344000</math> bits (<b>1 mark</b>)</p> <p><math>F_s = 20.187</math> Mb (<b>1 mark</b>)</p> <p>{Content Statement: Sound data – Calculations using the relationship: File size = sound frequency x sound time x sampling depth x channels}</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3x1 marks | <b>3 marks</b> |

[END OF SPECIMEN MARKING INSTRUCTIONS]

# Specimen Coursework Task

## Computing Higher

### Part 1

ScotDonuts plc currently has six delivery drivers. Each driver needs to access the office computer to get details of their delivery schedules and print out delivery notes, invoices etc. Each driver must have their own unique user ID for the system.

A program is required to create unique user IDs for the drivers.

#### How the program should work:

The program should take the first letter of the driver's forename, and combine it with the first four letters of the driver's surname – so John MacDonald gets user ID **JMacD**.

If the program duplicates a user ID, it should add a number after the duplicated user ID – so Jessica MacDougall gets user ID **JMacD2**. If there were more duplicates the program should produce user IDs **JMacD3**, **JMacD4** and so on.

The program should store the driver names and user IDs in arrays, and display a list of driver names and corresponding user IDs on the screen.

Following analysis of the specification, the following top-level algorithm and test data has been devised for the program:

#### Pseudocode

- 1 Set up array to store the usernames
- 2 Set up array to store the user IDs
- 3 Loop for each driver
- 4 Input name and create unique user ID
- 5 Add name and user ID to arrays
- 6 End loop
- 7 Display names and user IDs

#### Test data

| Test data     | Expected Results |
|---------------|------------------|
| Peter Harris  | PHarr            |
| Paul Harrison | PHarr2           |
| Patsy Harris  | PHarr3           |
| Peter Harris  | PHarr4           |
| Anne Lee      | ALee             |
| Andy Leesk    | ALees            |

| Test data          | Expected Results |
|--------------------|------------------|
| Margaret Campbell  | MCamp            |
| John MacDonald     | JMacD            |
| Thomas McGillvray  | TMcGi            |
| Jessica MacDougall | JMacD2           |
| Tina McGinness     | TMcGi2           |
| Tony McGillies     | TMcGi3           |

**What you have to do:**

| <b>Tasks</b> |                                                                                                                                                         | <b>Evidence required</b>                                              |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| 1.           | Refine steps 4, 5 and 7 of the algorithm. Each of these is to be a separate sub-program. Indicate clearly any parameter passing which will be required. | Pseudocode for steps 4, 5 and 7 clearly indicating parameter passing. |
| 2.           | Using a software development environment of your choice, implement the algorithm.                                                                       | Listing of implemented program.                                       |
| 3.           | Test the program using the two sets of test data provided.                                                                                              | Hard copy of initial test results.                                    |
| 4.           | If necessary, identify and correct any errors in your program.                                                                                          | Listing of corrected program, with changes highlighted.               |
| 5.           | Repeat the testing process, using the same two sets of test data, to show that the program is now fit for purpose                                       | Hard copy of test results.                                            |

## Part 2

Gita, the office manager, wants to install a program called *Route Expert* to help the drivers plan their delivery routes.

The specification of the **current** office computer is:

|                  |                                    |
|------------------|------------------------------------|
| Processor        | 800MHz                             |
| RAM              | 256 Mbytes                         |
| Storage Devices  | Hard Disk: 10 Gbytes, Floppy Drive |
| Operating System | Windows 98                         |

Here are the system requirements of *Route Expert* (which is supplied on a CD-ROM):

|                  |                            |
|------------------|----------------------------|
| Processor        | Minimum 800 MHz Pentium IV |
| RAM              | 320 Mbytes                 |
| Hard Disk        | 480 Mbytes                 |
| Operating System | Windows XP                 |

There are two options available to Gita:

- ◆ she can upgrade the present system, or
- ◆ replace it with a new system.

### What you have to do:

| Tasks |                                                                                                                               | Evidence required                               |
|-------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| 1.    | Identify and cost all the upgrades to the <b>existing</b> system which are required to enable <i>Route Expert</i> to be used. | Report on upgrading.                            |
| 2.    | Specify and cost a replacement system which would allow <i>Route Expert</i> to be used.                                       | Report on replacement.                          |
| 3.    | Identify <b>three</b> advantages of the upgrade option, and three advantages of the replacement option.                       | List of three criteria<br>Report on advantages. |
| 4.    | Make a recommendation using these advantages to justify your choice.                                                          | Recommendation and justification.               |

## Specimen Higher Computing Coursework Task marking scheme

| Name                                    |                                                  | Date                  |                    |
|-----------------------------------------|--------------------------------------------------|-----------------------|--------------------|
| <b>Part 1</b>                           |                                                  | <b>Possible marks</b> | <b>Mark gained</b> |
| <b>Design (8)</b>                       | Pseudocode for step 4                            | 2,1,0                 |                    |
|                                         | Pseudocode for step 5                            | 2,1,0                 |                    |
|                                         | Pseudocode for step 7                            | 2,1,0                 |                    |
|                                         | Indication of data flow                          | 2,1,0                 |                    |
| <b>Implementation (10)</b>              | Main program                                     | 2,1,0                 |                    |
|                                         | Sub-program for step 4                           | 2,1,0                 |                    |
|                                         | Sub-program for step 5                           | 2,1,0                 |                    |
|                                         | Sub-program for step 7                           | 2,1,0                 |                    |
|                                         | Parameter passing                                | 2,1,0                 |                    |
| <b>Correcting errors (8)</b>            | Identifying syntax errors                        | 2,1,0                 |                    |
|                                         | Correcting syntax errors                         | 2,1,0                 |                    |
|                                         | Identifying logic errors                         | 2,1,0                 |                    |
|                                         | Correcting logic errors                          | 2,1,0                 |                    |
| <b>Testing (4)</b>                      | Initial testing                                  | 2,1,0                 |                    |
|                                         | Final testing                                    | 2,1,0                 |                    |
| <b>Part 2</b>                           |                                                  | <b>Possible marks</b> | <b>Mark gained</b> |
| <b>Identify upgrades (8)</b>            | Upgrade 1:                                       | 2,1,0                 |                    |
|                                         | Upgrade 2:                                       | 2,1,0                 |                    |
|                                         | Upgrade 3:                                       | 2,1,0                 |                    |
|                                         | Identify costs of upgrades                       | 2,1,0                 |                    |
| <b>Identify replacement system (10)</b> | Processor                                        | 2,1,0                 |                    |
|                                         | RAM                                              | 2,1,0                 |                    |
|                                         | Backing storage                                  | 2,1,0                 |                    |
|                                         | Operating System                                 | 2,1,0                 |                    |
|                                         | Identify cost of replacement                     | 2,1,0                 |                    |
| <b>Recommend-<br/>-ation (12)</b>       | Three advantages of upgrade                      | 3,2,1,0               |                    |
|                                         | Three advantages of replacement                  | 3,2,1,0               |                    |
|                                         | Make a recommendation.                           | 1,0                   |                    |
|                                         | Justify recommendation based on given advantages | 3,2,1,0               |                    |
|                                         | Completeness and clarity of report.              | 2,1,0                 |                    |
| <b>Overall total/Total mark gained</b>  |                                                  | <b>60</b>             |                    |

*Notes: where marks are allocated as 2,1,0:*

*2 = achieved successfully without assistance*

*1= achieved partially without assistance, or completed with some assistance or hints*

*0= not achieved, or completed only with significant assistance*