

[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>
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- (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]

SECTION III

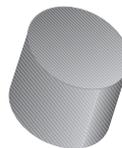
Part C—Multimedia Technology

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

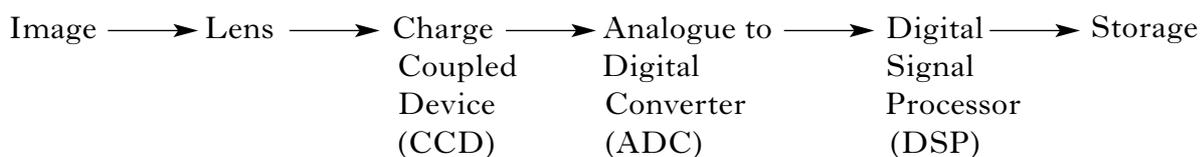
(b) Apart from compression, describe **two** methods which could be used to reduce the size of a video data file.

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]