codebash

OCR GCSE (9–1) Computer Science J277

J277/01 Computer systems

Mock examination | Set A

Time allowed: 1 hour 30 minutes
You must have: a black pen, a pencil and a ruler
You must not use: a calculator

Candidate name _____

Class _____ **Candidate number** _____

Instructions

- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space, use the additional answer page at the end of this paper and write the question number(s) clearly.
- Answer **all** the questions.

Information

- The total mark for this paper is **80**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in the question marked with an asterisk (*).
- This document has **15** pages.

For teacher use

Question	Max	Mark
1	11	
2	9	
3	12	
4	11	
5	13	
6	9	
7	7	
8	8	
Total	**80**	

Student self-assessment (complete after the mock)
What went well?
Where can I improve, and how?
Percentage: **Grade:**

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1 A company makes smart video doorbells. When someone presses the button, the doorbell records a video and sends an alert to the owner's phone.

(a) The doorbell contains an embedded system.

Explain why the doorbell's computer system is an example of an embedded system.

[2]

(b) The doorbell's CPU uses the von Neumann architecture.

Complete the table by giving the name of the register described in each row.

Description	Register
Holds the address of the next instruction to be fetched	
Holds the data or instruction that has been fetched from memory, or is waiting to be written to memory	
Stores the results of calculations carried out by the ALU	

[3]

(c) Describe what happens during the **fetch** stage of the fetch-execute cycle.

[3]

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(d) The company is choosing a processor for a new model of doorbell. The table shows two processors.

	Processor A	Processor B
Number of cores	2	4
Clock speed	1.8 GHz	1.2 GHz
Cache size	512 KB	256 KB

The doorbell's video software processes one video frame at a time. Each frame must be finished before the next frame can start.

Explain which processor is likely to give better performance when running this software.

Processor: _____

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

2 A freelance video editor uses a laptop to edit films for clients.

(a) The laptop's start-up (boot) instructions are stored in ROM.

Explain why these instructions are stored in ROM rather than in RAM.

_____

_____

_____

_____

_____

_____ **[2]**

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(b) The editor opens several large video files at the same time. The laptop starts to run slowly because it is using virtual memory.

(i) Explain how virtual memory is being used in this situation and why it makes the laptop run slowly.

[3]

(ii) State **one** hardware upgrade that would reduce the laptop's use of virtual memory.

[1]

(c) The editor posts each finished film to the client on a storage device. Each film is about 8 GB.

Recommend a suitable type of secondary storage for this task. Justify your recommendation by referring to **three** characteristics of the storage.

Type of storage: _____

[3]

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3 This question is about units and number systems.

(a) Tick (✓) **one** box to identify the **largest** amount of storage.

2000 megabytes	☐
1.5 gigabytes	☐
0.003 terabytes	☐
1 900 000 kilobytes	☐

[1]

(b) Convert the denary number 203 into 8-bit binary.

_____

[1]

(c) Convert the hexadecimal number 9C into denary.

_____

[1]

(d) Convert the binary number 01111010 into hexadecimal.

_____

[1]

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(e) Explain why programmers often use hexadecimal instead of binary.

_____

_____

_____

_____ **[2]**

(f) Add the two 8-bit binary numbers. Show your working.

```
  1  0  0  1  1  0  1  0
+ 0  1  0  0  1  1  1  1
-----------------------
```

[2]

(g) The binary number 11010110 is shifted **two** places to the **right**.

Give the 8-bit result and state the effect of this shift on the denary value.

Result: _____

Effect: _____

[2]

(h) State the largest denary number that can be stored using 8 bits, and describe what happens when the result of an addition is larger than this number.

Largest number: _____

_____

_____ **[2]**

4 A museum has an app that visitors use on their phones. The app shows text labels and photographs of exhibits, and plays audio commentaries.

(a) The text labels are stored using ASCII. The ASCII code for the character K is 75 in denary.

Give the 8-bit binary ASCII code for the character N.

_____

[1]

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(b) The museum increases the colour depth of its photographs from 8 bits to 24 bits.

Describe **two** effects of this change.

1

2

[2]

(c) Each photograph file also contains metadata.

Give **two** examples of metadata that would be stored with a photograph.

1

2

[2]

(d) One audio commentary is 30 seconds long. It is recorded in mono with a sample rate of 40 000 Hz and a sample resolution (bit depth) of 16 bits.

Calculate the file size of this commentary in megabytes (MB). Show your working.

File size: _____ MB

[3]

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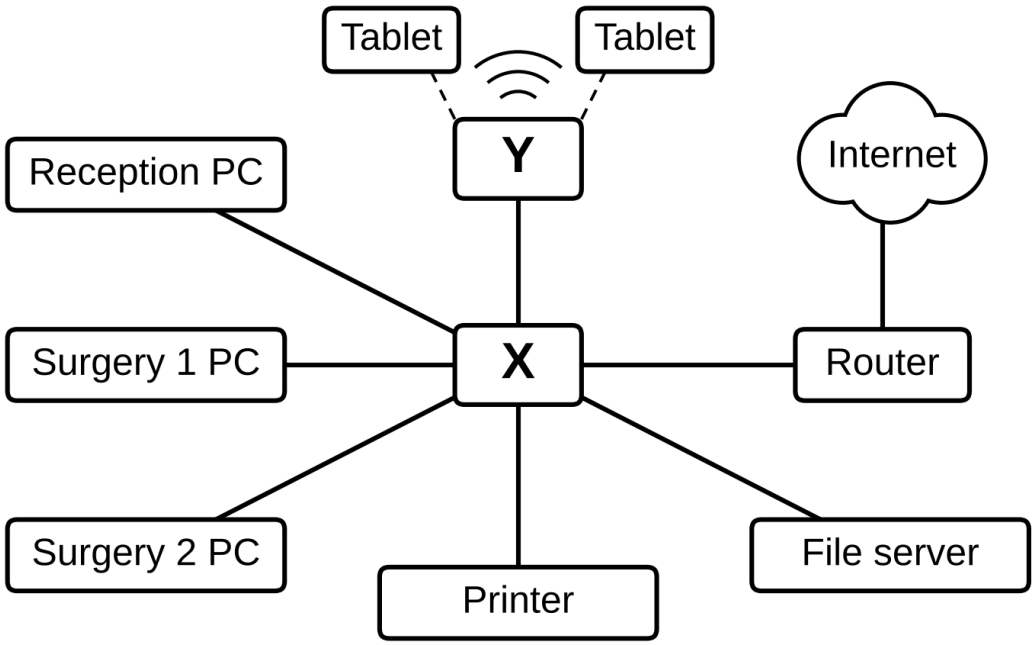
(e) To make the app download quickly, the audio commentaries are compressed using **lossy** compression. The text labels are compressed using **lossless** compression.

Explain why lossy compression is suitable for the audio commentaries but **not** for the text labels.

[3]

5 A dental practice has a local area network (LAN). The diagram shows part of the network.



(a) Identify the devices labelled **X** and **Y** in the diagram.

X: _____

Y: _____

[2]

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(b) The network uses a star topology.

Give **one** advantage and **one** disadvantage of a star topology for the dental practice, compared with a mesh topology.

Advantage: _____

_____

_____

Disadvantage: _____

_____

_____ **[2]**

(c) Staff say the network is slow when they open X-ray images stored on the server.

Explain **two** factors that could affect the performance of the network.

1

_____

_____

_____

2

_____

_____

_____ **[2]**

(d) The practice is thinking about storing its patient records in the cloud instead of on its own server.

Give **one** advantage and **one** disadvantage of this change.

Advantage: _____

_____

Disadvantage: _____

_____

_____ **[2]**

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(e) A receptionist types the web address www.dentalsupplies.co.uk into a browser to order equipment.

Describe how a Domain Name Server (DNS) is used to find the website.

[3]

(f) The practice sends appointment reminders by email.

Identify a protocol used to **send** email and a protocol used to **retrieve** email from a mail server.

Send: _____

Retrieve: _____

[2]

6 An online clothing retailer stores customer accounts and payment details on its servers.

(a) Complete the table by naming the threat described in each row.

Description	Threat
Software that encrypts the retailer's files and demands a payment before they are unlocked	
Flooding the retailer's web server with so many requests that customers cannot use the website	
Capturing packets as they travel across a network in order to read the data they contain	

[3]

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(b) An employee receives a phone call from someone who claims to work for the retailer's IT support team. The caller asks for the employee's password so they can "fix a problem".

(i) Identify the type of threat being used.

[1]

(ii) Describe **two** ways the retailer could reduce the risk of this type of attack succeeding.

1

2

[2]

(c) The retailer pays a security company to carry out penetration testing.

Explain the purpose of penetration testing.

[2]

(d) State the purpose of a firewall.

[1]

7 A secondary school's laptops use an operating system and utility software.

(a) The school connects a new 3D printer to a laptop.

Explain how the operating system manages this peripheral.

[2]

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(b) Describe **two** ways the operating system provides user management for students and staff.

1

2

[2]

(c) Teachers need to email large folders of coursework to an exam board.

(i) Name the type of utility software that would reduce the size of the folders.

[1]

(ii) The coursework contains students' personal data. Describe how encryption software would protect this data if an email is intercepted.

[2]

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8* A supermarket chain plans to replace most of its staffed checkouts with self-service checkouts.

When a customer buys alcohol, a camera at the checkout uses facial recognition software to estimate whether the customer is over 18. A member of staff is only called if the software is unsure.

Discuss the impact of this plan.

In your answer you should consider:

- ethical and cultural issues
- legal and privacy issues
- environmental issues.

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[8]

END OF QUESTION PAPER

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ADDITIONAL ANSWER SPACE

If you need extra space to answer a question, use the lined page below. Write the question number(s) clearly in the margin.

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