AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

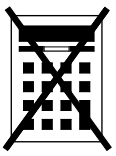
I declare this is my own work.

GCSE
COMPUTER SCIENCE

Paper 2 Written Assessment

Time allowed: 1 hour 30 minutes

Materials
- There are no additional materials required for this paper.



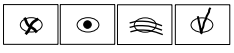
Instructions
- Use black ink or black ball-point pen. Use pencil only for drawing.
- Answer **all** questions.
- You must answer the questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- You must **not** use a calculator.

Information
- The total number of marks available for this paper is 80.

For Examiner's Use	
Question	Mark
1–3	
4–5	
6–9	
10	
11	
12–13	
14–15	
16–17	
18–19	
20	
TOTAL	

Advice

For the multiple-choice questions, completely fill in the lozenge alongside the appropriate answer.

CORRECT METHOD  WRONG METHODS 

If you want to change your answer you must cross out your original answer as shown. 

If you wish to return to an answer previously crossed out, ring the answer you now wish to select as shown. 

Do not write outside the box

Answer **all** questions in the spaces provided.

0 1 . 1 Convert the decimal number 220 into binary.

[1 mark]

0 1 . 2 Convert the hexadecimal number AD into binary.

You should show your working.

[2 marks]

Answer _____

0 1 . 3 Convert the hexadecimal number 1A into decimal.

[1 mark]

Do not write outside the box

0 1 . 4 What is the largest hexadecimal number that can be represented in binary using 8 bits?

[1 mark]

0 2 Which of the following is a reason why hexadecimal is used instead of binary?

Shade **one** lozenge.

[1 mark]

A Computers work in hexadecimal, not binary. ⬭

B Hexadecimal can be used to represent a wider range of numbers. ⬭

C Hexadecimal is a standard language and binary is not. ⬭

D Hexadecimal is more compact when displayed on screen. ⬭

0 3 **Figure 1** shows a value represented as a bit pattern.

Figure 1

1 0 1 1 0 0 0 0

A binary shift can be used to divide the value in **Figure 1** by 4.

What is the result of this shift?

Your answer **must** be in binary.

[1 mark]

7

Do not write outside the box

0 4 Add the following binary numbers and give your answer in binary.

[2 marks]

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

0 5 Eight minutes of sound has been digitally recorded. The sampling rate used was 25 000 Hertz and the sample resolution used was 4 bits.

0 5 . 1 Calculate the minimum file size for the recording. Give your answer in **megabytes**.

You should show your working.

[4 marks]

Answer _____

Do not write outside the box

0 5 . 2 Explain what effects increasing the sampling rate would have on the recording.

[2 marks]

8

Turn over for the next question

Do not write outside the box

0 6 Shade **two** lozenges to show which of the following are functions of an operating system.

[2 marks]

A Address filtering ⬭

B Application management ⬭

C Clock speed management ⬭

D Data encryption ⬭

E Processor management ⬭

0 7 . 1 Define the term **application software**.

[1 mark]

0 7 . 2 Give **two** examples of application software. You must **not** use brand names in your answer.

[2 marks]

Example 1 _____

Example 2 _____

Do not write outside the box

0 8 This description of how a magnetic hard disk drive works is partially correct but contains some errors:

'A magnetic hard disk spins very quickly. The surface of the disk has a groove on it where data is stored. There is a needle that runs along the groove and detects bumps. One of the components of the drive is a read/write head.'

0 8 . 1 Describe **three** factual errors in the description.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

0 8 . 2 State **one** correct fact in the description.

[1 mark]

_____

_____

0 9 Shade the **two** lozenges that are correct statements about RAM.

[2 marks]

A It is only used in solid state storage devices. ⬭

B It is used for main memory. ⬭

C It is used for secondary storage. ⬭

D It is volatile memory. ⬭

E It never loses data. ⬭

F It permanently stores programs and files. ⬭

11

Do not write outside the box

1 0 Three factors that affect the performance of a CPU are:

- clock speed
- number of processor cores
- cache size.

Explain how each of these factors affects CPU performance.

[6 marks]

Clock speed _____

Number of processor cores _____

Cache size _____

6

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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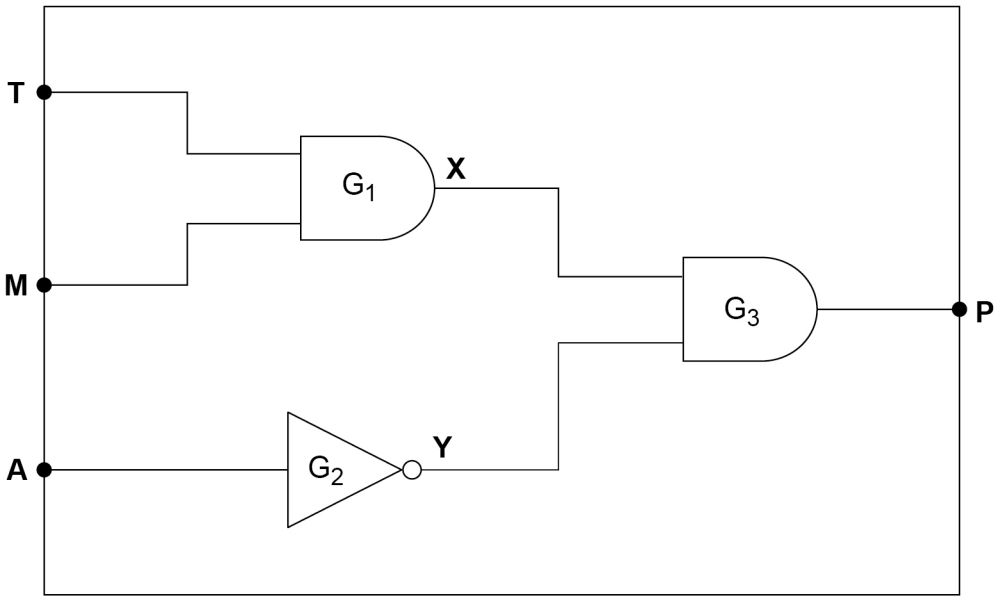
1 1 A farmer uses an automated system to indicate if soil conditions are right for planting.

The conditions are right for planting if the soil is:

- warm
- wet
- the correct acidity.

Figure 2 shows the logic circuit for this system.

Figure 2



The inputs to the system are:

Soil temperature (**T**):
0 if the soil is cold
1 if the soil is warm.

Soil moisture (**M**):
0 if the soil is dry
1 if the soil is wet.

Soil acidity (**A**):
0 if the soil is the correct acidity
1 if the soil acidity needs adjusting.

The output (**P**) is:
0 if the conditions for planting have not been met
1 if the conditions for planting have been met.

Do not write outside the box

1 1 . 1 Complete the truth table for the circuit in **Figure 2**.

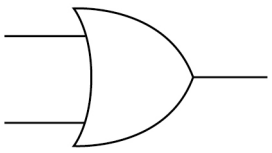
[3 marks]

T	M	A	X	Y	P
0	0	0			
0	0	1			
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1			

1 1 . 2 State the type of logic gate shown in **Figure 3**.

[1 mark]

Figure 3



Answer _____

1 1 . 3 The farmer wants to modify the system so that it will indicate that the soil conditions are right for planting if **at least one** of the three conditions has been met.

Describe changes that could be made to the logic circuit in **Figure 2** to allow this to happen.

[2 marks]

_____

_____

_____

_____

6

Turn over ►

Do not write outside the box

1 2 Describe **two** differences between an embedded system and a non-embedded system.

[2 marks]

1 _____

_____

_____

2 _____

_____

_____

1 3 . 1 Define the term **computer network**.

[2 marks]

_____

_____

_____

_____

1 3 . 2 Explain how a firewall can be used to improve the security of a computer network.

[2 marks]

_____

_____

_____

_____

Do not write outside the box

1 3 . 3 Authentication and MAC address filtering can be used to improve network security.

Explain how **one** of these security methods works.

[2 marks]

Ring your chosen security method:

Authentication **MAC address filtering**

How it works _____

_____

_____

_____

1 3 . 4 Shade the **two** lozenges that are correct statements about network protocols.

[2 marks]

A A protocol is a set of rules. ⬭

B All protocols only work with specific hardware. ⬭

C All protocols transmit data securely. ⬭

D Ethernet is a family of protocols. ⬭

E Wi-Fi is a single protocol. ⬭

10

Turn over for the next question

Do not write outside the box

1 4 Several companies produce microchips that can be implanted in humans. Thousands of people around the world have voluntarily had these microchips implanted in their hands. These tiny microchips are the size of a grain of rice. They can be a form of identification and can store a range of personal data.

Describe how human microchip implants might be used when travelling or visiting places away from home.

In your answer you should include:

- potential uses
- advantages to the person who has the implant
- legal and ethical considerations of human chip implants.

[6 marks]

Do not write outside the box

1 5 Explain **one** data privacy concern an organisation would need to consider when setting up a wireless network.

[2 marks]

_____

_____

_____

_____

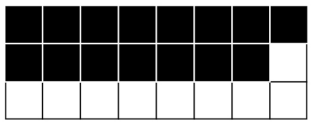
8

Turn over for the next question

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1 6 **Figure 4** shows a black and white image.

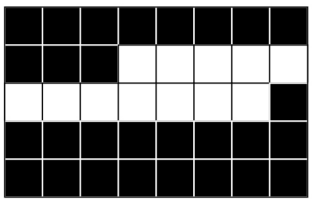
Figure 4



The image shown in **Figure 4** could be compressed using Run Length Encoding (RLE). The RLE for the image in **Figure 4** is B15 W9.

1 6 . 1 **Figure 5** shows another black and white image.

Figure 5



Give the RLE for the image shown in **Figure 5**.

[1 mark]

1 6 . 2 The RLE will be represented using binary, with one bit representing the colour (W = 1, B = 0) followed by seven bits representing the frequency.

Give the binary representation of the RLE: B15 W9

[2 marks]

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ANSWER IN THE SPACES PROVIDED

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1 7 . 1 **Table 1** is a frequency table that contains the frequency of characters in a string.

Table 1

A	6
B	2
C	3

Use the frequencies given in **Table 1** to draw a Huffman tree that represents the string.

[3 marks]

Do not write outside the box

1 7 . 2 **Table 2** shows the Huffman codes for the characters used in the string `PIEDPIPER`

Table 2

Character	Character frequency	Huffman code
P	3	10
I	2	11
E	2	01
D	1	000
R	1	001

Calculate how many bits would be saved if the phrase `PIEDPIPER` was encoded using the Huffman codes shown in **Table 2**, rather than using ASCII.

You should show your working.

[3 marks]

Number of bits saved _____

9

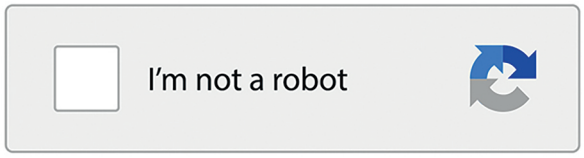
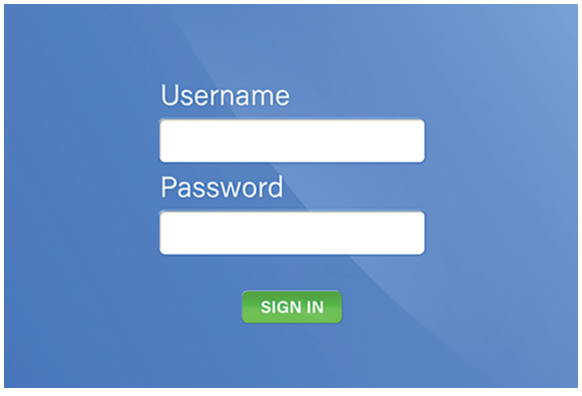
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1 8 . 1 **Table 3** shows screenshots of three different security measures.

Tick the box next to the CAPTCHA screenshot.

[1 mark]

Table 3

Security measure	Tick one box
	
	
	

Do not write outside the box

1 8 . 2 Give **three** examples of when it would be suitable to use a CAPTCHA system.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

1 9 Shade the **two** lozenges that are examples of social engineering.

[2 marks]

A Blagging ⬭

B Blogging ⬭

C Faking ⬭

D Phishing ⬭

E Porting ⬭

F Smashing ⬭

6

Turn over for the next question

Do not write outside the box

2 0 **Table 4** shows three layers of the TCP/IP model and some protocols that operate at each of these layers.

Table 4

Layer	Protocol
Application layer	HTTP HTTPS SMTP IMAP FTP
Transport layer	TCP UDP
Internet layer	IP

Describe the role of **one** protocol from **each** layer in **Table 4**. You **must** state which protocol you are describing.

[9 marks]

Application layer protocol _____

Transport layer protocol _____

Do not write outside the box

Internet layer protocol _____

_____

_____

_____

_____

_____

_____

_____

9

END OF QUESTIONS

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