Surname	Centre Number	Candidate Number
First name(s)		0

GCSE

3500U10-1

Z22-3500U10-1

FRIDAY, 27 MAY 2022 – AFTERNOON

COMPUTER SCIENCE

Unit 1: Understanding Computer Science

1 hour 45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**4**	
3.	**7**	
4.	**10**	
5.	**6**	
6.	**14**	
7.	**7**	
8.	**4**	
9.	**7**	
10.	**19**	
11.	**6**	
12.	**3**	
13.	**9**	
Total	**100**	

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INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

If you run out of space, use the continuation page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the need for good English and orderly, clear presentation in your answers.

The total number of marks is 100.

Some questions will require you to draw on your knowledge from multiple areas of your course of study.

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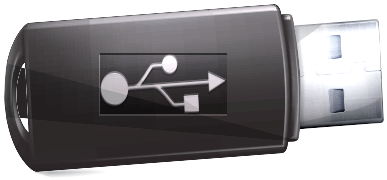
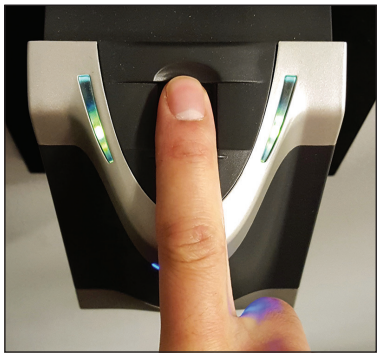
Answer **all** questions.

1. **Tick** (✓) **one box only** for each device to show if it is used for input, output or storage. [4]

Device	Input	Output	Storage
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐

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2. Complete the tables to show the relationship between the data storage units.
The first row has been completed for you. [4]

No.	Unit		No.	Unit
4	**bits**	**=**	**1**	**nybble**
2		=	1	byte
1024		=	1	kilobyte
1024	kilobytes	=	1	
1024	megabytes	=	1	

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3. (a) **Tick (✓) one box only** to match the correct description with the form of cyberattack. [3]

Description	Form of Cyberattack			
	Worm	**Spyware**	**SQL Injection**	**Trojan**
A program that appears to perform a useful function but also provides a 'backdoor' that enables data to be stolen.	☐	☐	☐	☐
A program installed by opening attachments that can be used to collect stored data without the user's knowledge.	☐	☐	☐	☐
Self-replicating program that identifies weaknesses in operating systems and enables remote control of the infected computer.	☐	☐	☐	☐

(b) Describe the following **two** methods of identifying vulnerabilities.

(i) **Footprinting** [2]

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(ii) **Penetration testing** [2]

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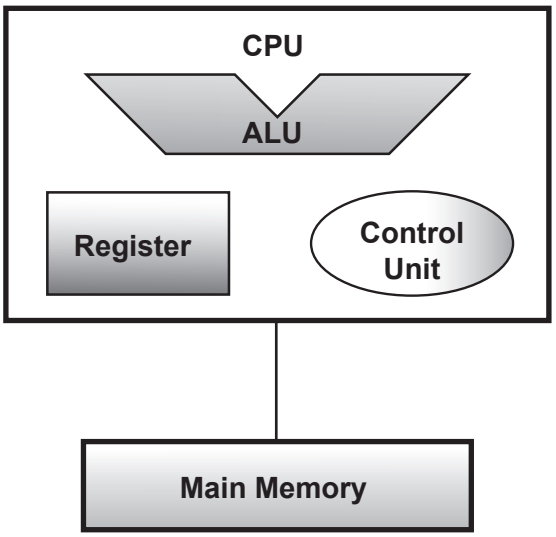
4. This is a diagram of a Von Neumann type architecture computer, with a single core Central Processing Unit (CPU).



(a) Using the components shown in the diagram, describe the fetch-decode-execute cycle. [4]

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(b) Describe how a RISC type processor differs from a CISC type processor. [2]

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(c) Describe the role of each of the following.

(i) Graphics card (GPU). [2]

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(ii) Motherboard. [2]

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5. (a) State the logical operator used in the following truth table. [1]

Input		Output
A	**B**	**C**
0	0	0
1	0	1
0	1	1
1	1	1

(b) **Tick** (✓) **one box only** to show the Boolean expression that represents the function described by each truth table.

KEY: + = *OR* · = *AND* ⊕ = *XOR* ¯ = *NOT*

(i)

Input		Output
P	**Q**	**R**
0	0	1
1	0	1
0	1	1
1	1	0

[1]

$R = P.Q$ ☐

$R = \overline{P.Q}$ ☐

$R = P.\overline{Q}$ ☐

$R = P + Q$ ☐

(ii)

Input		Output
X	**Y**	**Z**
0	0	1
1	0	0
0	1	0
1	1	1

[1]

$Z = X.Y$ ☐

$Z = \overline{X \oplus Y}$ ☐

$Z = X \oplus Y$ ☐

$Z = \overline{X.Y}$ ☐

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(c) Complete the truth table for the following Boolean expression:

$$A + (B + C)$$

A	B	C	$B + C$	$A + (B + C)$

[3]

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6. The TCP/IP 5-layer model defines how applications can communicate over a network.

(a) Complete the following sentences about the TCP/IP 5-layer model using only the words given:

TRANSPORT	**BOOLEAN**	**APPLICATION**	**SUSPENSION**
GATEWAY	**NETWORK**	**PHYSICAL**	**DATA LINK**

(i) The ..... layer provides interfaces to the software to allow it to use the network. [1]

(ii) The ..... layer ensures that data is transferred from one point to another reliably and without errors. [1]

(iii) Addressing and routing is provided by the ..... layer. [1]

(iv) The ..... layer prepares data to be passed to the physical layer. [1]

(v) The ..... layer transmits the raw data. [1]

(b) (i) Draw a diagram of a star network topology. [1]

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(ii) Give **two** advantages of a star network topology. [2]

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(iii) Give **one** disadvantage of a star network topology. [1]

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(c) Describe the typical contents of an acceptable use policy. [5]

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7. (a) (i) Convert 01101010_2 into hexadecimal. [1]

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(ii) Convert $B9_{16}$ into binary. [1]

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(iii) Give **one** reason why hexadecimal notation is used as shorthand for binary numbers. [1]

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(b) Using binary addition, add 10101011_2 to 00110110_2.

Show your workings. [2]

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(c) State the effect of arithmetic shift functions by one place. [2]

LEFT SHIFT .....

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RIGHT SHIFT .....

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8. When graphics are stored using a certain computer system, every colour pixel is created using a combination of the three primary colours: red, green and blue.

The following 600 × 500 pixels 8-bit colour image has been created.

(a) State the range and number of different colours in denary that can be represented using this colour model. [2]

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(b) Calculate the storage requirements of this image in kilobytes. [2]

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9. Clearly showing each step, simplify the following Boolean expressions using Boolean algebra and identities:

(a) $A.(B + \overline{B})$ [2]

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(b) $A.(A + B) + B.(A + B)$ [5]

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10. *Betty's B&B* wants to store booking data on a computer system.

This table shows the booking data to be stored by *Betty's B&B*.

Booking ID	Customer Title	Customer Name	Check in Date	Number of nights	Room Type	Cost	Paid
RM10001	Mrs	Anaya Patel	05/11/2020	7	Double	£349.93	Y
RM10002	Miss	Shania Williams	09/11/2020	1	Single	£49.99	Y
RM10003	Mr	Michael Jones	10/12/2020	3	Twin	£149.97	N
RM10004	Mrs	Susan Isaac	05/02/2021	4	Single	£199.96	Y
RM10005	Ms	Deborah Evans	31/10/2020	7	Twin	£349.93	N
RM10006	Miss	Megan Williams	20/11/2020	14	Double	£699.86	N
…	…	…	…	…	…	…	…

(a) (i) State why an array would **not** be suitable for storing this data. [1]

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(ii) Give a suitable example of data that may be stored by *Bettys B&B* using an array. [2]

(b) Design different types of validation check for **three** of the fields from the booking data table. Do not use presence check in your answer. [6]

Validation check 1

Field: .....

Type of check: .....

Rule:

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Validation check 2

Field: .....

Type of check: .....

Rule:

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Validation check 3

Field: .....

Type of check: .....

Rule:

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(c) As *Betty's B&B* is storing personal data on a computer system, they should be aware of the dangers of storing data and the need to keep data secure.

(i) Describe the dangers that organisations face from using computers to store personal data. Do not include malware in your answer. [4]

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(ii) Explain the need for organisations to make backups and to maintain generations of files. [4]

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(iii) Describe the need to archive files. [2]

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11. The following program is intended to add together two numbers and output the answer, but it contains errors.

```
1     set firstNumber as integer
2     set secondNumber as integer
3
4     input firstNumber
5     imput secondNumber
6
7     output "The sum is, FirstNumber - secondNumber
```

Identify **three** errors in the program and name each error type. [6]

Error 1

Error: ..... Line: .....

Error Type: .....

Error 2

Error: ..... Line: .....

Error Type: .....

Error 3

Error: ..... Line: .....

Error Type: .....

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12. Describe the environmental impact of digital technology on wider society. [3]

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13. Describe the principal stages of the compilation process. [9]

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