

CANDIDATE
NAME

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0478/01

For examination from 2029

1 hour 45 minutes

* 0 1 2 3 4 5 6 7 8 9 *

No additional materials are needed.

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- Dictionaries are not allowed.
- Calculators must **not** be used in this paper.

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [].
- No marks will be awarded for using brand names of software packages or hardware.

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[Turn over

- 1 A computer uses the American Standard Code for Information Interchange (ASCII) character set to convert characters into 7-bit binary numbers.

The table shows a sample of the ASCII character set.

character	binary number
A	1000001
B	1000010
C	1000011
a	1100001
b	1100010
c	1100011

- (a) Convert the binary number for the character 'B' to a denary number.

.....
 [1]

- (b) Convert the binary number for the character 'a' to a hexadecimal number.

.....
 [1]

- (c) Give the 7-bit binary number that represents the character 'e'.

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[1]

- (d) Tick (✓) **two** correct statements about the ASCII character set.

- | | | |
|----------|--|--------------------------|
| A | It represents all letters from the English alphabet. | ☐ |
| B | It represents all letters and symbols from every alphabet. | ☐ |
| C | It can be used to represent denary numbers. | ☐ |
| D | It represents emojis. | ☐ |
| E | It represents more characters than Unicode. | ☐ |
| F | It uses more storage space than Unicode. | ☐ |

[2]

2 A company uploads videos to a local web server. The videos can be downloaded by a user.

(a) A video file is separated into data packets to be transmitted to the user.

Describe the structure of a data packet.

.....

.....

..... [3]

(b) The video files are compressed before they are uploaded to the web server.

Tick (✓) **one** correct statement that is a benefit of compressing the video files.

A Data is encrypted.

☐

B The duration of each video will be reduced.

☐

C Less storage space on the web server is required.

☐

D More bandwidth is required when downloading the videos.

☐

[1]

(c) Suggest **two** methods of lossless compression that can be used to compress the video files.

method 1

.....

.....

method 2

.....

.....

[2]

- (d) The company uses parallel half-duplex data transmission to transmit the data for the video files to the web server.

Explain why parallel half-duplex is an appropriate method.

.....

.....

.....

..... [4]

- 3 A computer stores the binary numbers 01010101, 01110001 and 11110000.

- (a) Use binary addition to add the numbers 01010101 and 01110001.

Give your answer in binary.

You must show any carries in the carry box.

carry									
		0	1	0	1	0	1	0	1
	+	0	1	1	1	0	0	0	1
answer									

[3]

- (b) A left cyclic shift of **one** place is performed on the binary number 11110000.

Give the binary number that is stored after a left cyclic shift of **one** place is performed.

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[1]

- 4 (a) Select the correct term from the list to complete the statements about different types of programming languages.

Select a different term for each gap. You will not need to use all the terms.

assembly executable file high-level instruction low-level
machine code protocol source code syntax translator

The structure of language statements in a computer program is called
the

A programming language that uses natural language statements is called a
..... language.

When programs are written in this type of language they need a to
convert them into

[4]

- (b) A programmer uses an integrated development environment (IDE) to write a computer program.

Give **three** common functions of an IDE.

function 1

.....
.....

function 2

.....
.....

function 3

.....
.....

[3]

(c) An operating system is used to run the IDE and manage the memory of the computer.

Give **three** ways that the operating system manages the memory of the computer.

- 1
- 2
- 3 [3]

5 Connect each component with a correct statement.

component	statement
program counter (PC)	sends signals to manage the flow of data in the central processing unit (CPU)
memory data register (MDR)	stores the next instruction to be processed
accumulator (ACC)	stores the address of the next instruction to be processed
control unit (CU)	stores the interim results of calculations

[3]

- 6 (a) Complete the table by writing the correct core principle of cybersecurity for each statement.

statement	core principle
This verifies a user's identity to make sure that they are allowed access to data.	
This provides proof of sending and receiving data so that the transmission of data can be traced.	
This makes sure that data cannot be altered or deleted in an unauthorised way, therefore data is accurate and trustworthy.	

[3]

- (b) One example of a cybersecurity threat is hacking.

Give **three** other examples of cybersecurity threats.

example 1

.....

.....

example 2

.....

.....

example 3

.....

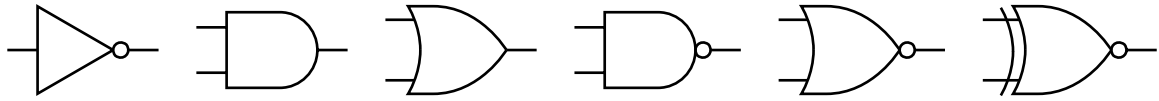
.....

[3]

7 Consider the logic statement:

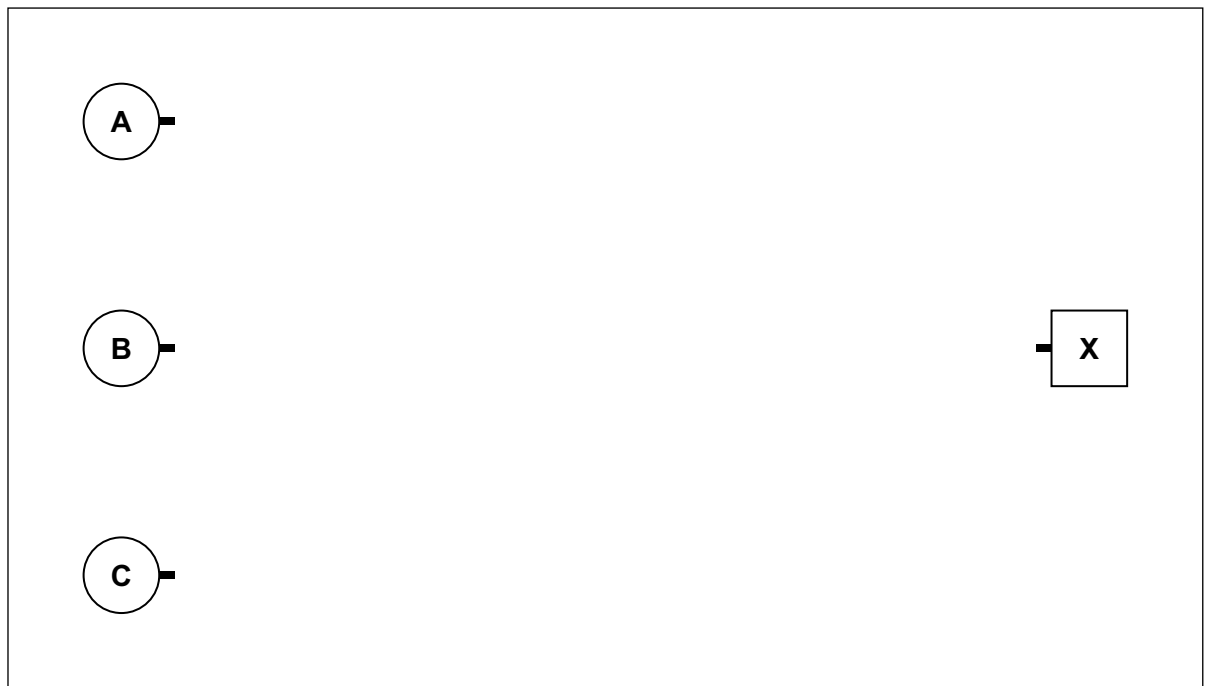
$$X = A \text{ AND } B \text{ OR } (\text{NOT } B \text{ AND } C)$$

(a) Complete the logic circuit to represent the logic statement.



Each logic gate must have a maximum of **two** inputs.

You must **not** simplify the statement.



[4]

(b) Complete the truth table by writing the correct output for each combination of inputs.

A	B	C	X
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

[4]

- 8 For each feature tick one or more internet protocol (IP) address formats.

feature	IP address	
	IPv4	IPv6
It is a 128-bit address.		
It can be static or dynamic.		
It uses a dot to separate numbers.		
It can contain hexadecimal numbers.		
It can be used to identify a device on a network.		
It contains four sets of numbers.		

[6]

- 9 Complete the table by writing the correct cloud storage model for each statement.

statement	cloud storage model
The services and infrastructure are provided by a third party.	
The services and infrastructure are dedicated to a single organisation.	
It is the most cost-effective cloud storage model to initially implement.	
The services and infrastructure are normally dedicated to a single organisation but can be expanded to include those provided by a third party.	

[4]

10 A farmer uses an automated robot to plant seeds in a field.

(a) Give **two** advantages to the farmer of using an automated robot to plant the seeds.

advantage 1

.....

.....

advantage 2

.....

.....

[2]

(b) Give **two** disadvantages to the farmer of using an automated robot to plant the seeds.

disadvantage 1

.....

.....

disadvantage 2

.....

.....

[2]

(c) The robot uses artificial intelligence (AI).

(i) The artificial intelligence uses a neural network.

Identify the correct **three** layer types of a neural network from the list shown.

input layer output layer process layer hidden layers

binary layer machine layer

1

2

3

[3]

(ii) State **two** ways the robot could use AI when planting seeds

1

2 [2]

(iii) Explain the ethical considerations of using a robot that uses AI.

.....

.....

.....

..... [4]

11 (a) Describe **two** differences between the architecture of a quantum computer and a classical computer.

difference 1

.....

.....

difference 2

.....

..... [4]

(b) State **two** advantages of using a quantum computer over a classical computer.

advantage 1

.....

.....

advantage 2

.....

..... [2]

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