Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5648189233

COMPUTER SCIENCE **9618/13**

Paper 1 Theory Fundamentals **May/June 2023**

1 hour 30 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen.
- 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 or correction fluid.
- Do **not** write on any bar codes.
- You may use an HB pencil for any diagrams, graphs or rough working.
- Calculators must **not** be used in this paper.

INFORMATION

- 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.

This document has **16** pages. Any blank pages are indicated.

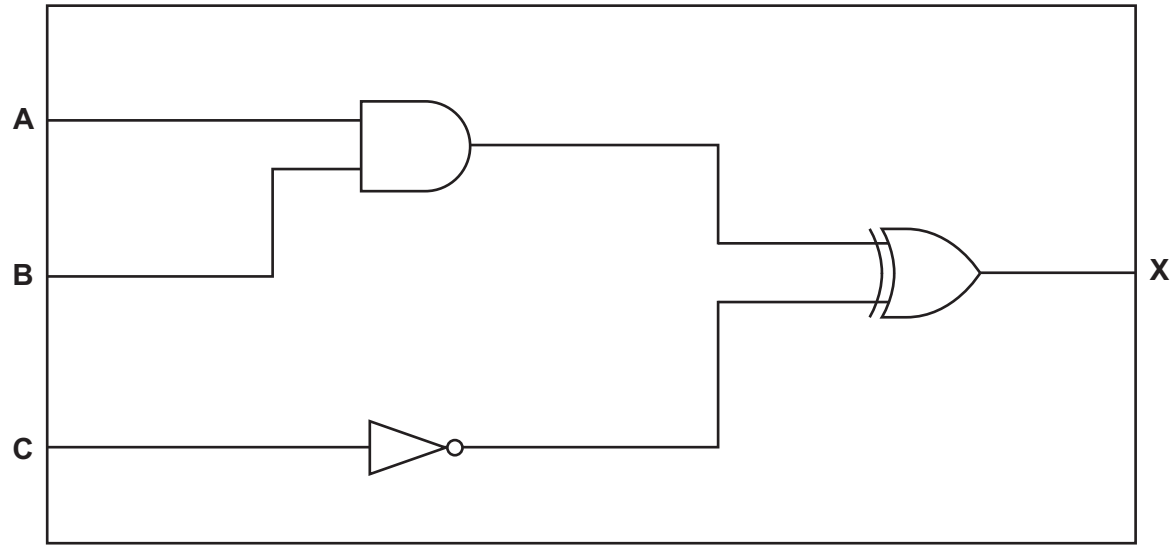
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1 **(a)** Write the logic expression for this truth table:

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

..... [1]

(b) Complete the truth table for this logic circuit:



A	B	C	Working space	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		

[2]

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2 A university has two sites. Each site has several computer rooms. The computers are all connected as a WAN (wide area network).

(a) Identify **two** differences between a WAN and a LAN (local area network).

1 .....

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2 .....

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[2]

(b) The network uses different topologies in different areas of the sites. In one building there are five computers connected in a mesh topology.

(i) Describe what is meant by a mesh topology.

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..... [2]

(ii) Give **two** advantages of using a mesh topology instead of a bus topology.

1 .....

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2 .....

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[2]

(c) The computers in one room are set up as thin-clients in a client-server model.

Describe the role of the different computers in this model.

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..... [2]

(d) Students can connect their devices to the university network using cables or a wireless connection.

Explain the benefits to the students of allowing them to use **both** wired and wireless connections.

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..... [4]

(e) One site has split the network into several subnetworks.

An IP address in a subnetwork is divided into two parts.

Identify **and** describe the **two** parts of an IP address in a subnetwork.

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..... [3]

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3 A mobile telephone is used to record a video.

(a) The mobile telephone has a touchscreen. There are different types of touchscreen.

Complete the description of the principal operation of touchscreens.

A ..... touchscreen has two layers. When the user touches the screen, the layers touch and a ..... is completed.

A ..... touchscreen has several layers. When the top layer is touched, there is a ..... in the electric current.

A microprocessor identifies the ..... of the touch.

[5]

(b) The mobile telephone uses a built-in digital camera to record the video.

The digital camera automatically focuses on the faces of people.

Explain how Artificial Intelligence (AI) is used by the camera to automatically focus on the faces of people.

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..... [3]

(c) The video includes a sound recording.

(i) Describe how sound is represented in a computer.

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..... [3]

(ii) A second video is recorded. The sound in the second video needs to be more precise.

Explain the reasons why increasing the sampling rate and the sampling resolution will improve the precision of the second recording.

Sampling rate .....

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Sampling resolution .....

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[4]

4 A shop rents cars to customers. The shop uses a relational database to store information about the rentals.

(a) Describe **two** ways in which a relational database addresses the limitations of a file-based approach.

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2 .....

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[4]

(b) Complete the table by writing the missing term or description for each database feature.

Term	Description
....	An object that data is stored about.
Tuple	....
Secondary key	....
....	A field in one table that is linked to a primary key in another table.

[4]

(c) The car rental database is not normalised. The current database design is:

```
BOOKING(CarRegistration, StartDate, EndDate,
        CarModel, CarColour, CustomerFirstName)

CUSTOMER(CustomerFirstName, CustomerLastName, EmailAddress,
         TelephoneNumber)
```

Write a normalised database design for this database.

All tables must be in Third Normal Form (3NF).

Use the field names given **and** underline the primary key fields.

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..... [4]

(d) The data is validated and verified when it is entered into the database.

(i) The car registration number must be: 1 letter, followed by 3 numbers, followed by 2 letters.

For example, A123AA is valid but A12AA is invalid.

One way that a registration number can be validated is by using a presence check to make sure the registration number has been entered.

Describe **two other** ways that the car registration number can be validated.

1 .....

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2 .....

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[2]

(ii) Describe **two** ways that the car registration number can be verified when it is entered into the database.

1 .....

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2 .....

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[2]

(iii) State why the car registration number might be incorrect even after it has been validated and verified.

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..... [1]

5 A programmer is developing a computer game in a high-level language to sell to the public.

(a) The programmer uses both an interpreter and a compiler at different stages of the development of the program.

(i) Explain the reasons why the programmer uses an interpreter while writing the program code.

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(ii) Explain the reasons why the programmer uses a compiler when the program has been written.

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..... [3]

(b) The programmer needs to publish the game under a software licence so that it can be sold to the public.

Identify the **most appropriate** type of software licence for the game **and** justify your choice.

Licence .....

Justification .....

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[4]

6 Data needs to be kept secure when stored on a computer and during transmission over a network.

(a) Explain how a digital signature is used to authenticate a digital document during transmission over a network.

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..... [5]

(b) Complete the table by identifying **and** describing **two** types of software that can be installed on a computer to prevent threats over a network.

Type of software	Description
…….. …….. 	....
…….. …….. 	....

[2]

7 A computer stores data in binary form.

(a) Draw **one** line from each description to its matching denary value.

Description	Denary value
	–127
The smallest integer that can be represented in 8-bit two's complement.	127
	–255
The largest integer that can be represented in 8-bit two's complement.	–128
	–256
The largest unsigned integer that can be represented in 8 bits.	256
	128
	255

[3]

(b) The computer has a Control Unit (CU), system clock and control bus.

Explain how the CU, system clock and control bus operate to transfer data between the components of the computer system.

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..... [4]

(c) Complete the table by writing the register transfer notation for each stage of the Fetch-Execute (F-E) cycle given in the table.

Stage description	Register transfer notation
The Program Counter (PC) is incremented	.....
The data in the address stored in the Memory Address Register (MAR) is copied to the Memory Data Register (MDR)	.....

[2]

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