Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0123456789

COMPUTER SCIENCE **9618/01**

Paper 1 Theory Fundamentals **For examination from 2021**

SPECIMEN PAPER **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 **14** pages. Blank pages are indicated.

1 **(a)** State **one** difference between a **kibibyte** and a **kilobyte**.

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..... [1]

(b) Give the number of bytes in a **mebibyte**.

..... [1]

(c) **(i)** Complete the following binary addition. Show your working.

1 0 0 1 1 0 1 0

+ 1 1 1 1 0 1 1 1

[2]

(ii) Describe the error that occurred when you added the binary numbers in **part (c)(i)**.

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..... [2]

(d) Complete the binary subtraction. Show your working.

0 1 1 0 0 1 1 1

– 0 0 1 1 0 0 1 0

[2]

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2 Yvette runs a company that books walking holidays for groups of people. She has a website that customers use to book the holidays.

(a) The website has a URL and an IPv6 address.

Describe, using an example, the format of an IPv6 address.

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(b) An IP address can be static or dynamic. Describe static and dynamic IP addresses.

Static .....

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Dynamic .....

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[4]

(c) Yvette's company has a LAN (Local Area Network) that has hybrid topology.

(i) Describe the characteristics of a LAN.

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(ii) The LAN has a range of different topologies. One subnetwork connects four computers and one server set up as a star topology.

Describe how packets are transmitted between two of the computers in this subnetwork.

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(d) The LAN has both wired and wireless connections.

(i) Ethernet cables connect the computers to the server.

Identify **three** other hardware components that might be used to set up the LAN.

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(ii) Describe how Carrier Sense Multiple Access/Collision Detection (CSMA/CD) manages collisions during data transmission.

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3 Mehrdad has a holiday company database that includes:

- data about holidays, such as the location, date, duration (in days)
- data about the customers and the holidays they have booked.

(a) Mehrdad has **normalised** the database, which has three tables.

(i) Draw an entity–relationship (E–R) diagram for the **normalised** tables.

[3]

(ii) Complete the table to identify the primary key and foreign key(s) for each of the tables you identified in **part (a)(i)**. If the table has no foreign key(s), write 'None'.

Table name	Primary key	Foreign key

[3]

(iii) Explain why the holiday database is in Third Normal Form (3NF).

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(b) The holiday company has several members of staff. The database has **two** additional tables to store data about the staff.

STAFF(StaffID, FirstName, SecondName, DateOfBirth, Role, Salary)

SCHEDULE(ScheduleID, StaffID, WorkDate, Morning, Afternoon)

The following table shows some sample data from the table SCHEDULE.

ScheduleID	StaffID	WorkDate	Morning	Afternoon
210520-1	BC	21/05/2020	TRUE	TRUE
210520-2	JB	21/05/2020	TRUE	FALSE
220520-1	BC	22/05/2020	FALSE	TRUE
220520-2	LK	22/05/2020	TRUE	FALSE

(i) Write an SQL script to display the first name and second name of all staff members working on 22/05/2020.

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(ii) Write an SQL script to count the number of people working on the morning of 26/05/2020.

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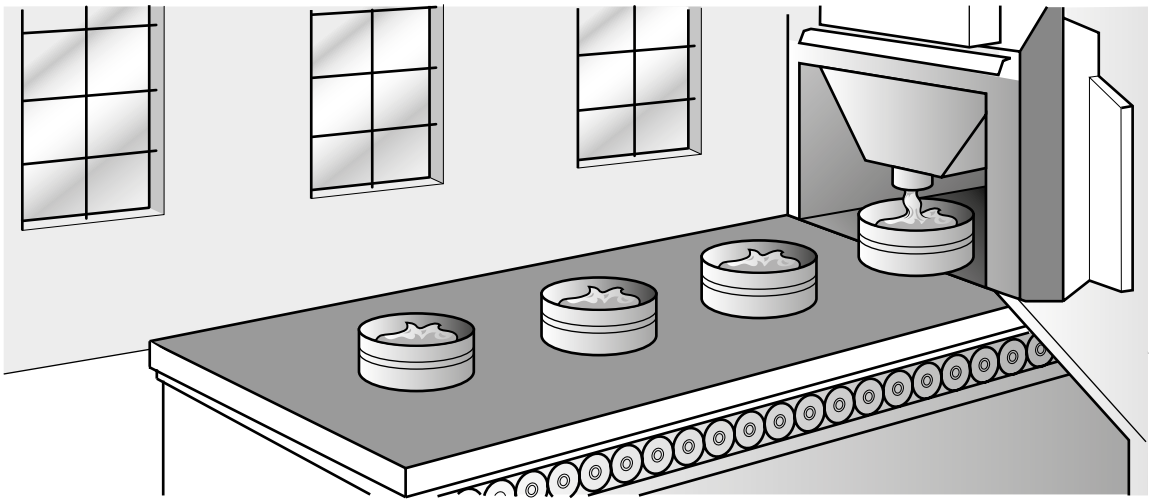
4 A cake factory uses machines to make cakes .

(a) Complete the following descriptions of types of system. Write the correct missing term in the spaces.

The factory uses a ..... system to record data such as the number of cakes being produced each hour.

When the data collected from sensors are analysed and used as ..... it is a ..... system. One example of this system, used in the factory, is to maintain a constant temperature in the ovens. It uses a ..... to measure the values. [4]

(b) Cake mixture is mixed in a large pot. A conveyer belt moves the cake tins beneath the pot. The conveyer belt stops and a set quantity of the cake mixture fills the cake tin. The conveyer belt then moves and another cake tin is positioned beneath the pot.



Explain how the control system will ensure the correct amount of mixture is placed in the cake tins.

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(c) The cake factory has servers that store its confidential recipes and control the factory machines.

(i) Describe the implications of a hacker gaining access to the cake factory's servers.

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(ii) Explain how the company could protect its data against hackers.

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(d) The machines have a counter to record the number of cake tins filled. Each time a cake tin is filled, the counter is increased by 1. The value is stored in an 8-bit register, the current value is shown.

0	0	0	0	1	0	0	1

(i) Show the value of the binary number after another five cake tins have been filled.

[1]

(ii) The following table shows some assembly language instructions for a processor which has one general purpose register, the Accumulator (ACC).

Instruction		**Explanation**
Op code	**Operand**	
AND	#n	Bitwise AND operation of the contents of ACC with the operand
AND	<address>	Bitwise AND operation of the contents of ACC with the contents of <address>
XOR	#n	Bitwise XOR operation of the contents of ACC with the operand
XOR	<address>	Bitwise XOR operation of the contents of ACC with the contents of <address>
OR	#n	Bitwise OR operation of the contents of ACC with the operand
OR	<address>	Bitwise OR operation of the contents of ACC with the contents of <address>
LSL	#n	Bits in ACC are shifted logically n places to the left. Zeros are introduced on the right hand end
LSR	#n	Bits in ACC are shifted logically n places to the right. Zeros are introduced on the left hand end.

At the end of each day, the register is reset to 0.

Write the assembly language statement to reset the register to 0.

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..... [2]

(iii) A **two-place logical shift** to the **left** is performed on the binary number shown in **part (d)**.

Show the result of this logical shift.

[1]

(iv) State the mathematical result of a **one-place logical shift** to the **right** on a binary number.

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..... [1]

(e) The factory servers run software that makes use of Artificial Intelligence (AI).

Explain how the use of AI can help improve the safety and efficiency of the factory.

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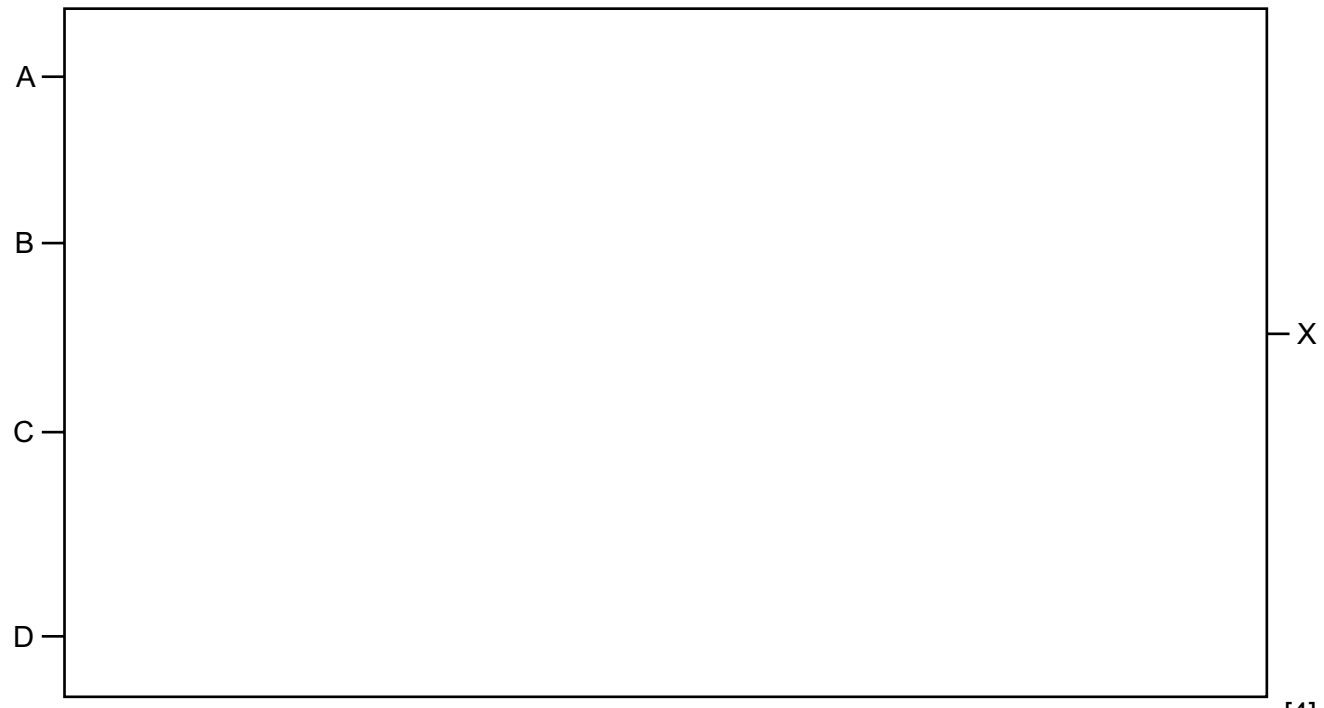
5 **(a)** Draw a logic circuit diagram for the logic expression:

X = NOT (A OR B OR C) OR (B AND C AND D)



[4]

(b) Complete the truth table for the logic expression:

X = (A XOR B) OR NOT (A OR B OR C)

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		

[4]

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