Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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5695273986

COMPUTER SCIENCE **9608/13**

Paper 1 Theory Fundamentals **October/November 2021**

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 **12** pages. Any blank pages are indicated.

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1 **(a)** Convert the following two's complement binary integer into denary. Show your working.

11001011

Working .....

.....

.....

.....

Answer .....

.....

[2]

(b) Convert the following unsigned binary integer into hexadecimal.

10101101

..... [1]

(c) Convert the following denary integer to Binary Coded Decimal (BCD).

1753

..... [1]

(d) Give **two** examples of practical applications of BCD.

1 .....

.....

2 .....

.....

[2]

(e) An encryption routine replaces each character in a short message with a different character.

For example, the following table shows how the routine encrypts the word 'HELLO' by adding **3** to the ASCII denary value of each character.

Original character	**H**	**E**	**L**	**L**	**O**
ASCII denary value	72	69	76	76	79
ASCII denary value + 3	75	72	79	79	82
Encrypted character	K	H	O	O	R

The ASCII value of the character A is 65.

Complete the table to show how the routine will encrypt the word 'WANDS'.

Original character	**W**	**A**	**N**	**D**	**S**
ASCII denary value					
ASCII denary value + 3					
Encrypted character					

[2]

2 Daniel is creating a sound file for a school project.

(a) Daniel records the sound using a sampling rate of 44.1 kHz and a sampling resolution of 16 bits.

(i) State what is meant by a **sampling rate** of **44.1 kHz**.

.....

..... [1]

(ii) State what is meant by a **sampling resolution** of **16 bits**.

.....

..... [1]

(b) Daniel needs to write a report about the sound he is using for his project. He will use a keyboard to write this report.

Describe the basic internal operation of a keyboard.

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.....

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.....

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..... [4]

3 **(a)** Describe what is meant by a **Public IP address** and a **Private IP address**.

Public IP address.....

.....

.....

.....

Private IP address .....

.....

.....

.....

[4]

(b) Complete the following paragraph that describes the sequence of events when a user requests a page from a website.

The user enters the Uniform Resource Locator (URL) into the address bar of the ..... .

The domain name is taken from the URL and sent to a Domain Name Service (DNS). This stores ..... of domain names and their matching IP addresses.

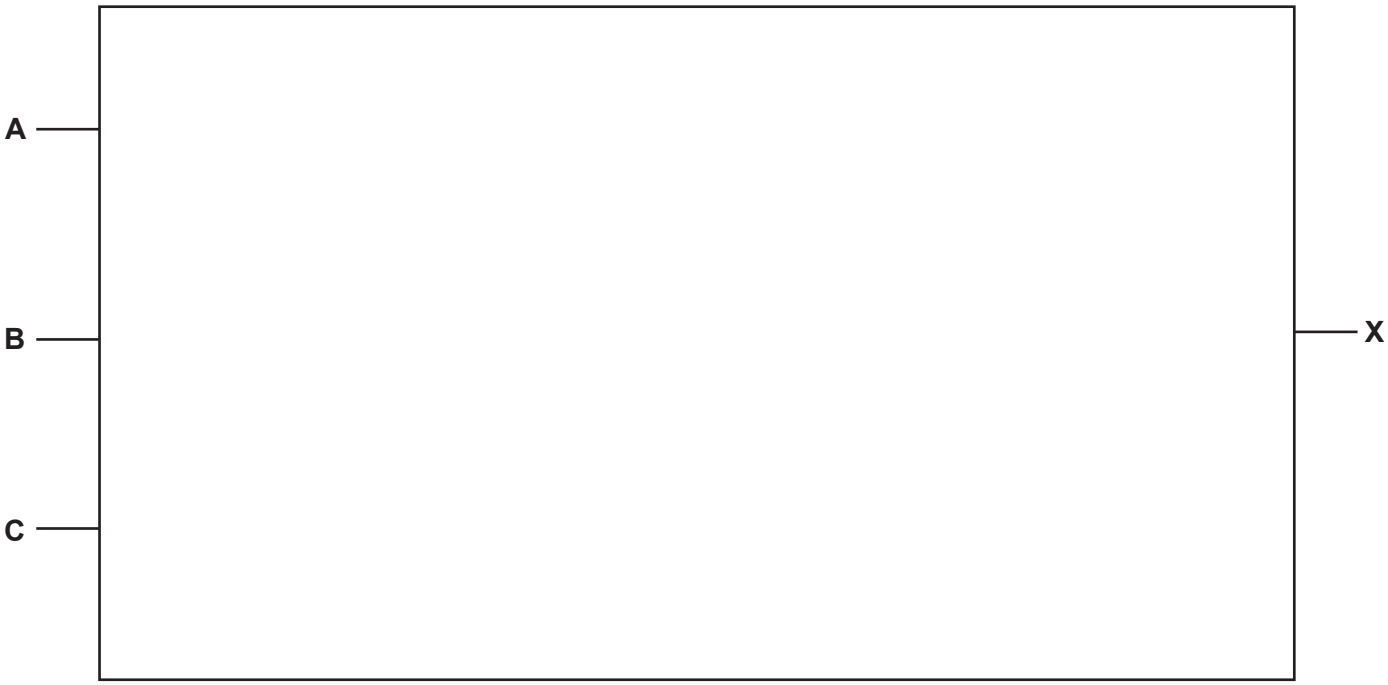
If it finds the domain name, it sends the IP address to the ..... .

If it does not find the domain name, it sends the request to ..... .

[4]

4 Draw the logic circuit for the logic expression:

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



[6]

5 **(a)** Describe how the following registers are used in the fetch-execute (F-E) cycle:

- Current Instruction Register (CIR)
- Program Counter (PC)
- Memory Data Register (MDR)
- Memory Address Register (MAR).

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..... [5]

(b) Describe the roles carried out by the Arithmetic and Logic Unit (ALU) and the system clock.

ALU .....

.....

System clock .....

.....

[2]

(c) The following table shows part of the instruction set for a processor. The processor has one general purpose register, the Accumulator (ACC), and an Index Register (IX).

Instruction		Explanation
Op code	**Operand**	
LDM	#n	Immediate addressing. Load the number n to ACC
CMP	<address>	Compare the contents of ACC with the contents of <address>
ADD	<address>	Add the contents of the given address to the ACC
INC	<register>	Add 1 to the contents of the register (ACC or IX)
JPE	<address>	Following a compare instruction, jump to <address> if the compare was True
STO	<address>	Store the contents of ACC at the given address
END		Return control to the operating system

The instructions in the processor's instruction set can be grouped according to their function.

Identify **one** instruction group for each instruction in the following table.

Instruction	Instruction group
LDM #12	
ADD 21	
STO 21	
CMP 21	
JPE 01	

[5]

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(d) Some assemblers scan the assembly language program twice; these are referred to as two-pass assemblers.

Complete these **two** sentences by writing the missing terms.

In the first pass the ..... table is generated.

In the second pass the program is converted into ..... code.

[2]

6 Complete the table by writing the missing names and descriptions of utility software.

Utility software	Description
Disk formatter	....
.....	Reduces the size of the file
Defragmenter	....
.....	Making a copy of data in case of loss

[4]

7 **(a)** Tick (✓) **one** box in each row to identify whether each measure is an example of data verification or data validation.

Measure	Data verification	Data validation
Parity check		
Double entry		
Format check		

[2]

(b) Identify one measure of data verification **not** given in **part (a)**.

..... [1]

(c) Identify one measure of data validation **not** given in **part (a)**.

..... [1]

8 **(a)** Describe how run-length encoding (RLE) can be used to compress a single video frame.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) Identify **two** other methods of compressing a single video frame.

1 .....

.....

2 .....

.....

[2]

9 A company uses a relational database.

(a) The company stores data about its customers and their bank details.

Explain the ways in which the database can be set up to only allow certain people to see the bank details.

.....

.....

.....

..... [2]

(b) The database contains the following tables that store data about suppliers and stock.

`SUPPLIER(SupId, SupName, SupAddress, SupPhone, SupContactName)`

`STOCK(StockId, SupId, StockName, StockImage, NumberInStock)`

(i) Write Data Manipulation Language (DML) statements to return the supplier name, phone number and contact name, and the number of items in stock for the item with the stock ID of D930.

.....

.....

.....

.....

.....

..... [4]

(ii) The stock price needs to be included in the stock table.

$10.55 and $299.99 are two examples of stock prices.

Write Data Definition Language (DDL) statements to insert the attribute `StockPrice` into the table `STOCK`.

.....

.....

.....

..... [2]

(c) Three examples of items stored in the data dictionary of a relational database are:

Item	Purpose
Field name	to store the names of fields so they cannot be repeated in a table
Primary key	to uniquely identify each record in a table
Validation rule	to ensure that data entered is sensible

Identify **three other** examples of items stored in a data dictionary **and** give the purpose of each.

Item 1 .....

Purpose .....

.....

.....

Item 2 .....

Purpose .....

.....

.....

Item 3 .....

Purpose .....

.....

.....

[6]

(d) Draw **one** line from each database term to its matching description.

Database term	Description
Logical schema	An attribute that could be a primary key but is not selected to be a primary key
Referential integrity	An attribute in one table that is a primary key in another table
Query processor	The overview of a database structure
Primary key	An attribute or set of attributes that uniquely identifies each tuple
Secondary key	Data between linked tables is consistent
	Changing data to see what would happen in different scenarios
	The part of the DBMS that allows a user to search for data

[5]

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