Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

4962084775

COMPUTER SCIENCE **9608/32**

Paper 3 Advanced Theory **October/November 2019**

1 hour 30 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
No marks will be awarded for using brand names of software packages or hardware.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The maximum number of marks is 75.

This document consists of **13** printed pages and **3** blank pages.

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1 **(a)** The following incomplete table shows descriptions relating to the security of data transmission.

Complete the table with the appropriate terms.

	Description	Term
A	The original data to be transmitted as a message	.....
B	An electronic document from a trusted authority that ensures authentication	.....
C	An encryption method produced by a trusted authority that can be used by anyone	.....

[3]

(b) **(i)** Explain the purpose of a digital signature.

.....

.....

.....

..... [2]

(ii) Describe how a digital signature is produced for transmission with the message.

.....

.....

.....

.....

.....

.....

..... [3]

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2 **(a)** A Boolean expression produces the following truth table.

INPUT			OUTPUT
A	**B**	**C**	**X**
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	0

(i) Write the Boolean expression for the truth table by applying the sum-of-products.

X = ...

..... [3]

(ii) Complete the Karnaugh Map (K-map) for the truth table in **part (a)**.

		AB			
		00	**01**	**11**	**10**
C	**0**				
	1				

[1]

The K-map can be used to simplify the function in **part (a)(i)**.

(iii) Draw loop(s) around appropriate groups in the table in **part (a)(ii)**, to produce an optimal sum-of-products. [2]

(iv) Write, using your answer to **part (a)(iii)**, a simplified Boolean expression for your Karnaugh map.

X = ... [2]

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(b) Simplify the following expression using De Morgan's laws. Show your working.

$$\overline{(\overline{W} + X) \bullet (Y + \overline{Z})}$$

.....

.....

.....

.....

.....

..... [3]

3 A computing department in a school has a Local Area Network (LAN) with a bus topology.

(a) A description of sending a message on a bus network is given.

Complete the following description by inserting an appropriate term in each space.

Computer 1 and Computer 2 are on the same bus network. Computer 1 sends a message to Computer 2. Before the message is sent, it is split into ..... .

Computer 1 needs to check that the ..... is free, before sending the message, otherwise a ..... will occur that will be managed by the ..... protocol.

[4]

(b) The computing department's LAN needs to connect to the Internet.

Explain how each device is used in the operation of the bus network.

Router .....

.....

.....

.....

Network Interface Card (NIC) .....

.....

.....

.....

[4]

(c) The computing department's network is being adapted to allow students to connect wireless devices.

(i) Identify **two** types of hardware components the computing department will need to allow wireless connection.

1 .....

2 .....
[2]

(ii) Describe how the wireless connection sends and receives data.

.....

.....

.....

.....

.....

.....

.....

..... [4]

4 Physical memory is managed using virtual memory and paging.

(a) Describe what is meant by **virtual memory**.

.....

.....

.....

..... [2]

(b) **(i)** Explain how paging is used to manage virtual memory.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(ii) Give a suitable page replacement algorithm for this process.

..... [1]

(iii) One drawback of using virtual memory is disk thrashing.

Describe what is meant by the term **disk thrashing**.

.....

.....

.....

..... [2]

5 A weather station uses monitoring and control systems.

(a) Describe the difference between a monitoring system and a control system.

.....

.....

.....

..... [2]

(b) **(i)** The weather station records how the outside temperature changes over a period of time. The system will read the temperature once every hour, over a period of 100 days.

The temperature readings are automatically stored in a file. No other data are stored.

Explain why the weather station has decided to use serial organisation for the file.

.....

.....

.....

..... [2]

(ii) Serial files can be accessed using sequential access.

Explain how sequential access could be used for the temperature readings file.

.....

.....

.....

..... [2]

(iii) Name **and** describe a method of file organisation other than serial or sequential.

Method .....

Description .....

.....

.....

.....

.....

.....

[4]

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6 **(a)** State what is meant by a **user-defined data type**.

.....

..... [2]

(b) A pseudocode declaration for a user-defined data type for the months of the year is as follows:

```
TYPE
  DECLARE Months: (January, February, March, April, May, June, July,
                   August, September, October, November, December)
ENDTYPE
```

(i) Identify this type of user-defined data type.

.....

..... [1]

(ii) Write a **pseudocode** statement to declare a variable `CurrentMonth` of data type `Months`.

.....

..... [1]

(iii) Write a **pseudocode** statement to assign the value `August` to the variable `CurrentMonth`.

.....

..... [1]

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7 The following are the first few lines of a source code program written in a high-level language. The source code program is to be translated by the language compiler.

```
// program written on 15 June 2019

DECLARE IsFound : Boolean;
DECLARE NoOfChildren : Integer;
DECLARE Count : Integer;
Constant TaxRate = 15;

// start of main program
For Count = 1 to 50
…
…
…
```

(a) During the lexical analysis stage, the compiler will use a keyword table and a symbol table.

(i) Identify **two** types of data in the keyword table.

Type 1 .....

Type 2 .....
[2]

(ii) Identify **two** types of data in the symbol table.

Type 1 .....

Type 2 .....
[2]

(iii) Explain how the contents of the keyword and symbol tables are used to translate the source code program.

.....

.....

.....

..... [2]

(iv) State **one** additional task completed at the lexical analysis stage that does not involve the use of a keyword or a symbol table.

.....

..... [1]

(b) The final stage of compilation can be code optimisation.

Explain why code is optimised.

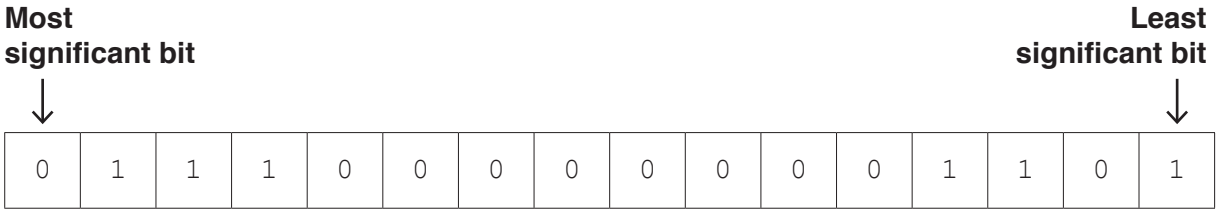
.....

.....

.....

..... [2]

8 **(a)** The following 16-bit binary pattern represents a floating-point number stored in two's complement form. The twelve most significant bits are used for the mantissa and the four least significant bits are used for the exponent.



(i) Identify the binary value of the exponent.

..... [1]

(ii) Identify the binary value of the mantissa.

..... [1]

(iii) State whether the number stored is positive or negative. Justify your choice.

Positive or negative .....

Justification .....

.....

.....

[2]

(iv) Convert the binary floating-point number in **part (a)** into denary. Show your working.

Working .....

.....

.....

.....

.....

Denary value .....

[3]

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(b) The number of bits used for the exponent is increased to eight, and the number of bits used for the mantissa is decreased to eight.

State the effects of this change.

.....

.....

.....

..... [2]

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