Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6690157298

COMPUTER SCIENCE **9608/32**

Paper 3 Advanced Theory **May/June 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 **11** printed pages and **1** blank page.

DC (ST) 163542/3

Cambridge Assessment International Education

1 **(a)** A computer stores real numbers using floating-point representation. The floating-point numbers have:

- eight bits for the mantissa
- four bits for the exponent.

The mantissa and exponent are both stored in two's complement format.

(i) Calculate the denary value of the following floating-point number.

Show your working.

Mantissa

0	0	1	1	0	1	1	1

Exponent

0	1	0	1

Working ....

....

....

....

....

Answer .... [3]

(ii) State why the floating-point number in **part (a)(i)** is **not** normalised.

....

.... [1]

(iii) Give the floating-point number in **part (a)(i)** in normalised two's complement format.

Mantissa

Exponent

[2]

(b) **(i)** Convert the denary number +11.625 into a normalised floating-point number.

Show your working.

Working ....

....

....

....

....

....

Mantissa

Exponent

[3]

(ii) Convert the denary number –11.625 into a normalised floating-point number.

Show your working.

Working ....

....

....

....

....

....

Mantissa

Exponent

[3]

(c) A student enters the following into an interpreter:

```
OUTPUT(0.2 * 0.4)
```

The student is surprised to see that the interpreter outputs the following:

```
0.08000000000000002
```

Explain why the interpreter outputs this value.

....

....

....

....

....

.... [3]

2 Packet switching can be used to transmit data across the Internet.

Packet switching is not always the most appropriate method of transferring data.

(a) Name an alternative method of transferring data across the Internet.

.... [1]

(b) Give an example of a situation where the method you identified in **part (a)** is more appropriate.

Justify your choice.

Example ....

....

Justification ....

....

....

....
[3]

3 **(a)** A Boolean algebraic 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) Complete the Karnaugh Map (K-map) for the truth table.

AB

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

[1]

The K-map can be used to simplify the expression that produced the truth table in **part (a)**.

(ii) Draw loops around appropriate groups of 1s in the K-map to produce an optimal sum-of-products. [2]

(iii) Write the simplified sum-of-products Boolean expression for the truth table.

X = ... [2]

(b) A logic circuit with four inputs produces the following truth table.

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

(i) Complete the K-map for the truth table.

AB

CD

[4]

(ii) Draw loops around appropriate groups of 1s in the K-map to produce an optimal sum-of-products. [2]

(iii) Write the simplified sum-of-products Boolean algebraic expression for the truth table.

X = ... [2]

4 **(a)** Describe the main steps in the evaluation of a Reverse Polish Notation (RPN) expression using a stack.

[4]

(b) The infix expression `8 * (5 – 2) – 30 / (2 * 3)` converts to:

`8 5 2 – * 30 2 3 * / –`

in Reverse Polish Notation (RPN).

Show the changing contents of the stack as this RPN expression is evaluated.

[4]

5 Sanjeet is a member of the public, and he wants to send a private message to a government department.

(a) Explain how asymmetric encryption is used to ensure that the message remains private.

....

....

....

.... [2]

(b) When the government department replies to Sanjeet, it needs to send a verified message.

Explain how asymmetric encryption can be used to ensure that it is a verified message.

....

....

....

....

....

.... [2]

(c) The government's computer systems are vulnerable to malware.

(i) Describe **two** vulnerabilities that malware can exploit in computer systems.

1 ....

....

....

....

2 ....

....

....

....

[4]

(ii) Identify **one** method that can be used to restrict the effect of malware.

....

.... [1]

6 A company sells plant watering systems that automatically turn on water sprinklers when the soil becomes too dry.

The plant watering system has a processor and connecting cables.

Identify **two** other hardware devices that are required in this system. State the purpose of each device.

Device 1 ....

Purpose ....

....

Device 2 ....

Purpose ....

....
[4]

7 **(a)** RISC (Reduced Instruction Set Computing) and CISC (Complex Instruction Set Computing) are two types of processor.

Tick (✓) **one** box in each row to show if the statement applies to RISC or CISC processors.

Statement	RISC	CISC
Larger instruction set		
Variable length instructions		
Smaller number of instruction formats		
Pipelining is easier		
Microprogrammed control unit		
Multi-cycle instructions		

[3]

(b) In parallel processing, a computer can have multiple processors running in parallel.

(i) State the **four** basic computer architectures used in parallel processing.

1 ....

2 ....

3 ....

4 ....
[4]

(ii) Describe what is meant by a **massively parallel computer**.

....

....

....

....

....

.... [3]

8 **(a)** A computer process can be in one of three states.

Identify **and** describe **two** of these states.

State 1 ....

Description ....

....

....

State 2 ....

Description ....

....

....
[6]

(b) One of the main tasks of an operating system is resource management.

Describe how an operating system can maximise the use of resources.

Primary memory ....

....

....

....

....

....

Disk ....

....

....

....

....

....
[6]

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