Cambridge International AS & A Level

**Cambridge Assessment International Education**
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER



**COMPUTER SCIENCE** **9608/11**

Paper 1 Theory Fundamentals **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 **14** printed pages and **2** blank pages.



Cambridge Assessment International Education

**[Turn over**

**1** Von Neumann is an example of a computer architecture.

**(a)** The diagram has registers used in Von Neumann architecture on the left and descriptions on the right.

Draw **one** line to match each register with its correct description.

| Register | Description |
| --- | --- |
| Current Instruction Register | Stores the data that has just been read from memory, or is about to be written to memory |
| Memory Address Register | Stores the instruction that is being decoded and executed |
| Program Counter | Stores the address of the input device from which the processor accesses the instruction |
| Memory Data Register | Stores the address of the next instruction to be read |
| | Stores the address of the memory location about to be written to or read from |

[4]

**(b)** Many components of the computer system transfer data between them using buses. One example of a bus is an address bus.

**(i)** Name **two** other buses that exist within a computer and give the purpose of each.

Bus 1 .....

Purpose .....

.....

.....

Bus 2 .....

Purpose .....

.....

.....

[4]

**(ii)** State the benefit of increasing the address bus width from 16 bits to 32 bits.

.....

..... [1]

**(c)** The following statements describe features of a low-level language.

Complete the statements by writing the appropriate terms in the spaces.

A ..... is a sequence of instructions that are given an identifier. These instructions may need to be executed several times.

A ..... is an instruction that tells the assembler to do something. It is not a program instruction.

The processor's instruction set can be put into several groups. One of these groups is ..... .

[3]





**[Turn over**

**2** Aaron uses a desktop computer to do school work.

**(a)** Aaron has a mouse and keyboard that he can use as input devices and a monitor as an output device.

**(i)** Identify **two** additional input devices Aaron could use with his desktop computer.

1 .....

2 .....
[2]

**(ii)** Identify **two** additional output devices Aaron could use with his desktop computer.

1 .....

2 .....
[2]

**(iii)** Aaron needs to store a large number of applications and data on his computer. He needs at least 50GB of secondary storage space.

Identify **one** internal secondary storage device for Aaron's computer.

.....

..... [1]

**(iv)** Describe the internal operation of a trackerball mouse.

.....

.....

.....

.....

.....

..... [3]

**(b)** Aaron's computer has an operating system (OS). The OS manages the running processes and provides a user interface.

Describe these OS management tasks.

Process management .....

.....

.....

.....

.....

.....

Provision of a user interface .....

.....

.....

.....

.....

.....

[6]

**(c)** Aaron's computer has a virus checker and backup software.

Describe these utility programs.

Virus checker .....

.....

.....

.....

Backup software .....

.....

.....

.....

[4]

**(d)** Aaron creates a web page using JavaScript code and HTML tags.

Describe how the JavaScript code is translated using an interpreter.

.....

.....

.....

..... [2]

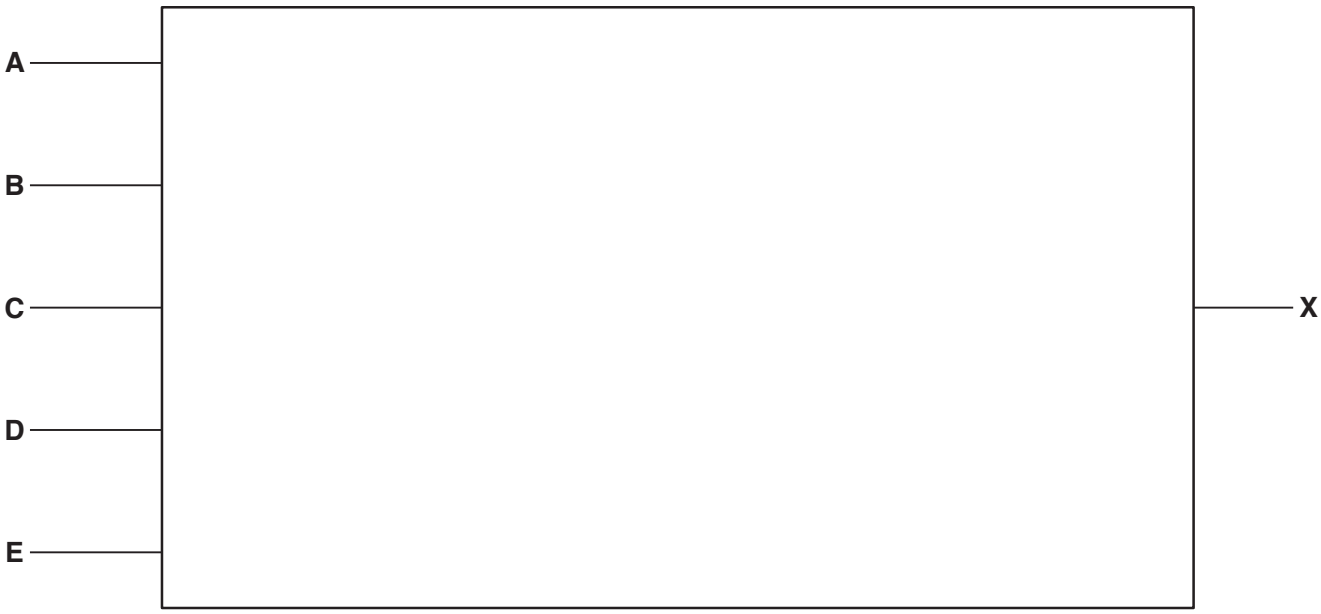
3 **(a)** A bank approves a customer for an account based on the criteria in the following table.

| Parameter | Description of parameter | Binary value | Condition |
|---|---|---|---|
| **A** | Employed | 1 | True |
| | | 0 | False |
| **B** | Self-employed | 1 | True |
| | | 0 | False |
| **C** | Over 21 | 1 | True |
| | | 0 | False |
| **D** | Earn more than 30 000 | 1 | True |
| | | 0 | False |
| **E** | Another account | 1 | True |
| | | 0 | False |

A customer is approved (**X** = 1) if the person:

- is over 21 **and** employed
  **or**
- is over 21 **and** self-employed **and**
  - **either** earns more than 30 000
    **or**
  - has another account.

Draw a logic circuit to represent the model.




[5]

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

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

4 Customers of a bank can access their account information by logging in on the bank's website.

**(a)** The bank has a client-server model of networked computers.

**(i)** Describe, using the bank as an example, the key features of a client-server model.

.....

.....

.....

.....

.....

..... [3]

**(ii)** Give **two** other examples of applications that can use the client-server model.

1 .....

.....

2 .....

.....

[2]

**(b)** The bank's customers log in to the website using a web application.

Explain why the web application uses server-side scripting.

.....

.....

.....

.....

.....

..... [3]

**(c)** The bank is upgrading its local area network (LAN) copper cables to fibre-optic cables.

**(i)** State **two** benefits to the bank of upgrading to fibre-optic cable from copper cable.

1 .....

.....

2 .....

.....

[2]

**(ii)** State **two** drawbacks of upgrading to fibre-optic cables.

1 .....

.....

2 .....

.....

[2]

**(d)** The bank uses a relational database, `ACCOUNTS`, to store the information about customers and their accounts.

The database stores the customer's first name, last name and date of birth.

The bank has several different types of account. Each account type has a unique ID number, name (for example, regular or saving) and bonus (for example, $5.00, $10.00 or $15.00).

A customer can have more than one account.

Each customer's account has its own ID number and stores the amount of money the customer has in that account.

The bank creates a normalised, relational database to store the required information. There are three tables:

- `CUSTOMER`
- `ACCOUNT_TYPE`
- `CUSTOMER_ACCOUNT`

**(i)** Write the attributes for each table to complete the database design for the bank.

`CUSTOMER(` .....

.....

.....`)`

`ACCOUNT_TYPE(` .....

.....

.....`)`

`CUSTOMER_ACCOUNT(` .....

.....

.....`)`

[3]

**(ii)** Identify the primary key for each table that you designed in **part (d)(i)**.

`CUSTOMER` .....

`ACCOUNT_TYPE` .....

`CUSTOMER_ACCOUNT` .....

[2]

**(iii)** Identify **one** foreign key in one of the tables that you designed in **part (d)(i)**.

Table name .....

Foreign key .....

[1]





**[Turn over**

**(iv)** The following table has definitions of database terms.

Write the correct database term in the table for each definition.

| Definition | Term |
|---|---|
| All the data about one entity | |
| The data in one row of a table | |
| A column or field in a table | |

[3]

5 **(a)** The bit depth of an image dictates how many different colours can be represented by each pixel.

**(i)** State the number of different colours that can be represented by a bit depth of 8 bits.

..... [1]

**(ii)** One binary colour is represented by 0100 1110

Convert the unsigned binary number 0100 1110 into denary.

..... [1]

**(b)** Convert the denary number –194 into 12-bit two's complement.

..... [1]

**(c)** **(i)** Convert the Binary Coded Decimal (BCD) value 0110 1001 into denary.

..... [1]

**(ii)** Identify **one** practical application where BCD is used.

.....

..... [1]

**(d)** One example of a character set used by computers is ASCII.

Describe how one character is represented in a character set.

.....

.....

.....

..... [2]





**[Turn over**

**(e)** Data can be compressed using either lossy or lossless compression.

Tick (✓) **one** box in each scenario to identify whether lossy or lossless compression should be used. Justify your choice.

**(i)** A program written in a high-level language.

| Lossy | Lossless |
|---|---|
| | |

Justification .....

.....

.....

..... [2]

**(ii)** A photograph that needs to be emailed to a friend.

| Lossy | Lossless |
|---|---|
| | |

Justification .....

.....

.....

..... [2]

**(iii)** You need to upload a video that you have created to a website.

| Lossy | Lossless |
|---|---|
| | |

Justification .....

.....

.....

..... [2]

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