# Cambridge O Level

| CANDIDATE NAME | |
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**COMPUTER SCIENCE** **3175/12**

Paper 1 Theory **May/June 2021**

**1 hour 45 minutes**

You must answer on the question paper.

No additional materials are needed.

## INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- 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.
- 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.

1 The table contains **three** applications in which a sensor could be used.

Give a suitable sensor that can be used in each application.

A different sensor must be given for each application.

| Application | Sensor |
|---|---|
| monitoring the flow of liquid in a pipe | |
| counting the number of vehicles using a road | |
| controlling an automatic watering system in a greenhouse | |

[3]

2 **Three** data transmission methods and **three** descriptions are given.

Draw a line to connect each transmission method to a correct description.

**Transmission method**                                        **Description**

| simplex |    | data can be sent and received at the same time |

| duplex |    | data can only be sent or received |

| half-duplex |    | data can be sent and received but **not** at the same time |

[2]

3 The Internet relies on the use of IP addressing.

  (a) State what the letters IP represent.

   I .......................................... P ...........................................   [1]

  (b) Describe the role of an IP address.

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   ...................................................................................................................................[2]

**4** Storage media can be magnetic, optical or solid state.

The table shows **five** storage media.

Tick (✓) to show whether each storage media is Magnetic, Optical or Solid State.

| Storage media | Magnetic (✓) | Optical (✓) | Solid State (✓) |
|---|---|---|---|
| Removable Hard Disk Drive | | | |
| Digital Versatile Disc (DVD) | | | |
| Hard Disk Drive (HDD) | | | |
| USB Flash memory | | | |
| Blu-ray disc | | | |

[5]

**5** Describe the role of Random Access Memory (RAM) in a computer.

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**6 (a)** For this logic circuit:
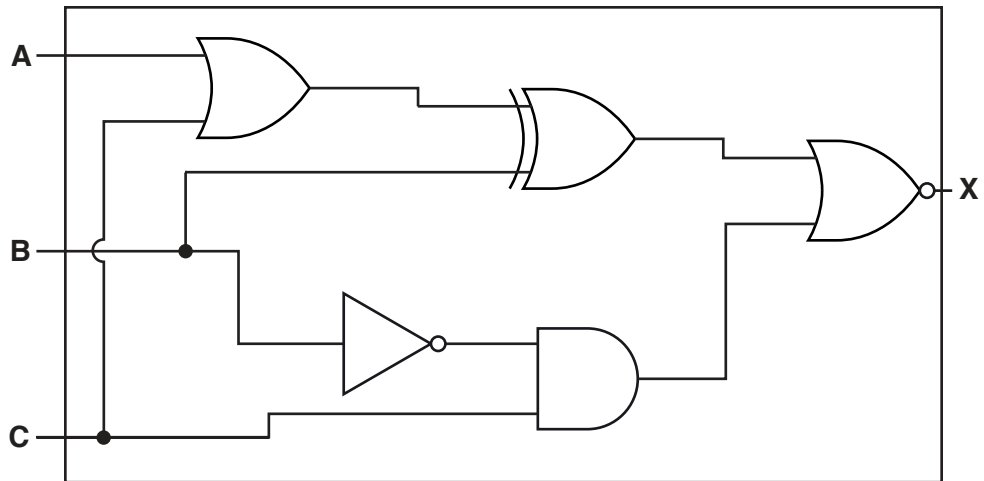


Complete the truth table.

| 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]

**(b)** For this logic circuit:



Write the logic statement corresponding to the given logic circuit.

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7    A Von Neumann model for a computer system makes use of registers and buses.

**(a)** Explain the use of the registers in the fetch-execute cycle.

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**(b)** Name **three** buses used in the fetch-execute cycle.

Bus 1 ...................................................................................................................................

Bus 2 ...................................................................................................................................

Bus 3 ...................................................................................................................................

[3]

**8** An image is to be stored electronically. The image is 1024 pixels wide by 100 pixels high. The image has a 32-bit colour depth.

**(a)** Calculate the file size in kilobytes of the image.

You must show all of your workings.

File size ........................................................ kB

[2]

**(b)** The image is to be compressed. Describe how lossless compression could reduce the file size of the image.

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**9** Malik is setting up a local area network.

**(a)** Three security issues that could affect the network are denial-of-service (DoS) attacks, viruses and hacking.

Explain what is meant by each of these security issues.

Denial-of-service attack ....................................................................................................

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Viruses .............................................................................................................................

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Hacking ............................................................................................................................

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[6]

**(b)** To help protect personal data when it is transmitted over the network, Malik decides to use symmetric encryption.

Explain how symmetric encryption is used to protect the data.

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**(c)** Explain **two** benefits of Malik using serial data transmission to transmit data around the network.

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Benefit 2 ...................................................................................................................................

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[4]

**10** A computer is used to record how many people have entered a concert. This value is stored using 10-bit binary.

The current binary value stored is: 0001110111

**(a)** Convert this binary value to denary.

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**(b)** When the concert starts, 314 people have entered.

State the binary value that will be stored in the computer.

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**(c)** Convert the denary number 314 to hexadecimal.

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11 Some types of software can be described as shareware or free software.

Draw lines to link each description to a correct type of software.

A description can be linked to more than one type of software.

**Description**                                                    **Types of software**

| is subject to copyright legislation |

| code can be modified and redistributed |                                    | shareware |

| a free trial version of the full software |                          | free software |

[2]

12 A system uses odd parity when transferring data.

(a) Indicate the correct parity bits for the data shown.

| Parity bit | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

[2]

(b) A parity check may **not** always be able to detect an error in transmission.

Give a situation in which this could occur.

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**(c)** A parity byte can be used to identify bits that have been incorrectly transmitted in a block of data. The table shows a block of data that uses odd parity.

| | Parity bit | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 |
|---|---|---|---|---|---|---|---|---|
| **Byte 1** | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| **Byte 2** | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 |
| **Byte 3** | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| **Byte 4** | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |
| **Byte 5** | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 |
| **Byte 6** | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| **Byte 7** | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| **Parity byte** | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 |

One of the bits has been transmitted incorrectly.

State the Byte number and Bit number of the incorrect bit.

Byte number ...................................................................................................................................

Bit number ....................................................................................................................................

[2]

**13** Explain why an automatic door that uses a simple sensor and microprocessor system is unlikely to have an operating system.

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14 State **three** functions of a proxy server.

Function 1 .......................................................................................................................

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Function 2 .......................................................................................................................

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Function 3 .......................................................................................................................

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[3]

15 Billie has purchased a 3D printer.

(a) State **one** use of a 3D printer.

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(b) Describe how a 3D printer works.

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**12**

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