**5** Kiara has a washing machine and a refrigerator.

**(a)** She has an embedded system in her washing machine.

Describe what is meant by an **embedded system**, using the washing machine as an example.

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..... [2]

**(b)** The washing machine's embedded system makes use of both Random Access Memory (RAM) and Read Only Memory (ROM).

State the purpose of RAM and ROM within the washing machine's embedded system.

RAM .....

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ROM .....

.....

[2]

**(c)** The temperature in her refrigerator must be kept between 4 and 6 degrees Celsius.

The microprocessor in the refrigerator turns on the cooling if the temperature is too high, and turns off the cooling if the temperature is too low.

Explain why the system in the refrigerator is a control and not a monitoring system.

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..... [2]

**8** Tick (✓) **one** box in each row to identify the logic gate that each statement describes.

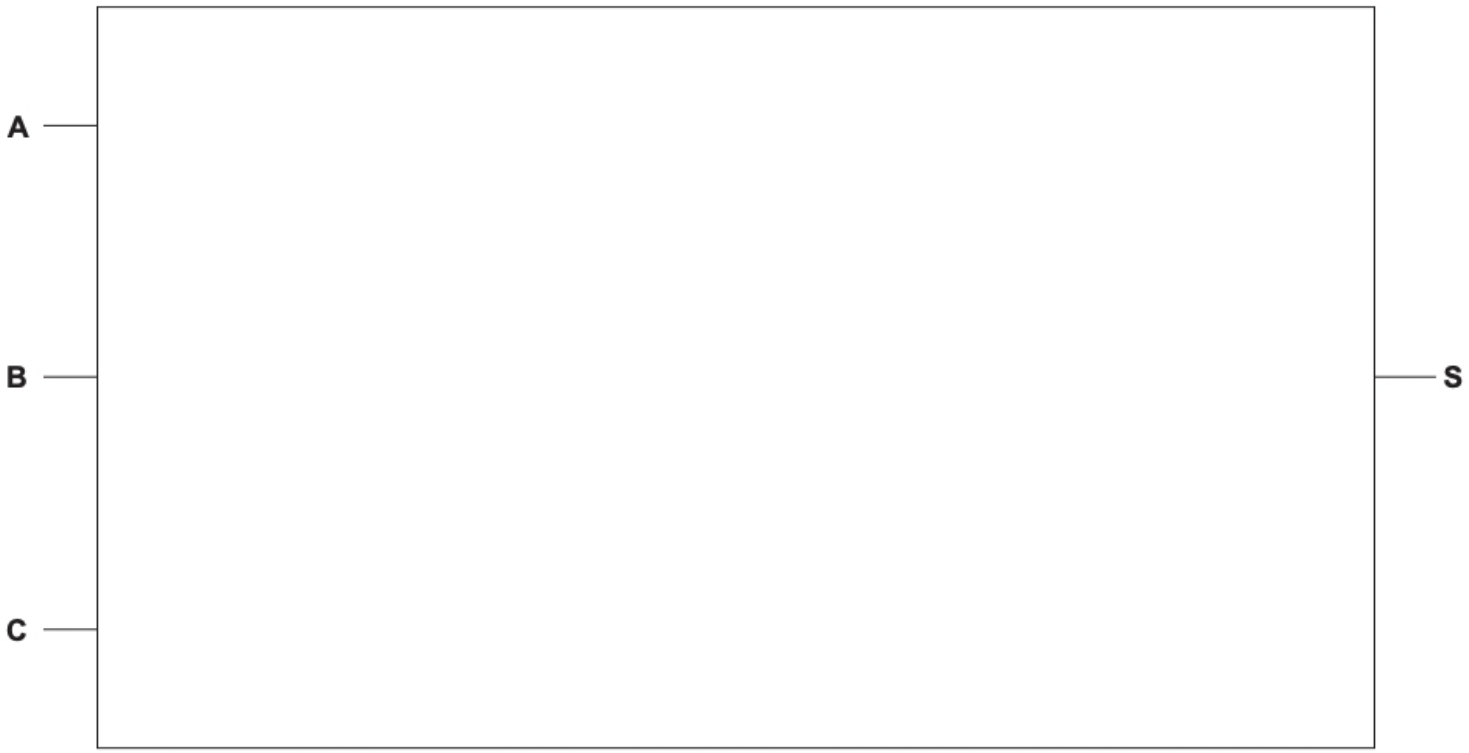
| Statement | AND | NAND | NOR | XOR | OR |
|---|---|---|---|---|---|
| The output is 1 only when both inputs are 1 | | | | | |
| The output is 1 only when both inputs are different | | | | | |
| The output is 1 only when both inputs are 0 | | | | | |

[3]

**3** A logic expression is given:

**S** = (**A** AND **B** AND **C**) OR (**B** XOR **C**)

**(a)** Draw the logic circuit for the given expression.




[4]

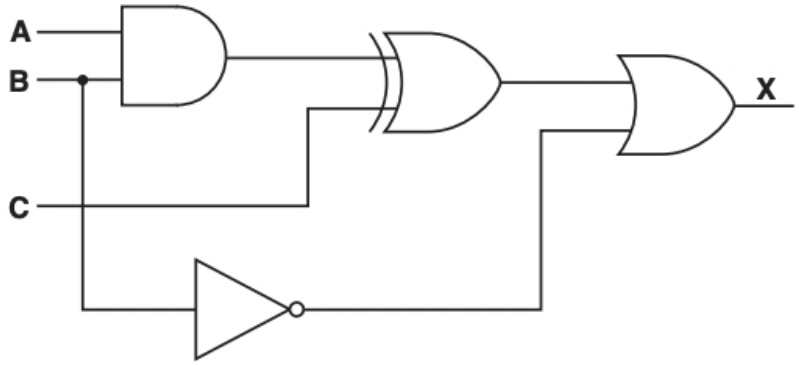
**(b)** Complete the truth table for the logic expression:

**S** = (**A** AND **B** AND **C**) OR (**B** XOR **C**)

| A | B | C | Working space | S |
|---|---|---|---|---|
| 0 | 0 | 0 | | |
| 0 | 0 | 1 | | |
| 0 | 1 | 0 | | |
| 0 | 1 | 1 | | |
| 1 | 0 | 0 | | |
| 1 | 0 | 1 | | |
| 1 | 1 | 0 | | |
| 1 | 1 | 1 | | |

[2]

3 A logic circuit is shown:




**(a)** Write the logic expression for the logic circuit.

.....

..... [3]

**(b)** Complete the truth table for the given logic circuit.

| 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 | | |

[2]

**(c)** Identify **one** logic gate **not** used in the given logic circuit. Draw the symbol for the logic gate **and** complete its truth table.

**Logic gate**: .....

**Symbol**:

**Truth table**:

| A | B | Output |
|---|---|---|
| 0 | 0 | |
| 0 | 1 | |
| 1 | 0 | |
| 1 | 1 | |

[3]

**2** A computer has hardware and software.

**(a)** The hardware includes different types of memory.

**(i)** Complete the description of computer memory.

Random Access Memory (RAM) and Read Only Memory (ROM) are both examples of

..... memory.

One item that is stored in RAM is ..... .

One item that is stored in ROM is ..... .

RAM can be either Static RAM (SRAM) or Dynamic RAM (DRAM).

SRAM uses transistors arranged as ..... .

DRAM uses transistors and ..... .

[5]

**(ii)** Explain the difference between Programmable ROM (PROM), Erasable Programmable ROM (EPROM) and Electrically Erasable Programmable ROM (EEPROM).

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..... [3]

**(b)** A magnetic hard disk is used to store data on the computer.

Describe the principal operations of a magnetic hard disk.

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..... [5]

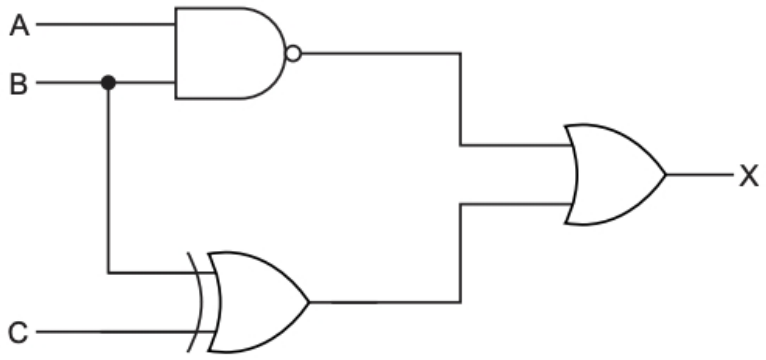
**(c)** Computers consist of logic gates.

**(i)** Complete the table by writing **one** set of values (input 1 and input 2) for each gate that will give the output 1.

| Gate | Input 1 | Input 2 | Output |
|---|---|---|---|
| AND | | | 1 |
| NAND | | | 1 |
| XOR | | | 1 |
| NOR | | | 1 |

[4]

**(ii)** Write the logic expression for the given logic circuit.

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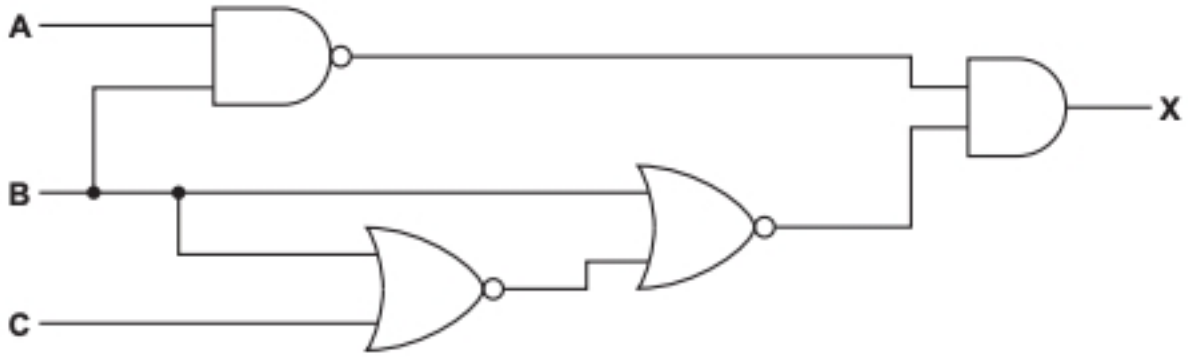
..... [3]

4 Consider the following logic circuit:




**(a)** Complete the truth table for the logic circuit.

| 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)** Identify **three** logic gates **not** used in the logic circuit.

Gate 1 .....

Gate 2 .....

Gate 3 .....

[1]

4 Oliver needs to increase the secondary storage on his computer. He already has several hard disks.

**(a)** Identify **two other** secondary storage devices that Oliver could use. Each device must be different.

1 .....

2 .....
[2]

**(b)** Oliver needs a scanner to make digital copies of some paper documents.

Describe the basic internal operation of a scanner.

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..... [4]

**(c)** Oliver wants to upgrade the RAM in his computer. He is not sure whether his computer has Static RAM (SRAM) or Dynamic RAM (DRAM).

Draw **one or more** lines from each type of RAM to its appropriate description(s).

| **Type of RAM** | **Description** |
| --- | --- |
| | Is less expensive to manufacture |
| SRAM | Needs to be refreshed |
| | Has more complex circuitry |
| DRAM | Is often used as cache |
| | Has faster access time |

[2]

**5** Complete the truth table for the following logic expression:

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

| 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]

2 Kal teaches Computer Science and uses different devices when teaching his students.

**(a)** Tick (✓) **one or more** boxes on each row to indicate whether each device is an input device, an output device, or both.

| Device | Input | Output |
|---|---|---|
| LCD monitor | | |
| Microphone | | |
| Keyboard | | |
| Touchscreen | | |

[2]

**(b)** Kal has built a 3D printer to show students how it works.

**(i)** The steps 1 to 9 describe the basic internal operation of a 3D printer.

The following five statements are used to complete the sequence of steps.

| | |
|---|---|
| **A** | A stepper motor moves the nozzle into position |
| **B** | A fan cools the layer |
| **C** | The software splits the object into slices |
| **D** | The nozzle extrudes the molten plastic |
| **E** | The data about the slices is sent to the printer |

Write one of the letters **A**, **B**, **C**, **D** or **E** in the appropriate step to complete the sequence.

1. The object is designed using Computer Aided Design (CAD) software
2. .....
3. .....
4. The solid plastic is melted and transferred to the nozzle
5. .....
6. .....
7. The steps 5 to 6 are repeated until the layer is complete
8. .....
9. The steps 4 to 8 are repeated for each subsequent layer

[4]

**(ii)** The 3D printer has both RAM and ROM.

Describe the purpose of RAM and ROM in a **3D printer**.

RAM .....

.....

.....

.....

ROM .....

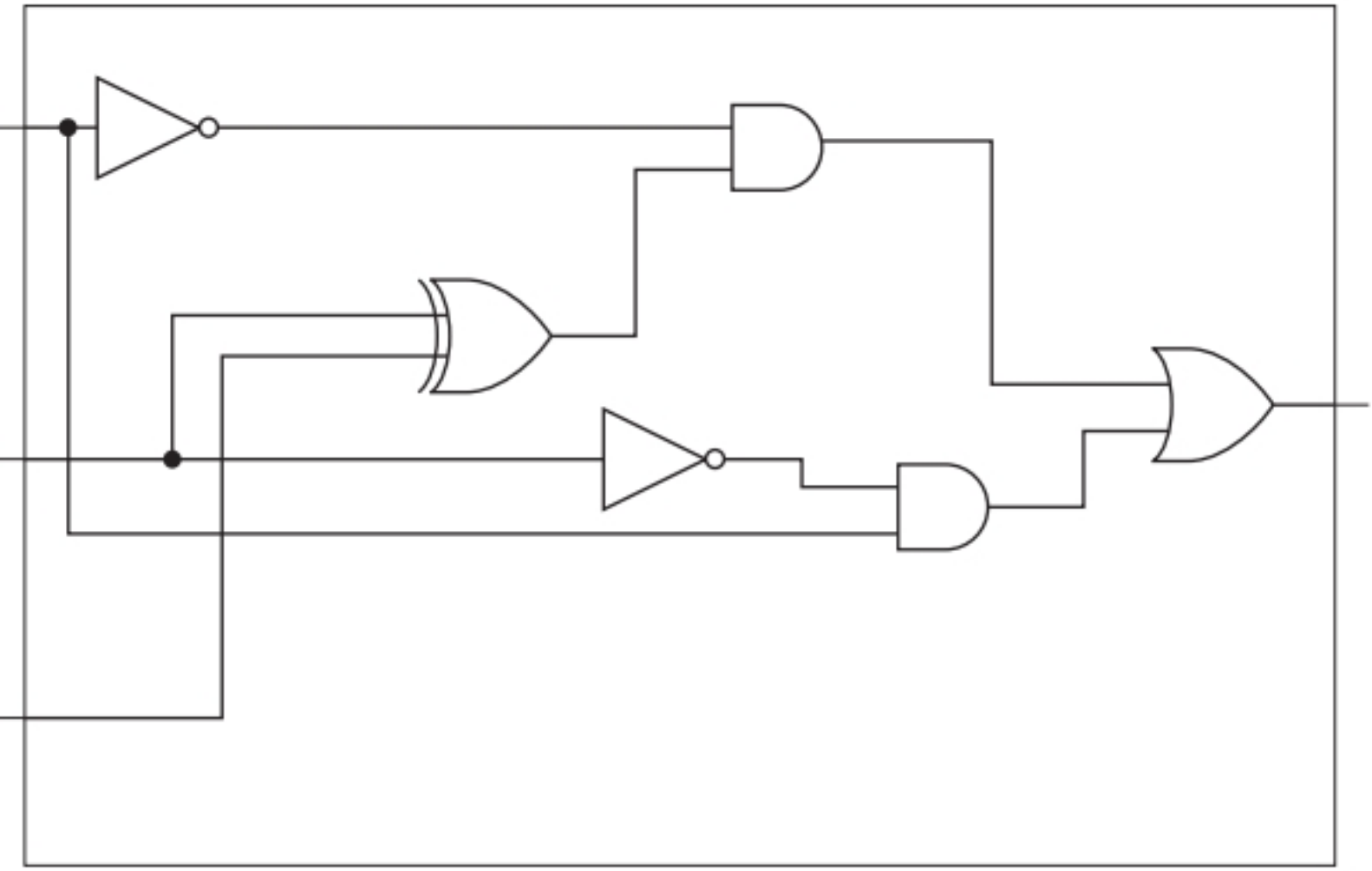
.....

.....

.....

[4]

**a)** A logic circuit is given:



Complete the following truth table for the logic circuit.

| 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 | | |

**(b)** Identify **one** logic gate not used in the logic circuit in **part (a)**.

Draw the symbol for this logic gate **and** complete its truth table.

Logic gate: .....

Symbol:

Truth table:

| Input | | Output |
|---|---|---|
| **A** | **B** | |
| 0 | 0 | |
| 0 | 1 | |
| 1 | 0 | |
| 1 | 1 | |

[3]