

9 Describe the differences between a monitoring system and a control system.

[3]

10 An architect needs a model of a building.

(a) Explain how the model will be printed using a 3D printer.

[3]

(b) State why a 3D printer needs a buffer.

[1]

11 An automated system opens doors when a person is detected within 2 metres. The system closes the doors when there is no longer a person within 2 metres.

Identify whether the automated system is an example of a monitoring system or a control system.

Justify your choice.

Monitoring or Control

Justification

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- 4 A shop installs a new system that allows users to purchase items without going through a manual checkout.

The new system:

- identifies customers when they enter the shop and matches them to their account
- prevents a customer from walking through the automatic barriers if they do not have an account
- automatically detects the items that a customer has taken from a shelf and charges these to the customer's account.

- (a) The new system uses digital cameras and Artificial Intelligence (AI) to identify the customers.

Explain how the new system uses AI to identify each customer.

[4]

- (b)** The new system uses sensors to identify the items taken from a shelf.

Identify **one** type of sensor that can be used in this new system.

State how the sensor can be used to identify the items taken from a shelf.

Sensor

Use

[2]

6 A programmer is buying a new computer.

(a) The programmer is considering the following two computers:

Computer 1	Quad-core 2.2 GHz processor 16-bit architecture 1 GB Random Access Memory (RAM) 500 GB magnetic hard disk
Computer 2	Dual-core 3.8 GHz processor 32-bit architecture 2 GB RAM 500 GB solid state drive (SSD)

(i) Computer 1 has a magnetic hard disk.

Complete the description of the principal operation of a magnetic hard disk by writing the missing words.

The magnetic hard disk has one or more that can be magnetised. These are mounted on a and rotate at high speed.

A is moved across the surface on an arm.

When data is read, the changes in the produce a change in the electric current.

[4]

(ii) The two computers have different amounts of RAM.

Explain how different amounts of RAM affect the performance of a computer.

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(iii) The two computers have different bus widths.

Explain how different bus widths affect the performance of a computer.

[2]

(b) Both computers have an Operating System (OS).

Describe the purpose of an OS in a computer.

[5]

2 Embedded systems are used in many electronic devices.

(a) Describe the drawbacks of embedded systems.

[3]

(b) An embedded system has Dynamic RAM (DRAM).

Identify **one** benefit of using DRAM instead of Static RAM (SRAM) in an embedded system.

[1]

(c) Give **two** differences between Erasable Programmable ROM (EPROM) and Electrically Erasable Programmable ROM (EEPROM).

Difference 1

Difference 2

[2]

9 A road bridge has a weight limit and a height limit for vehicles. For example, a vehicle must weigh less than 10 000 kg and must have a height of less than 3 m.

The bridge has a warning system. If a vehicle is approaching the bridge and it exceeds one or both limits, a sign displays a warning telling the driver of the vehicle to stop.

(a) The bridge warning system uses sensors to detect if a vehicle exceeds the limits.

Complete the table by identifying **two** different sensors that could be used by the system **and** describe how each sensor is used by the system.

Sensor	Use in bridge warning system

[2]

(b) Explain whether the bridge warning system is an example of a monitoring system or of a control system.

[2]

2 A memory buffer uses Dynamic RAM (DRAM).

(a) Identify **two** differences between DRAM and Static RAM (SRAM).

Difference 1

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Difference 2

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(b) Explain how a memory buffer is used when a computer is transferring data to its magnetic hard disk drive.

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[4]

3 A car has an automatic braking system.

A sensor is used to measure the distance to objects that are in front of the car.

The car automatically brakes if an object is too close to the front of the car or the distance between the car and the object is decreasing too quickly. The closer the object is to the front of the car, the harder the car brakes so that the car slows down more quickly.

Explain the reasons why the automatic braking system of the car is a control system.

[3]

- 2 A video doorbell is attached to the front door of a house. The doorbell uses a motion sensor to detect when a visitor walks in front of the door. When the motion sensor is activated:
- The digital camera in the doorbell starts recording a video.
 - A message is transmitted to a smartphone so that the person who lives in the house can watch the video.

The doorbell also has a button that can be pressed. When the button is pressed, a message is transmitted to a smartphone to play the doorbell sound.

The videos are stored on the doorbell’s internal secondary storage device and overwritten when the secondary storage device is full.



- (a) The video doorbell can be considered an example of an embedded system.
- Identify **two** characteristics of the doorbell that suggest it is an embedded system.
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- [2]
- (b) State whether the video doorbell is a monitoring system or a control system.
- Justify your choice.
- Monitoring or control system

Justification

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(c) The video doorbell has both primary memory and secondary storage.

(i) Identify **two** items of data that the video doorbell will store in primary memory.

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(ii) The video doorbell has a solid state (flash) secondary storage device.

Complete the table by writing the answer or answers to each statement about the principal operation of solid state (flash) memory.

Statement	Answer
the two types of logic gate that can be used to create solid state devices	1 2
the number of transistors contained in each cell	
the type of gate that can retain electrons without power	
the type of gate that allows or stops current from passing through	

[4]

(iii) The video doorbell uses a buffer.

Describe how the video doorbell will use the buffer.

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[2]

(d) The digital camera has a microphone which is used to record the sound for the video.

The user changes the sampling rate that the microphone uses from 44.1 kHz to 88.2kHz.

Describe how this change in sampling rate will affect the performance of the video doorbell.

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(e) The video doorbell allows both real-time and on-demand bit streaming.

(i) State what is meant by bit streaming.

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(ii) Give **two** differences between real-time and on-demand bit streaming.

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