Name: _____

IAL IT Topic 2 Questions

Date:

Time:

Total marks available:

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Questions

Q1.

Mikhail is setting up a local area network (LAN) for his business.

The LAN will only be used by Mikhail and five employees.

Mikhail connects his laptop to the LAN. He uses media access control (MAC) addressing to prevent unauthorised mobile devices connecting to the LAN.

(i) State where the laptop's MAC address is held.

(1)

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(ii) Describe how MAC addressing can be used to prevent unauthorised mobile devices connecting to the LAN.

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(Total for question = 3 marks)

Q2.

Mikhail is setting up a local area network (LAN) for his business.

The LAN will only be used by Mikhail and five employees.

Mikhail could connect devices on the LAN using WiFi or Ethernet.

(i) Give **one** advantage of Ethernet over WiFi for connecting devices on a LAN.

(1)

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(ii) Give **one** advantage of WiFi over Ethernet for connecting devices on a LAN.

(1)

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(Total for question = 2 marks)

Q3.

Some questions must be answered with a cross in a box (☒). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒).

A company that sells flowers has replaced its paper-based transaction system with an IT system.

When flowers are delivered to a customer, the driver records the event on a tablet.

On return to the company's premises the delivery records are transferred from the tablet to the company's IT system.

(i) Identify the method that will transfer the records in the shortest time, **once a connection has been made**.

(1)

☒ **A** Bluetooth

☒ **B** USB C cable

☒ **C** Ethernet cable

☒ **D** Micro USB cable

(ii) The tablet is location aware.

Explain how the tablet 'knows' when it is on company premises.

(2)

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(Total for question = 3 marks)

Q4.

Paula has a network with a home office and wants to add an entertainment room.

Paula has these requirements.

- The existing home office has a PC and network-attached storage device (NAS). These are connected by Ethernet and will remain as they are.
- The internet connection comes into the house in the home office. It will be shared with the rest of the network.
- The rest of the house has a single Ethernet connection from the home office.
- Paula has a laptop that connects to the network by Wi-Fi. This must still be possible.
- The entertainment room will have a media server, a sound system, a projector and a television. These must all have Ethernet connections.
- The sound system will be controlled by the projector via Bluetooth.
- The television will be able to mirror a screen display from any mobile device that has Wi-Fi enabled.

When a video is sent to the projector it requires an Ethernet cable connection but the audio track for that video can be sent to the sound system via Bluetooth.

Explain why the video must be sent by Ethernet but the audio only needs Bluetooth.

(2)

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(Total for question = 2 marks)

Q5.

Website traffic statistics show that mobile devices, such as smartphones, are now used more often than desktop PCs.

Phone calls can be made over the internet using voice over internet protocol (VOIP).

TCP/IP and VOIP both use packets to carry data, but only VOIP can be used for making a phone call.

Explain why TCP/IP is not suitable for making a phone call.

(2)

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(Total for question = 2 marks)

Q6.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

Mikhail is setting up a local area network (LAN) for his business.

The LAN will only be used by Mikhail and five employees.

The completed LAN uses a client-server network model, with six PCs connected to a server via a switch.

(i) Identify the statement that **only** applies to a client-server network model.

(1)

☒ **A** A network of computers where services must be requested from an internet service provider

☒ **B** A network of computers where any computer can provide services to any other computer

☒ **C** A network of computers where services must be requested from one computer

☒ **D** A network of computers where all services are provided over the internet

(ii) A network may be connected by a hub, a router or a switch.

Identify the statement that **only** applies to a switch.

(1)

☒ **A** A device that connects parts of a network together

☒ **B** A device that accepts data from one computer and sends it to another computer

☒ **C** A device that accepts data on multiple input ports and sends it to the correct output port

☒ **D** A device that reads the IP address on data packets and forwards the packet to that IP address

(Total for question = 2 marks)

Q7.

Mikhail is setting up a local area network (LAN) for his business.

The LAN will only be used by Mikhail and five employees.

Mikhail's employees often need to transfer large video files over the network.

The Ethernet cables connecting the LAN are rated at 10 gigabits per second.

(i) Construct an expression to show how long it should take, in seconds, to transfer a 20 gibibyte file.

You do **not** need to do the calculation.

(3)

(ii) In practice, file transfer speeds do not reach 10 gigabits per second.

Give **two** reasons why file transfer speeds do not reach 10 gigabits per second in this cable network.

(2)

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2 .....

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(Total for question = 5 marks)

Q8.

Mikhail is setting up a local area network (LAN) for his business.

The LAN will only be used by Mikhail and five employees.

The LAN uses hardware and software firewalls.

(i) State where the hardware firewall is located.

(1)

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(ii) State where a software firewall is located.

(1)

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(Total for question = 2 marks)

Q9.

An online-only bank needs to store large amounts of data about its customers.
Each customer can generate many transactions every day.

The bank wants to introduce multi-factor authentication to control access to its computer systems.

Describe **one** way in which multi-factor authentication could be implemented.

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(Total for question = 4 marks)

Q10.

In the country of Varma Loko, main roads often run through small villages. The Transport Ministry has installed a traffic management system in each village.

One crossroads in each village has a set of traffic lights controlling the main road and the side roads. The system is controlled by a computer.

These are the system requirements.

- The default setting is for the lights on the main road to be green (go) and the lights on the side roads to be red (stop).

- Proximity and speed sensors are used to detect the two conditions for when the lights will change.

The conditions are:

- when a vehicle stops at a red light on the side road

- when a vehicle enters the village on a main road over the speed limit.

- An emergency vehicle can send a radio signal to change the lights.

- The lights reset to the default setting after a set time.

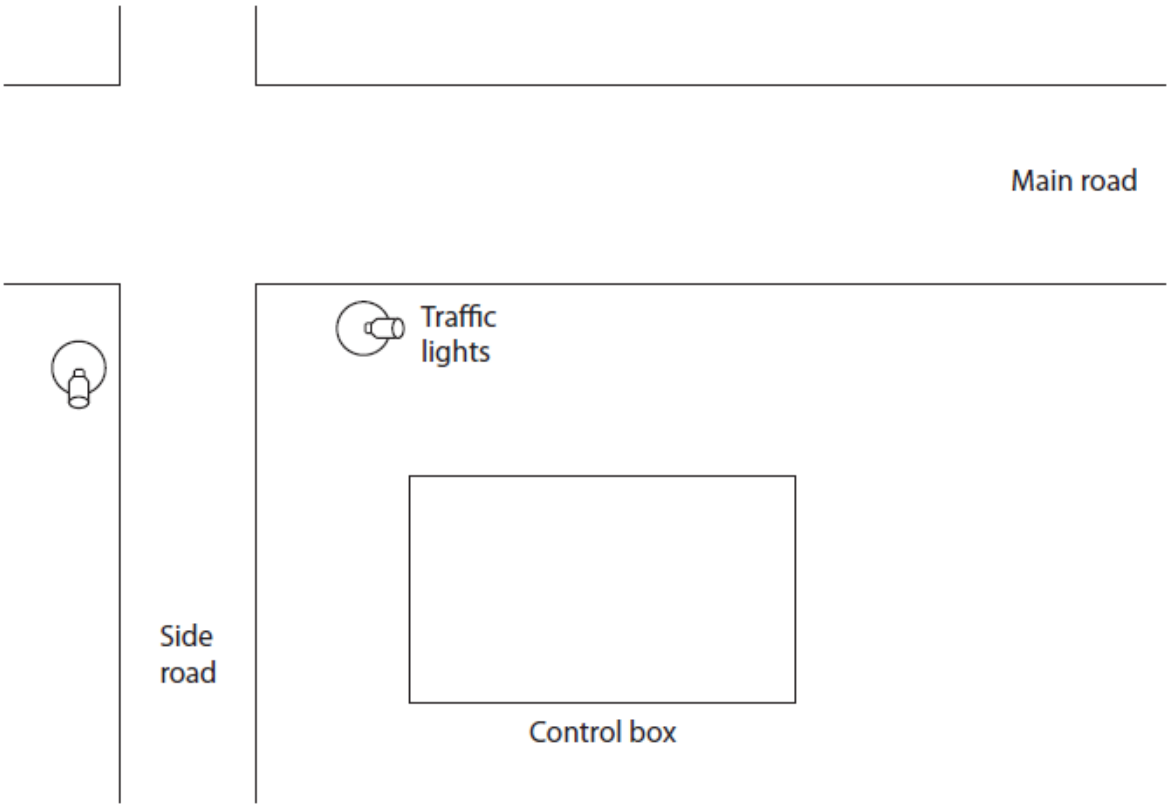
- If a vehicle moves past a red light on any road, a digital camera takes a photo and uploads it to the local police headquarters via the internet.

You only need to show devices and connections for the lower side road and the right-hand part of the main road.

You should:

- represent a cable connection by a solid line
- represent a wireless connection by a line of dashes
- represent network components by a labelled box or symbol
- include appropriate network components in the control box.

(10)



(Total for question = 10 marks)

Q11.

Paula has a network with a home office and wants to add an entertainment room.

Paula has these requirements.

- The existing home office has a PC and network-attached storage device (NAS). These are connected by Ethernet and will remain as they are.
- The internet connection comes into the house in the home office. It will be shared with the rest of the network.
- The rest of the house has a single Ethernet connection from the home office.
- Paula has a laptop that connects to the network by Wi-Fi. This must still be possible.
- The entertainment room will have a media server, a sound system, a projector and a television. These must all have Ethernet connections.
- The sound system will be controlled by the projector via Bluetooth.
- The television will be able to mirror a screen display from any mobile device that has Wi-Fi enabled.

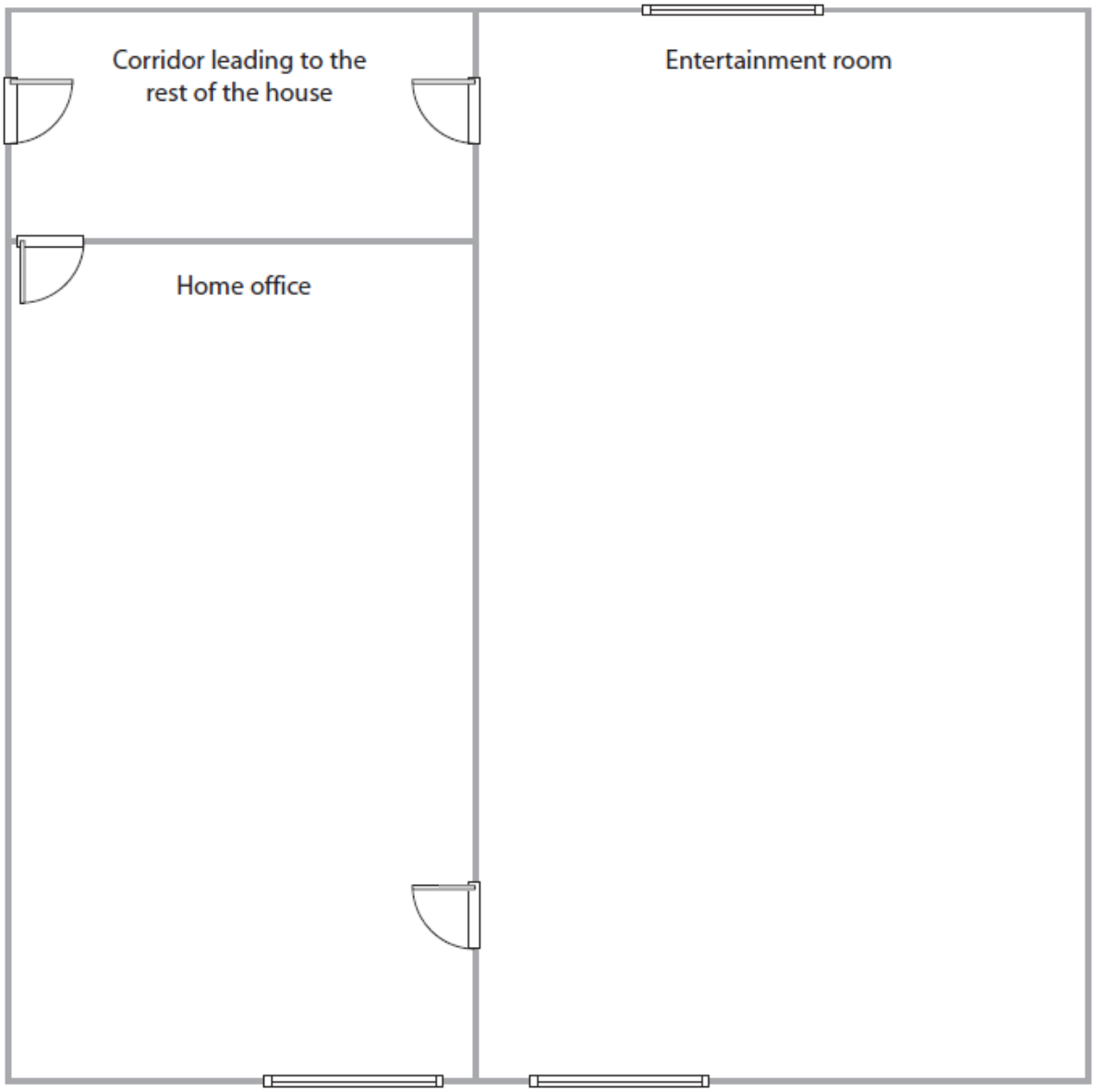
(a) Complete the diagram to show a network design that will meet Paula's requirements.

You must:

- represent an Ethernet connection by a solid line
- represent a wireless connection by a line of dashes.

You may represent network components by a labelled box or symbol.

(10)



(b) Paula's network can be improved by adding a hardware firewall.

(i) Draw an X on your network diagram to show where the hardware firewall should be located.

(1)

(ii) Explain **one** advantage of a hardware firewall over a software firewall.

(2)

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(c) When a video is sent to the projector it requires an Ethernet cable connection but the audio track for that video can be sent to the sound system via Bluetooth.

Explain why the video must be sent by Ethernet but the audio only needs Bluetooth.

(2)

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(Total for question = 13 marks)

Q12.

A bus company provides hop-on hop-off buses for tourists.

The buses run on four routes, stopping at tourist attractions. Speakers by each seat give a commentary on what can be seen as a bus travels around its route.

Customers purchase tickets for one or more routes.

The bus company controls the buses and ticketing from servers at the main bus station.

There is a hot backup system at a secondary bus station. The hot backup duplicates the main system. It is updated in real time and can take over immediately if needed.

A mesh Wi-Fi network links bus stations, buses, and bus stops.

Tickets may be purchased at numerous shops around the city. A ticket is a plastic card holding details of the routes and the date for which it is valid.

Ticket outlets and buses have near field communication (NFC) devices that can read from and write to the tickets.

Each bus stop has a display screen. The screen shows the route and estimated arrival time of the next five buses.

Each bus has a GPS receiver. The buses report their position every minute and the servers

update the display screens.

Complete the diagram to show a network design for the system.

Indicate:

- wired connections by solid lines
- fibre optic connections by double solid lines
- wireless connections by dashed lines
- network components by labelled symbols.

(Total for question = 12 marks)

Q13.

A railway museum consists of two buildings and several outdoor exhibition spaces.

The museum layout is shown in **Figure 2**.

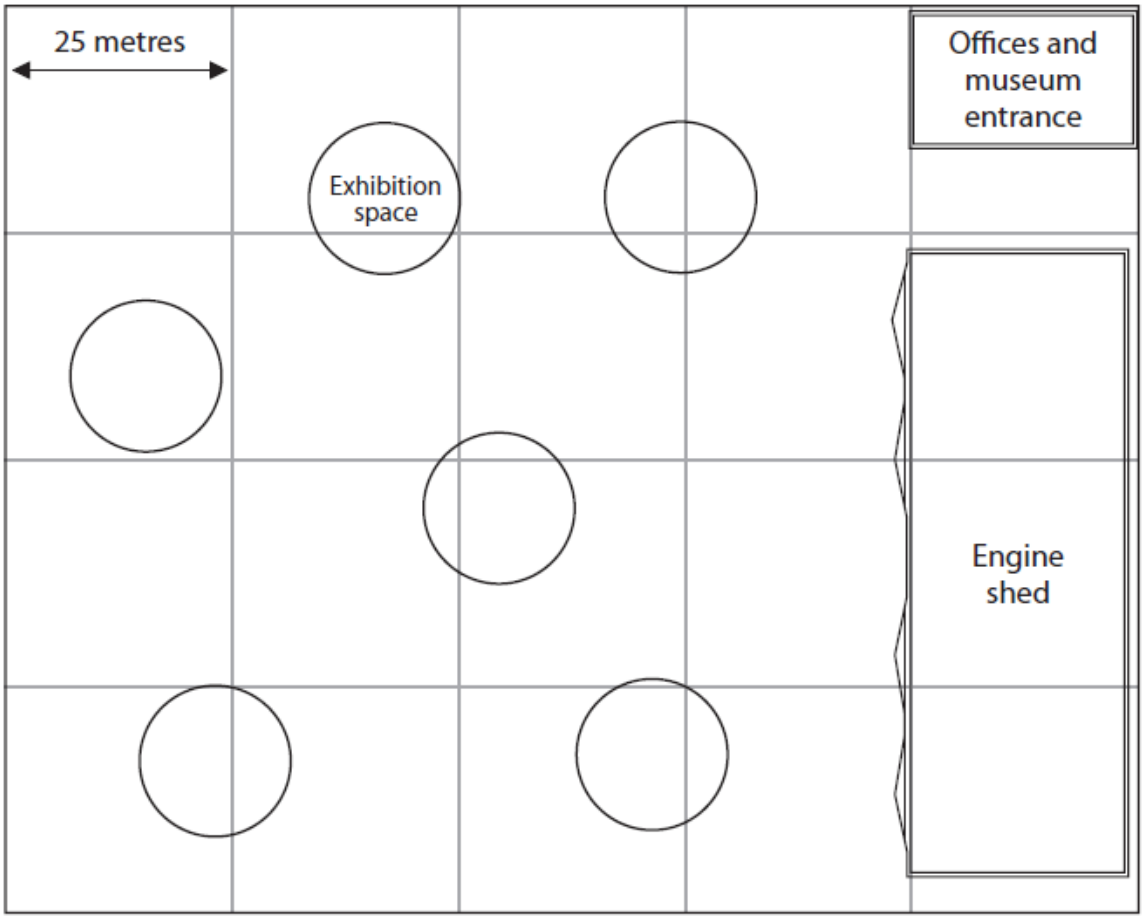


Figure 2

The engine shed, and outdoor exhibition spaces contain a variety of railway-related items.

The museum wants a new network to provide extra facilities for visitors.

The design brief states that the network must:

- provide Wi-Fi for visitors
- have interactive touch screens in the engine shed and outdoor exhibition spaces
- allow museum staff to control the screens from the museum offices
- allow the content being displayed to be altered from the museum offices
- be robust and have minimum risk of outside interference.

Draw and label a network diagram that will meet the design brief.

Represent a wireless connection by a line of dashes.

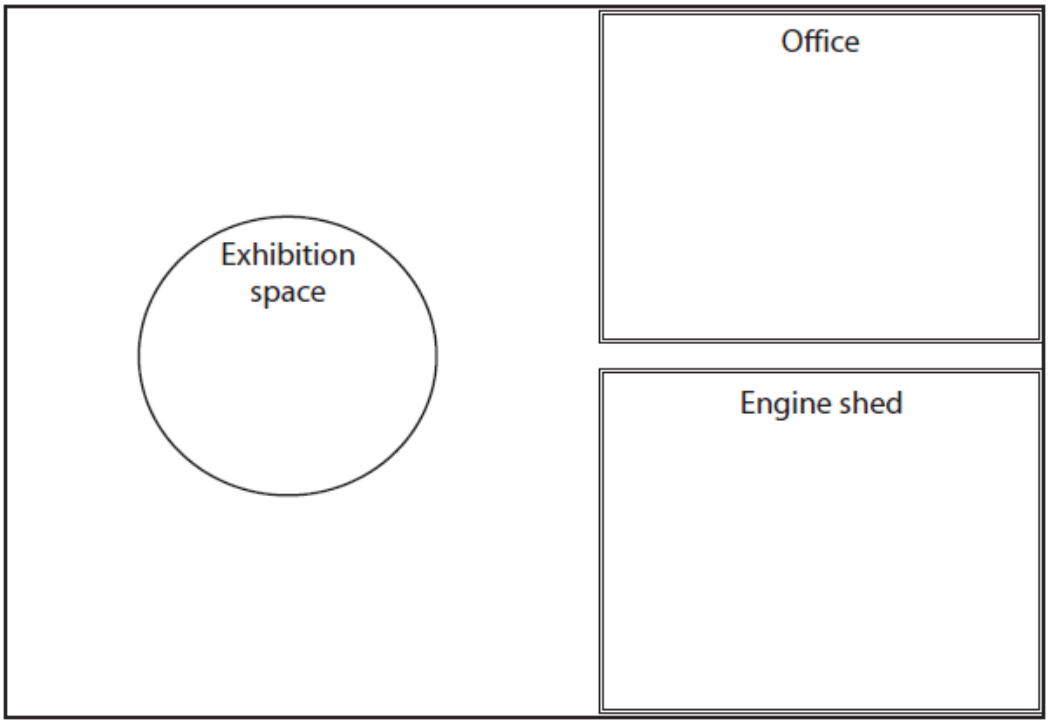
Represent a cable connection by a solid line.

Indicate the cable type(s) to be used.

Use this simplified layout of the museum to draw your diagram.

You need only show one of the exhibition spaces.

(6)



(Total for question = 6 marks)

Q14.

A railway museum consists of two buildings and several outdoor exhibition spaces.

The museum layout is shown in **Figure 2**.

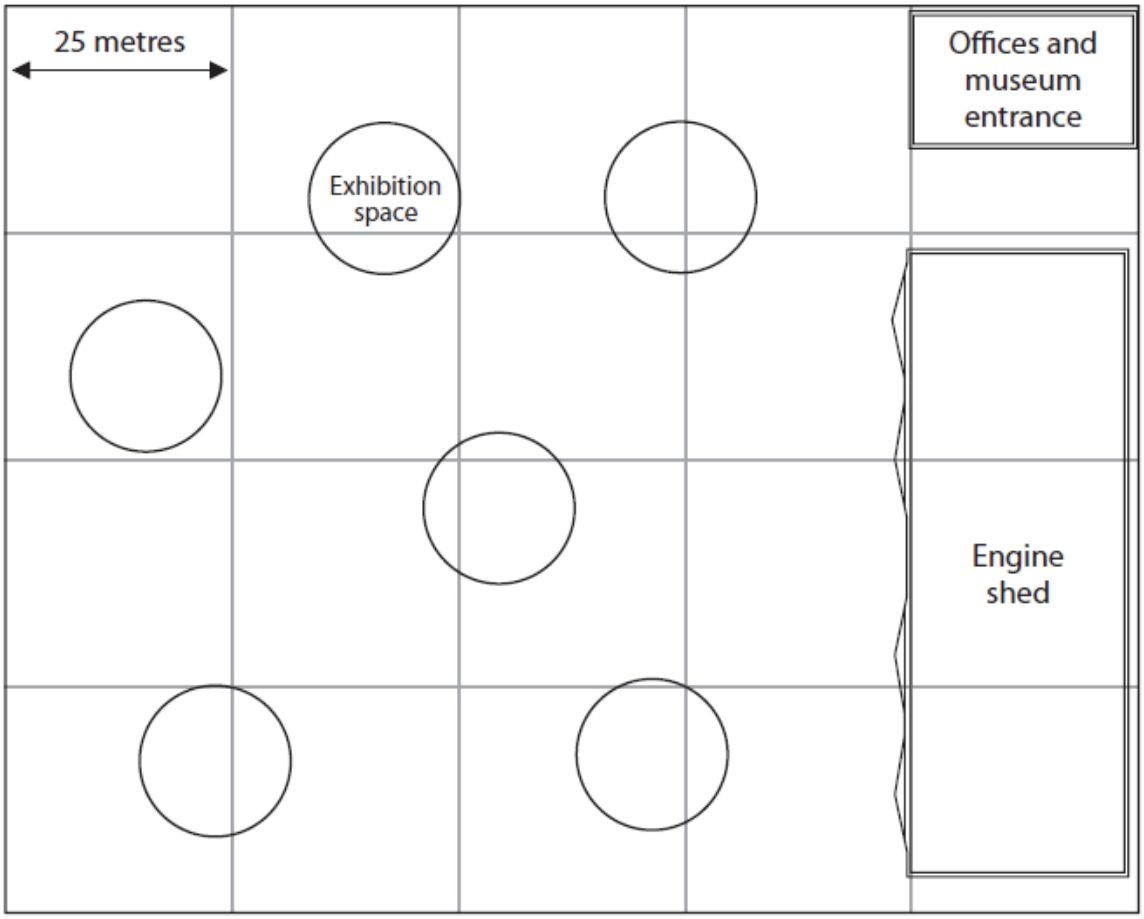


Figure 2

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The design brief states that the network must:

- provide Wi-Fi for visitors
- have interactive touch screens in the engine shed and outdoor exhibition spaces
- allow museum staff to control the screens from the museum offices
- allow the content being displayed to be altered from the museum offices
- be robust and have minimum risk of outside interference.

The museum staff are concerned that hackers might gain unauthorised access to the system via the internet.

Explain what measures could be taken to reduce the threat of hackers from the internet.

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(Total for question = 6 marks)

Q15.

The Open Systems Interconnection (OSI) model is a 7-layer model of communications protocols.

It is used to connect computers over the internet.

Data passing through the layers is encapsulated.

Explain the OSI model using a labelled diagram.

(6)

(Total for question = 6 marks)

Q16.

A holiday camp for teenagers offers a wide range of activities.

The camp is upgrading its network infrastructure to offer the latest in digital games and network access.

The computers in the games room will be used to play multi-player games. The campers play only against each other. They cannot play with people outside the room as the computers cannot connect to the internet. The games require a very quick network response time.

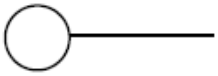
The computers in the office are used by the administration staff. All of the camp's files are stored centrally on the site. The administration team generates a great deal of network traffic between themselves. The network traffic generated by the administration team must not slow down the rest of the camp's network.

The common room is a separate hut 200 metres away from the main building. Campers can use their own tablets and phones to access the Internet in the common room.

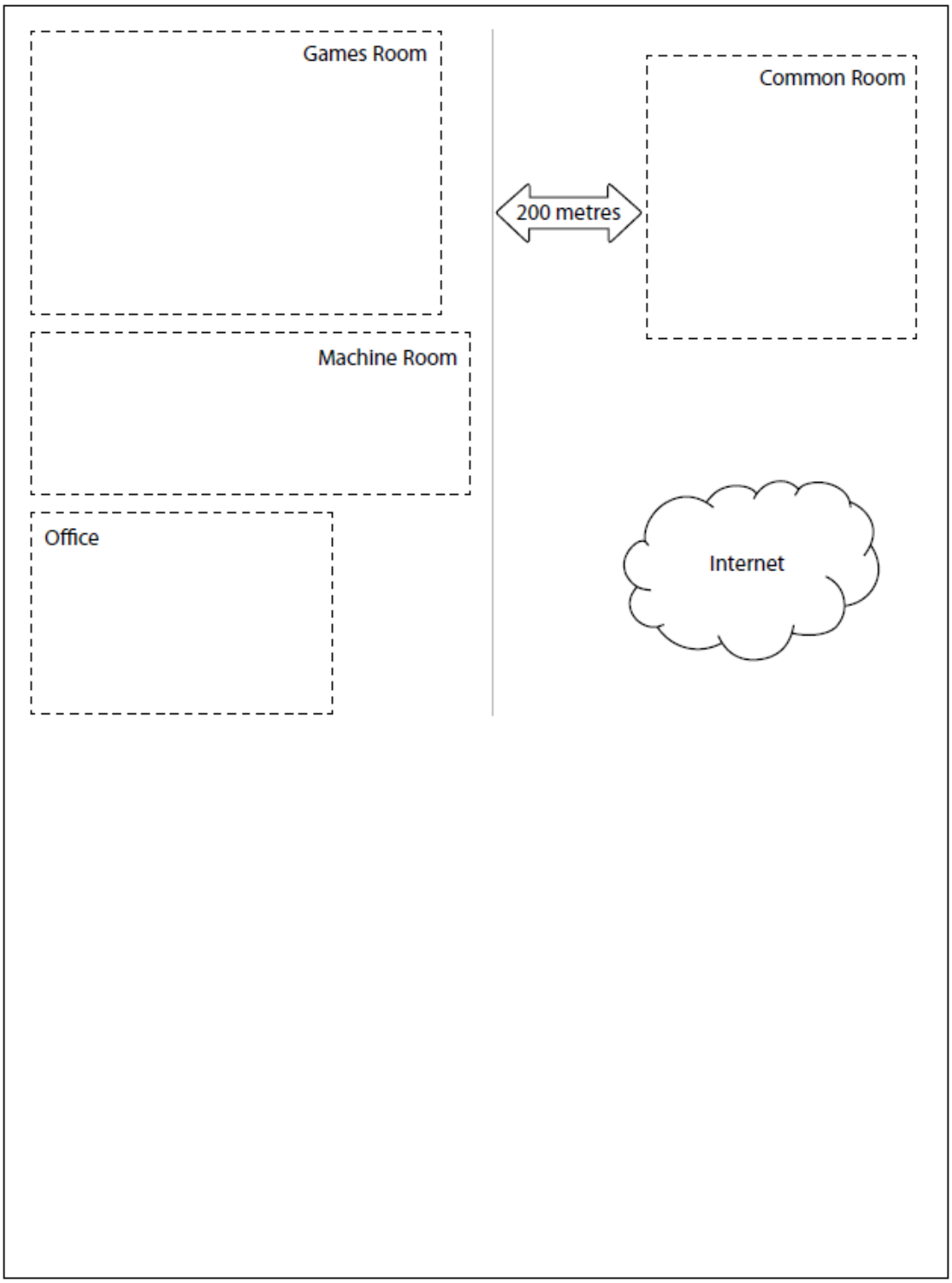
There is a machine room with air conditioning close to the office.

Complete the diagram to show a design for a network infrastructure that will meet these requirements.

A cable is represented by a line. Use labels to make the design clear.
Represent up to 10 machines with this symbol.



(9)



(Total for question = 9 marks)

Q17.

The Open Systems Interconnection (OSI) model is a 7-layer model of communications protocols. It is used to connect computers over the internet.

Data passing through the layers is encapsulated.

Describe the process of encapsulation in this context.

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(Total for question = 3 marks)

Q18.

The Open Systems Interconnection (OSI) model is a 7-layer model of communications protocols. It is used to connect computers over the internet.

Data passing through the layers is encapsulated.

Transmission Control Protocol/Internet Protocol (TCP/IP) is a 4-layer model of communications protocols.

(i) Explain **one** difference between the TCP/IP model and the OSI model. Do not include details of layer names or functions.

(4)

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(ii) Most internet traffic uses Internet Protocol version 4 (IPv4) but this is being replaced by IPv6.

Give **two** reasons why IPv6 is replacing IPv4.

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(Total for question = 6 marks)

Q19.

A holiday camp for teenagers offers a wide range of activities.

Campers retrieve their schedules from a file server. The file transfer program operates at Layer 7 (Application) of the OSI 7-Layer Model.

Describe how the file transfer program passes data from the file server to its peer on the user's device.

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(Total for question = 3 marks)

Q20.

Some questions must be answered with a cross in a box (☒). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒).

Website traffic statistics show that mobile devices, such as smartphones, are now used more often than desktop PCs.

Mobile devices communicate over the internet using the transmission control protocol and internet protocol (TCP/IP).

(i) Identify the correct sequence of layers when data is **sent**.

(1)

☒ **A** Application, transport, internet, link

☒ **B** Application, link, transport, internet

☒ **C** Link, transport, internet, application

☒ **D** Internet, link, application, transport

(ii) State what is meant by a network communication protocol.

(1)

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(Total for question = 2 marks)

Q21.

Visitors to the botanic garden can pay the entry fee by using a near-field communication (NFC) card.

(i) Describe **two** security risks of using NFC transmission for this purpose.

(4)

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(ii) Explain **one** method of protecting the data being transmitted by NFC.

(2)

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(Total for question = 6 marks)

Q22.

Website traffic statistics show that mobile devices, such as smartphones, are now used more often than desktop PCs.

Mobile devices can connect to wireless networks at public Wi-Fi hotspots.

(i) When a device connects to a hotspot it needs an IP address.

IP addresses can be static or dynamic.

Explain why a mobile device should be allocated a **dynamic** IP address.

(2)

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(ii) The mobile device will send its media access control (MAC) address to the hotspot.

Explain why the MAC address is used in making the connection.

(2)

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(Total for question = 4 marks)

Q23.

A small business needs a new IT system.

The design of the new system needs to specify the hardware, software, and processes required.

Discuss how network metrics could be used to evaluate this network.

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(Total for question = 6 marks)