## May/June 2024

**(b)** The exam markers use software that operates as a thin-client to mark the exam papers.

Complete the table by identifying **two** characteristics of a thin-client.

Describe how each characteristic will be used in this software.

| | Thin-client characteristic | Description of use in this software |
|---|---|---|
| 1 | ..... | ..... |
| | ..... | ..... |
| | ..... | ..... |
| | ..... | ..... |
| 2 | ..... | ..... |
| | ..... | ..... |
| | ..... | ..... |
| | ..... | ..... |

[4]

**(c)** Data transmitted on the internet passes through multiple different systems.

**(i)** Describe the role of routers in the transmission of data through the internet.

.....

.....

.....

..... [2]

**(ii)** Describe the role of the PSTN (Public Switched Telephone Network) in the transmission of data through the internet.

.....

.....

.....

..... [2]

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(b)</td><td>1 mark for characteristic<br>1 mark for description of application to examination software:<br><br>
<table>
<tr><th>Thin-client characteristic</th><th>Description of use in this software</th></tr>
<tr><td>Data is not stored on the client computer</td><td>Exam papers are stored on the server and not on the examiner's computer // exam papers are not permanently stored on the examiners' computers</td></tr>
<tr><td>Client computer is reliant on access to server</td><td>Examiners cannot mark if their device cannot access the server / the server 'goes down'</td></tr>
<tr><td>Client computer heavily reliant on network/internet connection</td><td>The marking software will not operate without network/internet access</td></tr>
<tr><td>Client computer requires few local resources/memory</td><td>Examiners can use devices with low resources and the marking software will still function</td></tr>
<tr><td>Client computer performs minimal functions/processes</td><td>The marking software transmits requests, the server responds and sends the response to the user</td></tr>
</table></td><td>4</td></tr>
<tr><td>3(c)(i)</td><td>1 mark each to max 2:<br><br>• Receives packets from internet<br>• Analyses the destination IP address of each packet<br>• Forwards the packet towards its destination<br>• ... using the routing table<br>• Maintains/updates the routing table<br>• Finds the most efficient route to the destination</td><td>2</td></tr>
<tr><td>3(c)(ii)</td><td>1 mark each to max 2:<br><br>• The PSTN consists of many different types of communication lines<br>• … therefore the digital data may need to be converted into a different form/analogue signal<br>• Data is transmitted in both directions at the same time // duplex data transmission<br>• Using a PSTN the communication passes through different switching centres/ISPs</td><td>2</td></tr>
</table>

## October/November 2023

7 A Local Area Network (LAN) contains four devices:

- a router
- two laptop computers
- a server.

**(a)** The server has the IP address 192.168.3.2

Explain why this is **not** an IPv6 address.

.....

.....

.....

..... [2]

**(b)** **(i)** The LAN is set up as a star topology.

Draw a diagram of the topology of the LAN.

[2]

**(ii)** Explain how data is transmitted between the two laptops in the LAN.

.....

.....

.....

..... [2]

(iii) Subnetting can be used to separate a network into logical segments.

Describe **two other** reasons why subnetting is used in a network.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[4]

(c) State **three** tasks performed by devices to deal with collisions when using the Carrier Sense Multiple Access/Collision Detection (CSMA/CD) protocol in a network.

1 .....

.....

2 .....

.....

3 .....

.....

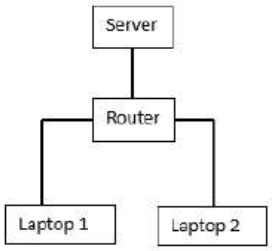
[3]

(d) The following incomplete table contains types of IP addresses and their descriptions.

Complete the table by writing the missing types of IP addresses and the missing descriptions.

| Type of IP address | Description |
|---|---|
| ..... ..... | an IP address that is assigned to a device to allow direct access on the internet |
| static IP address | ..... ..... ..... ..... |
| ..... ..... | an IP address used for internal LAN communication only |
| dynamic IP address | ..... ..... ..... ..... |

[4]

| Question | Answer | Marks |
|---|---|---|
| 7(a) | **1 mark** for each bullet point **(max 2)**<br><br>• Only has four groups of digits // IPv6 has eight groups<br>• Uses dotted notation instead of colons<br>• Because it is a 32 bit / 4 byte address // IPv6 is 128 bits / 16 bytes | **2** |
| 7(b)(i) | **1 mark** for server only connected to router<br>**1 mark** for two laptop computers connected only to router<br><br>  <br> | **2** |
| 7(b)(ii) | **1 mark** for each bullet point (**max 2**)<br><br>• The data from the sending laptop is transmitted to the router<br>• The data has address of recipient<br>• The router determines recipient's destination address<br>• ... by using a routing table<br>• The router transmits data directly / only to recipient | **2** |
| 7(b)(iii) | **1 mark** for each use (**max 2**) and<br>**1 mark** for corresponding expansion (**max 2**)<br><br>• To improve the security of the LAN<br>• … so that devices do not receive unintended data<br>• … so that a compromised device does not expose the whole network<br>• ... so not all devices can access all segments<br><br>• To make the network management easier<br>• … because faults can be isolated more efficiently<br>• ... by appropriate example<br><br>• To make the network easier to expand // For better control of network growth<br>• … by allowing for greater range of IP addresses to be available<br><br>• To improve network performance<br>• To reduce network congestion<br>• … by localising network communications // by dividing data between segments<br>• … so that devices are not flooded with data<br>• … because data sent between devices on the same subnet stays within the subnet | **4** |

<table>
<tr><td>7(c)</td><td>1 mark for each bullet point (max 3)<br><br>• To monitor the communications channel<br>• To send data only when there is no data being transmitted / the line is quiet / idle<br>• To detect a collision and then stop transmissions of further data // transmit a jamming signal<br>• To calculate a random wait time / back-off time<br>• ... then retransmit the data after that random wait time<br>• Increase random time if multiple collisions</td><td>3</td></tr>
<tr><td>7(d)</td><td>1 mark for each highlighted area<br><br><table><tr><th>Type of IP address</th><th>Description</th></tr><tr><td>public IP address</td><td>an IP address that is assigned to a device to allow direct access on the internet</td></tr><tr><td>static IP address</td><td>an IP address that is fixed / doesn't change each time a device re-joins a LAN / network</td></tr><tr><td>private IP address</td><td>an IP address used for internal LAN communication only</td></tr><tr><td>dynamic IP address</td><td>an IP address that may be refreshed / changed each time a device re-joins a LAN / network</td></tr></table></td><td>4</td></tr>
</table>

## May/June 2023

1 A company has a LAN (local area network).

**(a)** Give **two** benefits of connecting computers to a LAN.

1 .....

.....

2 .....

.....

[2]

**(b)** Give **two** characteristics of a LAN.

1 .....

.....

2 .....

.....

[2]

**(c)** One of the company's offices has one server and four computers connected in a star topology.

Draw a diagram to show the layout of the office's star topology.

[2]

**(d)** Computers can be connected using Ethernet.

Describe what is meant by **Ethernet**.

.....

.....

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.....

.....

..... [3]

**(e)** The network runs as a thick-client model.

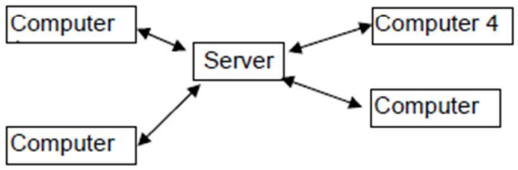
Describe what is meant by a **thick-client** model.

.....

.....

.....

..... [2]

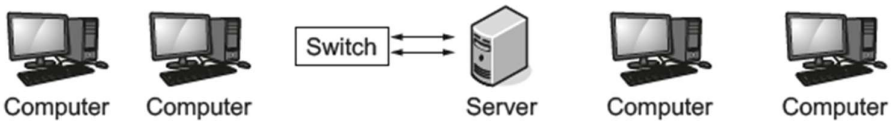
| Question | Answer | Marks |
|---|---|---|
| 1(a) | **1 mark** each to **max 2**<br><br>• Allows the sharing of files/data // Allows communication between the devices<br>• Allows the sharing of resources e.g. hardware / software (applications)<br>• Allows central management // by example, backup, security, etc. | **2** |
| 1(b) | **1 mark** each to **max 2**<br><br>• Covers a small geographical area<br>• The infrastructure is privately owned // not controlled by external organisations | **2** |
| 1(c) | **1 mark** each to **max 2**<br><br>• Each computer directly connected only to the server ...<br>• ... all components correctly labelled<br><br>  | **2** |
| 1(d) | **1 mark** each to **max 3**<br><br>• A protocol (suite)<br>• For **data transmission** over standard / universal **wired** / **cabled** network connections<br>• Uses Carrier Sense Multiple Access / Collision Detection (CSMA/CD)<br>• Data is transmitted in frames<br>• … each frame has a source and destination (IP/MAC) address<br>• ... and error checking data (so damaged frames can be resent) | **3** |
| 1(e) | **1 mark** each<br><br>• The server performs **minimal** / **some processing** for the client<br>• The clients also do **most** of their own processing/work independently // most of the resources are installed locally | **2** |

## October/November 2022

**10** A Local Area Network (LAN) consists of four computers, one server and a switch.

The LAN uses a star topology.

**(a)** Complete the following diagram to show how the hardware is connected.




[1]

**(b)** A router is attached to one of the devices on the LAN shown in **part (a)** to connect the LAN to the internet.

**(i)** Identify the device. Give a reason for your choice.

Device .....

Reason .....

.....

.....

[2]

**(ii)** Describe the role **and** function of the router in the network.

.....

.....

.....

.....

.....

..... [3]

| Question | Answer | Marks |
|---|---|---|
| 10(a) | all four computers directly connected to the **switch** and no other connections. | 1 |
| 10(b)(i) | **1 mark** for the device. **1 mark** for corresponding reason.<br><br>• Device: Server<br>• Reason: Server processes the requests and authorises traffic // firewall software on the server authorises traffic // server acts as the proxy<br><br>• Device: Switch<br>• Reason: Switch is connected to all the computers // to share access to the router on the network | 2 |
| 10(b)(ii) | **1 mark** for each bullet point **(max 3)**:<br><br>• receive packets from devices / internet<br>• find destination of packets using the IP address<br>• forward packets to **the destination**<br>• assign **private** IP addresses to devices on LAN<br>• store/update/maintain a routing table<br>• find most efficient **path** to destination<br>• maintain table of MAC and IP addresses<br>• provides the LAN with a public IP address<br>• acts as a gateway<br>• performs protocol conversion<br>• acts as a firewall | 3 |

## May/June 2022

9 **(a)** The following incomplete table contains four network devices and their descriptions.

Complete the table by writing the missing devices and missing descriptions.

| Device | Description |
|---|---|
| ..... | Receives and sends data between two networks operating on the same protocol |
| Wireless Network Interface Card (WNIC) | ..... ..... ..... |
| ..... | Restores the digital signal so it can be transmitted over greater distances |
| Wireless Access Point (WAP) | ..... ..... ..... |

[4]

**(b)** Describe **three** differences between fibre-optic cables and copper cables.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

**(c)** Ethernet uses Carrier Sense Multiple Access/Collision Detection (CSMA/CD).

Describe CSMA/CD.

.....

.....

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..... [4]

| Question | Answer | Marks |
|---|---|---|
| 9(a) | **1 mark** for each completed name or description<br><br>**Device** / **Description**<br>Router – Receives and sends data between two networks operating on the same protocol<br>Wireless Network Interface Card (WNIC) – Hardware component that allows a device to connect to a wireless network // Provides a MAC address to the device to identify it on the wireless network<br>Repeater – Restores the digital signal so it can be transmitted over greater distances<br>Wireless Access Point (WAP) – Hardware component that provides radio communication from the central device to nodes on the network (and vice versa) | 4 |
| 9(b) | **1 mark** for each difference<br>e.g.<br>• Fibre optic data is transmitted using light, copper cable through electrical signals<br>• Fibre optic has higher bandwidth than copper cable // Fibre optic has higher transmission rates than copper cable<br>• Fibre optic has smaller risk of (noise) interference than copper cable<br>• Fibre optic can be used over longer distances than copper cable before repeaters are needed<br>• Fibre optic is much more difficult to hack into than copper cable<br>• Fibre optic is more prone to damage than copper cable | 3 |
| 9(c) | **1 mark** per point to **max 4**<br><br>• A **workstation** / node (wishing to transmit) listens to the communication channel<br>• …data is only sent when the channel is free // … if channel is free data is sent<br>• Because there is more than one computer connected to the same transmission medium<br>• … two workstations can start to transmit at the same time, causing a collision<br>• If a collision happens, the **workstations** send a (jamming) signal / abort transmission<br>• …and each waits a **random** amount of time before attempting to resend | 4 |

## October/November 2021

**(b)** Andy plays some of the computer games over the internet. He has several devices that connect wirelessly to the router in his house.

**(i)** Identify the topology of Andy's home network. Justify your choice.

Topology .....

Justification .....

.....

[2]

**(ii)** The router has a wireless access point (WAP) to allow the devices to connect wirelessly.

Identify **three** functions of the router in Andy's network.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

| | | |
|---|---|---|
| 3(b)(i) | **1 mark** for identification of star topology<br><br>**1 mark** for justification<br>Devices are connected directly to the router independently<br>// all devices are **only** connected to the router | **2** |
| 3(b)(ii) | **1 mark** for each correct function to **max 3**<br><br>• To receive packets from devices or the Internet<br>• To forward / route packets to the destination<br>• To find the destination of the packet<br>• To assign / allocate private IP addresses to devices on LAN<br>• To store / update / maintain a routing table<br>• To find the most efficient path to the destination<br>• To maintain a table of MAC and IP addresses | **3** |

## May/June 2021

**(c)** Seth accesses both software and data using cloud computing.

**(i)** Give **two** benefits of storing data using cloud computing.

1 .....

.....

2 .....

.....

[2]

**(ii)** Give **two** drawbacks of Seth using cloud computing.

1 .....

.....

2 .....

.....

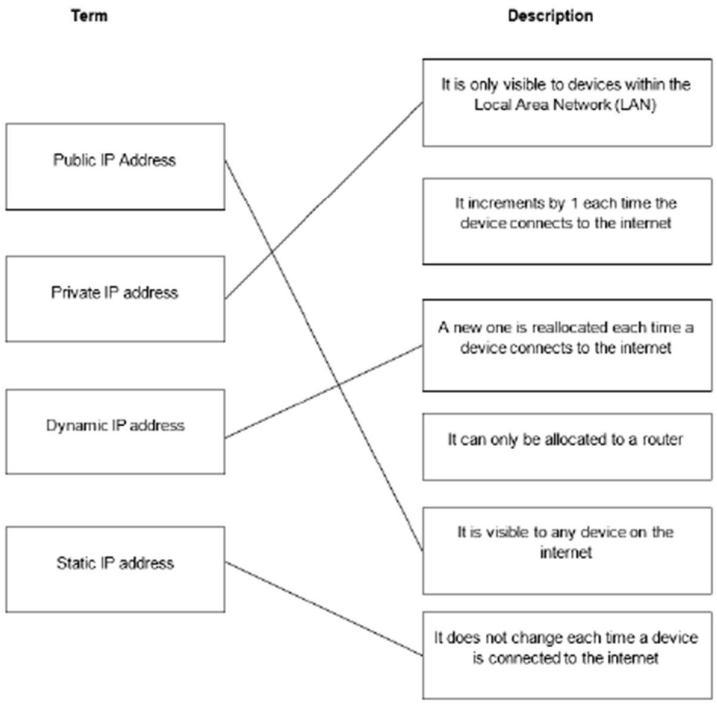
[2]

**(d)** Draw **one** line from each term to its **most appropriate** description.

| Term | Description |
|---|---|
| | It is only visible to devices within the Local Area Network (LAN) |
| Public IP address | It increments by 1 each time the device connects to the internet |
| Private IP address | A new one is reallocated each time a device connects to the internet |
| Dynamic IP address | It can only be allocated to a router |
| Static IP address | It is visible to any device on the internet |
| | It does not change each time a device connects to the internet |

[4]

| | | |
|---|---|---|
| 5(c)(i) | **1 mark** per bullet point to **max 2**<br><br>• Cloud storage can be free (for small quantities )<br>• No need for separate (high capacity) storage devices // saves storage on existing devices<br>• Can access data from any computer **with internet access**<br>• Most cloud data services will have in-built backup/disaster recovery<br>• Security could be better<br>• Can easily increase capacity<br>• Data can be easily shared | **2** |
| 5(c)(ii) | **1 mark** per bullet point to **max 2**:<br><br>• Can only access (the cloud) with internet access<br>• Security may not be strong // no control over security<br>• There may not be any backups // no control over backups<br>• It can take a long time to **upload/download** the data<br>• It can be more expensive in the long term<br>• There could be a limit to the amount of storage unless paid for<br>• There could be compatibility/access issues<br>• There could be issues with the company offering cloud services | **2** |

| | | |
|---|---|---|
| 5(d) | **1 mark** for each correct line<br><br>  <br> | **4** |