

Past-paper walk-through

Types and methods of data transmission ■ 2.1

eXercise

Questions in this set

- 0478/13 N25 Q3 ■ 14 marks
- 0478/11 J24 Q4 ■ 7 marks
- 0478/12 J24 Q2 ■ 7 marks
- 0478/13 J24 Q7 ■ 18 marks
- 0478/11 N23 Q4 ■ 7 marks
- 0478/11 N23 Q7 ■ 4 marks
- 0478/12 N23 Q6 ■ 4 marks
- 0478/12 J23 Q4 ■ 9 marks

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

Question 3

0478/13 N25 ■ Q3 ■ 14 marks

Data is split into packets before it is transmitted across a network.

(a) The diagram shows a packet with three sections.

Complete the diagram by writing the name of each section of the packet.

Write an example in each section of what would be stored in that part of the packet.

The first section is called the

The second section is called the

The third section is called the

[6]

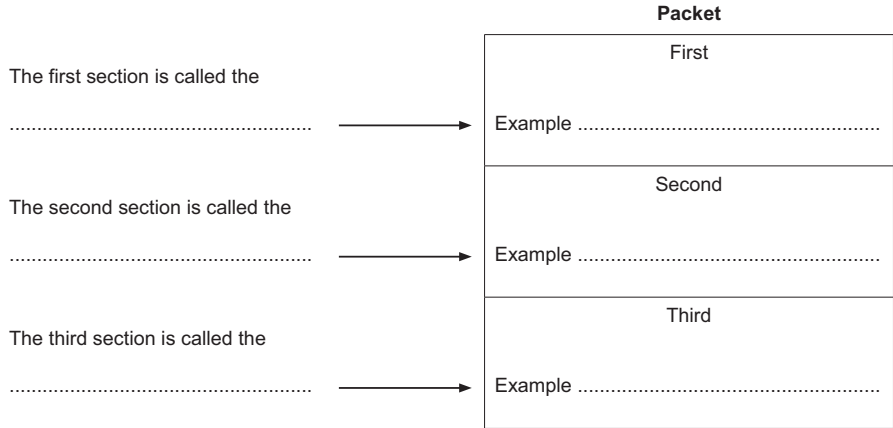
(b)(i) Serial full-duplex

[4]

(b)(ii) Parallel half-duplex

[4]

Question 3



Solution 3

(a) Worked steps

Six marks: **one for each correct section name** and **one for an example of what it stores**. So the answer is three pairs, and a list of three names earns half.

- **Header** — stores the **sender's and recipient's IP addresses**, the **packet number** in the sequence, and the **total number of packets** in the message.
- **Payload** (the body) — the **actual data** being carried, typically about 64 kB of it.
- **Trailer** — a marker showing the **end of the packet**, and an **error-checking method** such as a cyclic redundancy check.

Solution 3

Give a *specific* example for each, not a restatement. “The header stores header information” is the answer that scores nothing; “the header stores the destination IP address” is the one that scores.

Why each exists, which makes the three easy to reconstruct rather than memorise: packets travel **independently by different routes**, so the header must say where a packet is going and where it belongs in the sequence, and the trailer must let the receiver tell whether it arrived intact. [Mark scheme](#)

- One mark for each correct section
- One mark for each correct example of what it stores
- First section

Solution 3

- ■ Header
- ■ Originators/senders (IP) address
- ■ Destination/receivers (IP) address
- ■ Packet number
- Second section
- ■ Payload
- ■ The data itself
- Third section
- ■ Trailer
- ■ End of packet notification

Solution 3

- ■ Error checking data

Solution 3

(b)(i)

Mark scheme

- Four from:
 - Data is sent one bit at a time
 - ... down a single wire
 - Data can be sent in both directions ...
 - ... at the same time

Solution 3

(b)(ii) Mark scheme

- Any Four from:
 - Data is sent multiple bits at the same time
 - ... down multiple wires
 - Data can be sent in both directions ...
 - ... not at the same time
- 4
- October/November
- 2025

Question 4

0478/11 J24 ■ Q4 ■ 7 marks

Data packets are transmitted across a network from one computer to another computer.

(a) Describe the structure of a data packet. [3]

(b) Packet switching is used to transmit the data packets across the network.

Identify the device that controls which path is taken by each data packet. [1]

(c) Serial data transmission is used to transmit the data packets across the network.

Explain why serial data transmission is used to transmit the data packets. [3]

Solution 4

(a) Mark scheme

- Any three from:
 - ■
 - A packet is split into three different sections
 - ■
 - ... the header
 - ■
 - ... the payload
 - ■

Solution 4

- ... the trailer

Solution 4

(b)

Mark scheme

- Router

Solution 4

(c) Mark scheme

- Any three from:
 - ■
 - The network may be spread over a long distance ...
 - ■
 - ... so it is more reliable
 - ■
 - Bits will be sent/arrive in sequence
 - ■

Solution 4

- ...so bits less likely to be skewed
- ■
- Less crosstalk/interference
- ■
- ... so less likely to have errors
- ■
- The data may not need to be transmitted at a fast speed // data transmission speed of serial is adequate
- ■
- The cables in the network only use serial transmission

Question 2

0478/12 J24 ■ Q2 ■ 7 marks

Data can be transmitted from one device to another.

(a) Tick (✓) one box to show which of the terms is **not** a method for transmitting data. [1]

A serial

B simplex

C parallel

D parity

Question 2

0478/12 J24 ■ Q2 ■ 7 marks

Data can be transmitted from one device to another.

(b) Data is broken down into smaller units to be transmitted from one device to another.

Give the name of the unit that data is broken down into.

[1]

Question 2

0478/12 J24 ■ Q2 ■ 7 marks

Data can be transmitted from one device to another.

(c)(i) Explain how data is encrypted using symmetric encryption.

[4]

(c)(ii) Give the purpose of encryption.

[1]

Solution 2

A serial

B simplex

C parallel

D parity



Answer: **D**

Question 7

0478/13 J24 ■ Q7 ■ 18 marks

A company has a network that includes a web server.

Data is transmitted across the network using serial half-duplex data transmission.

(a) Draw and annotate a diagram to show how the data is transmitted using serial half-duplex data transmission.

[4]

Question 7

0478/13 J24 ■ Q7 ■ 18 marks

A company has a network that includes a web server.

Data is transmitted across the network using serial half-duplex data transmission.

(b) Give **two** benefits of the company using serial half-duplex data transmission for this purpose.

1. 2.

[2]

Question 7

0478/13 J24 ■ Q7 ■ 18 marks

A company has a network that includes a web server.

Data is transmitted across the network using serial half-duplex data transmission.

(c) Give **one** drawback of the company using serial half-duplex data transmission for this purpose. **[1]**

Question 7

0478/13 J24 ■ Q7 ■ 18 marks

A company has a network that includes a web server.

Data is transmitted across the network using serial half-duplex data transmission.

(d)(i) Give **three** cyber security threats that the proxy server can help protect against.

1. 2. 3. **[3]**

(d)(ii) Identify **two** functions of the proxy server that can be used to help protect the web server and the network.

1. 2. **[2]**

Question 7

0478/13 J24 ■ Q7 ■ 18 marks

A company has a network that includes a web server.

Data is transmitted across the network using serial half-duplex data transmission.

(e) Customers access the company's web pages that are stored on the web server. Describe how the web pages are located, retrieved and displayed on a customer's computer.

[6]

Solution 7

(a) Worked steps

Two words, two features of the drawing — get both into it and the marks follow. One mark for each correct part.

- **Serial**: the bits are sent **one at a time, along a single wire**, one after another. Draw one line and label the bits in sequence.
- **Half-duplex**: data travels in **both directions, but only one at a time**. Draw arrows in both directions on that single line, and annotate that only one is active at any moment.

So the finished diagram is **one channel**, carrying **one bit at a time**, with **two-way arrows** and a note that the directions **alternate**.

The three contrasts worth keeping straight, because the same question appears with any pairing:

Solution 7

- **Serial vs parallel** — one wire versus several wires side by side.
- **Simplex** — one direction only. **Half-duplex** — both directions, one at a time.
Full-duplex — both directions simultaneously.

The mark most often lost is the “one at a time” annotation on half-duplex. Two-way arrows alone draw full-duplex, and the word that makes it *half* has to be written on the diagram. [Mark scheme](#)

- One mark for each correct part of the diagram.
- The diagram shows:
 - ■
- Bits being sent one at a time

Solution 7

- ■
- Bits being sent over a single wire
- ■
- Data can be sent to and from the web server/network component/computers ...
- ■
- ... not at the same time
- For example:

Solution 7

(b) Mark scheme

- Any two from:
 -
 - Bits will not be skewed // Bits are sent in order
 -
 - Less chance of error
 -
 - Less crosstalk/interference
 -

Solution 7

- Data can be sent over a long distance (if needed)
- ■
- It is possible to download and upload data to the web server
- ■
- Higher bandwidth than full duplex

Solution 7

(c) Mark scheme

- Any one from:
 -
- The transmission of data may be relatively slow
-
- Data cannot be sent and received at the same time
-
- May be more data collisions
- 1 computer web server

Solution 7

- 1
- 0
- 1
- 1
- 0
- 0
- 1
- A single wire is used to send data one bit at a time.
- Data can be sent to and from the web server, but not at the same time.

Solution 7

(d)(i) Mark scheme

- Any three from:
 - ■
 - DDoS // DoS
 - ■
 - Hacking
 - ■
 - Malware // by example
 - ■

Solution 7

- Brute-force attack
- NOTE: three different examples of malware can be awarded.

Solution 7

(d)(ii) Mark scheme

- Any two from:
 - ■
 - Can limit the number of requests sent to the web server at a time
 - ■
 - Can process common requests that will not need to enter the network
 - ■
 - Act as a firewall
 - ■

Solution 7

- Examine incoming data to the webserver/network
 - ■
- Can have set rules/criteria for data to meet
 - ■
- Can have a blacklist/whitelist/list of IP addresses to block
 - ■
- Blocks traffic that doesn't meet criteria
 - ■
- Closing certain ports

Solution 7

(e) Mark scheme

- Any six from:
 - ■
 - The users type the URL into the address bar/web browser
 - ■
 - The web browser sends the URL to the DNS
 - ■
 - The DNS searches for the matching IP address
 - ■

Solution 7

- The DNS returns the IP address to the web browser
- ■
- If the DNS cannot find the IP address it sends the URL to the next DNS
- ■
- The web browser sends a request to the IP address/web server
- ■
- The web server sends the data for the web page to the web browser
- ■
- The web browser renders the HTML data to display the web page

Question 4

0478/11 N23 ■ Q4 ■ 7 marks

4 Data is transmitted between a computer and a printer.

- (a) The data is transmitted one bit at a time down a single wire. The computer can transmit data to the printer and the printer can transmit data to the computer, using the same connection.

Circle the **two** data transmission methods that will transmit data in this way.

parallel full-duplex

parallel half-duplex

parallel simplex

serial full-duplex

serial half-duplex

serial simplex

[2]

- (b) An odd parity check is used to detect errors in the data transmission.

Question 4

Explain how the odd parity check detects errors.

Question 4

- (c) Another error detection method sends the data from the computer to the printer, then a copy of the data received is sent back from the printer to the computer. The two sets of data are compared to see if they match.

State the name of this type of error detection method.

Solution 4

(a)

Mark scheme

- One mark for each correct transmission method:
- —
- Serial half-duplex
- —
- Serial full-duplex
- 2

Solution 4

(b) Mark scheme

- Any four from:
- —
- The number of 1 s/0 s are counted
- —
- A parity bit is added to each byte/7 bits before transmission
- —
- ... to make the sum of the bits/1 or 0 s in each byte odd
- —

Solution 4

- After transmission, if the number is odd no error is detected
- —
- After transmission, if the number is even an error is detected
- 4
- 0478/11
- October/November 2023

Solution 4

(c)

Mark scheme

- –
- Echo (check)
- 1

Question 7

0478/11 N23 ■ Q7 ■ 4 marks

7 Complete the statements about data packets and packet switching.

Use the terms from the list.

Some of the terms in the list will not be used. You should only use a term once.

destination address first footer header last main data packets payload routers servers trailer

Data is broken down into packets. A data packet has a packet that contains the packet number and the Each packet could take a different path from the sender to the receiver; this is controlled by Packets may arrive out of order. Once the packet has arrived, the packets are reordered.

[4]

[4]

Solution 7

- One mark for each correct term, in the correct order:
- —
- header
- —
- destination address
- —
- routers
- —

Solution 7

- last
- 4
- 0478/11
- October/November 2023

Question 6

0478/12 N23 ■ Q6 ■ 4 marks

6 The table contains descriptions about data transmission methods.

Complete the table by identifying which data transmission methods are described.

Data transmission method	Description
	Data is transmitted down a single wire, one bit at a time, in one direction only
	Data is transmitted down multiple wires, multiple bits at a time, in both directions, but only one direction at a time
	Data is transmitted down a single wire, one bit at a time, in both directions at the same time
	Data is transmitted down multiple wires, multiple bits at a time, in one direction only.

[4]

[4]

Question 6

Data transmission method	Description
.....	Data is transmitted down a single wire, one bit at a time, in one direction only.
.....	Data is transmitted down multiple wires, multiple bits at a time, in both directions, but only one direction at a time.
.....	Data is transmitted down a single wire, one bit at a time, in both directions at the same time.
.....	Data is transmitted down multiple wires, multiple bits at a time, in one direction only.

Solution 6

- One mark for each correct data transmission method:
- Data transmission method
- Description
- serial simplex
- Data is transmitted down a single
- wire, one bit at a time, in one
- direction only.
- parallel half-duplex

Solution 6

- Data is transmitted down multiple
- wires, multiple bits at a time, in both
- directions, but only one direction at
- a time.
- serial full-duplex
- Data is transmitted down a single
- wire, one bit at a time, in both
- directions at the same time.
- parallel simplex

Solution 6

- Data is transmitted down multiple
- wires, multiple bits at a time, in one
- direction only.
- 4

Question 4

0478/12 J23 ■ Q4 ■ 9 marks

- 4** A student uses a mobile phone to take photographs for a school project.

The student needs to transmit the photographs to their computer. They could use serial data transmission or parallel data transmission to transmit the photographs.

- (a) (i)** Describe how the photographs would be transmitted using serial data transmission.

Question 4

- (ii) Give **two** benefits of transmitting the photographs using serial data transmission.

Question 4

[2]

- (iii) State **one** benefit of the student using parallel data transmission instead of serial data transmission.

Question 4

- (b) The photographs are also transmitted across a network to cloud storage. A device on the network forwards the data towards its correct destination.
 - (i) State the name of this device.

Question 4

(ii) Describe what is meant by cloud storage.

Question 4

- (iii) Give **one** disadvantage of storing the photographs in cloud storage instead of storing them locally.

Solution 4

(a)(i)

Mark scheme

- Two from:
 - ■
- Data is sent one bit at a time
- ■
- A single wire is used
- 2

Solution 4

(a)(ii) Mark scheme

- Any two from:
 - ■
 - Data won't be skewed
 - ■
 - Less chance of interference/crosstalk/corruption/error
 - ■
 - Transmission speed is adequate
- 2

Solution 4

(a)(iii)

Mark scheme

- ■
- The data may be transmitted quicker
- 1
- 0478/12
- May/June 2023

Solution 4

(b)(i)

Mark scheme

- ■
- Router
- 1

Solution 4

(b)(ii) Mark scheme

- Any two from:
 - ■
 - A collection of servers
 - ■
 - ... that store data in a remote location // that allows data to be accessed remotely
 - ■
 - ... that are (normally) accessed using an internet connection
- 2

Solution 4

(b)(iii) Mark scheme

- Any one from:
- e.g.
- ■
- May be less secure // by example
- ■
- May lose access to them if internet connection lost/not available
- ■
- Reliant on a third party maintaining the hardware // by example

Solution 4

- ■
- Could incur an extra/ongoing fee/cost
- 1