Data Transmission

2.1 Types and methods of data transmission

1 **(a)** State what is meant by the terms:

Parallel data transmission .....

.....

.....

Serial data transmission .....

.....

.....

[2]

(b) Give **one** benefit of each type of data transmission.

Parallel data transmission

Benefit .....

.....

Serial data transmission

Benefit .....

.....

[2]

(c) Give **one** application of each type of data transmission. Each application must be different.

Parallel data transmission

Application .....

.....

Serial data transmission

Application .....

.....

[2]

2 **(a)** State what is meant by the term USB.

.....

.....

[1]

(b) Describe **two** benefits of using USB connections between a computer and a device.

1 .....

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.....

2 .....

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[2]

3 **(a)** Describe what is meant by lossy and lossless compression when applied to files.

Lossy .....

.....

.....

Lossless .....

.....

.....

[2]

(b) Name and describe **one** type of file that uses lossy compression.

Name .....

Description .....

.....

.....

[2]

4 (a) **Three** descriptions of data transmission are given below.

Tick (✓) the appropriate box in each table to show the:

- type of transmission
- method of transmission

Description 1:

Data is transmitted several bits at a time down several wires in both directions simultaneously.

Type	Tick (✓)
simplex	
half-duplex	
full-duplex	

Method	Tick (✓)
serial	
parallel	

Description 2:

Data is transmitted in one direction only, one bit at a time, down a single wire.

Type	Tick (✓)
simplex	
half-duplex	
full-duplex	

Method	Tick (✓)
serial	
parallel	

Description 3:

Data is transmitted one bit at a time down a single wire; the data is transmitted in both directions but not at the same time.

Type	Tick (✓)
simplex	
half-duplex	
full-duplex	

Method	Tick (✓)
serial	
parallel	

[6]

(b) Give **two** reasons why serial transmission, rather than parallel transmission, is used to connect devices to a computer.

1 .....

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2 .....

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[2]

5 **(a)** Explain what is meant by:

(i) Serial data transmission

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.....[2]

(ii) Parallel data transmission

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.....[2]

(b) A computer in a factory is connected to a printer. The printer is located in an office 1 km away from the factory.

Identify which data transmission method would be most suitable for this connection.

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Give **two** reasons for your choice.

1 .....

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2 .....

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.....

[3]

6 Computer A is communicating with computer B.

(a) Draw an arrow or arrows to show simplex, duplex and half-duplex data transmission. The **direction** of the data transmission must be fully **labelled**.

Simplex data transmission

Duplex data transmission

Half-duplex data transmission

Computer **A**

Computer **B**

[6]

(b) State a use for the following data transmission methods. The use must be different for each data transmission method.

Simplex .....

.....

Duplex .....

.....

[2]

7 A file server is used as a central data store for a network of computers.

Rory sends data from his computer to a file server that is approximately 100 metres away.

It is important that the data is transmitted accurately. Rory needs to be able to read data from and write data to the file server at the same time.

(a) (i) Use ticks (✓) to identify the most suitable data transmission methods for this application.

Method 1	Tick (✓)	**Method 2**	Tick (✓)
Serial		Simplex	
Parallel		Half-duplex	
		Duplex	

[2]

(ii) Explain why your answer to **part (a)(i)** is the most suitable data transmission.

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.....[4]

8 Draw a line to connect each term to the correct application.

Term	Application
Simplex	A telephone that can receive and transmit audio signals simultaneously.
Duplex	A two-way radio (walkie-talkie) that can receive and transmit messages, but not at the same time.
Half-duplex	A microphone that transmits data to a MIDI system.

[2]

9 A company transmits data to external storage at the end of each day.

(a) Parity checks can be used to check for errors during data transmission.

The system uses **odd parity**.

(i) Tick (✓) to show for each of the received bytes whether they have been **transmitted correctly** or **transmitted incorrectly**.

Received byte	Transmitted correctly (✓)	Transmitted incorrectly (✓)
10001011		
10101110		
01011101		
00100101		

[4]

(ii) State **one** other method that could be used to check for transmission errors.

..... [1]

(b) Data can be transferred using parallel or serial data transmission.

(i) Describe what is meant by parallel data transmission.

.....

.....

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..... [2]

(ii) Give **one** application of parallel data transmission.

.....

..... [1]

(iii) Explain why serial data transmission is normally used for transferring data over a long distance.

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..... [2]

10 Computers can use different methods of transmission to send data from one computer to another.

Parallel data transmission is one method that can be used.

(a) Explain what is meant by parallel data transmission.

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..... [2]

(b) Give **one** benefit and **one** drawback of parallel data transmission, compared to serial data transmission, over short distances.

Benefit .....

.....

.....

Drawback .....

.....

.....

[2]

(c) Give **one** example where parallel data transmission is used.

..... [1]

11 **(a)** Computers can transmit data using different methods.

Describe the **three** data transmission methods given.

(i) Serial data transmission

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.....

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.....[2]

(ii) Parallel data transmission

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.....

.....

.....[2]

(iii) Duplex data transmission

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.....

.....

.....[2]

12 Data can be transferred using half-duplex serial transmission.

(a) Describe serial transmission.

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.....

.....

.....[2]

(b) Give **one** application of serial data transmission.

.....

.....[1]

(c) Describe half-duplex data transmission.

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.....[2]

13 Sonia shares files with her friends. The method of data transmission she uses is half-duplex serial transmission.

(a) Describe how data is transmitted using half-duplex serial data transmission.

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..... [4]

(b) The system uses parity bits to check for errors during data transmission.

The outcome of four bytes after transmission is:

Byte 1	Byte 2	Byte 3	Byte 4
00110011	01010100	10110100	01110111

One of the bytes has been transmitted incorrectly.

Identify the byte that was transmitted incorrectly.

Byte .....

Explain how you identified the byte that was transmitted incorrectly.

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[4]

14 Maisey purchases a new router and attaches it to her computer. The connection she sets up uses duplex data transmission.

(a) **Five** statements are given about duplex data transmission.

Tick (✓) to show if the statement is **True** or **False**.

Statement	True (✓)	False (✓)
Duplex data transmission can be either serial or parallel		
Duplex data transmission is when data is transmitted both ways, but only one way at a time		
Duplex data transmission is always used to connect a device to a computer		
Duplex data transmission is when data is transmitted both ways at the same time		
Duplex data transmission automatically detects any errors in data		

[5]

(b) Maisey's computer uses an integrated circuit (IC) for data transmission that sends multiple bits at the same time.

State whether the IC uses **serial** or **parallel** data transmission.

..... [1]

15 Blair writes a paragraph about data transmission in her Computer Science examination.

Use the list given to complete Blair's paragraph by inserting the correct **five** missing terms. Not all terms will be used. Terms can be used more than once.

- duplex
- half-duplex
- parallel
- serial
- simplex

..... data transmission is when data is transmitted a single bit at a time. ..... data transmission is when multiple bits of data are sent all at once. If a user wants to transmit data over a long distance, with the highest chance of accuracy, ... data transmission should be used. If data needs to be transmitted in one direction only, for example from a computer to a printer, ... data transmission should be used. If a user has a large amount of data to transmit and this needs to be done as quickly as possible ..... data transmission should be used.

[5]

16 Arjun uses a scanner to create digital versions of some printed documents.

The scanner is attached to his computer using a USB connection.

(a) Tick (✓) to show if the USB connection uses **Parallel** or **Serial** data transmission.

Describe your chosen method of data transmission.

Parallel ☐

Serial ☐

Description

.....

.....

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[3]

17 The data is sent using parallel half-duplex data transmission.

(i) Describe how data is sent using parallel half-duplex data transmission.

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..... [4]

(ii) State **two** drawbacks of using parallel data transmission.

Drawback 1 .....

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Drawback 2 .....

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[2]

18 The data is sent using serial duplex data transmission.

(i) Describe how data is sent using serial duplex data transmission.

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..... [4]

(ii) State **one** drawback of using serial data transmission, rather than parallel data transmission.

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..... [1]

19 **(a)** **Six** statements are given about methods of data transmission.

Tick (✓) to show if each statement applies to serial simplex, parallel simplex, parallel half-duplex or serial duplex data transmission. Some statements may apply to more than **one** data transmission method.

Statement	Serial simplex (✓)	Parallel simplex (✓)	Parallel half-duplex (✓)	Serial duplex (✓)
bits are transmitted along a single wire				
data is transmitted in both directions				
it is only suitable for distances less than 5 metres				
bits from the same byte are transmitted one after the other				
data may **not** arrive in the correct sequence				
data is transmitted in both directions, but only **one** direction at a time				

[6]

(b) A Universal Serial Bus (USB) connection can be used to transmit data from a mobile device to a computer.

Give **three** benefits of using a USB connection for this purpose.

Benefit 1 .....

.....

Benefit 2 .....

.....

Benefit 3 .....

.....

[3]

20 Jermain uses the Secure Socket Layer (SSL) protocol for secure transmission when sending data using the internet.

(a) Explain how the SSL protocol secures the data for transmission.

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.....

.....

..... [2]

(b) Identify an alternative protocol that could be used for secure transmission of data using the internet.

..... [1]

(c) Give **two** ways that a user can identify if a website uses secure data transmission.

1 .....

.....

2 .....

.....

[2]

21 Frederick prints a document that he has typed.

The printer begins to print the document, but then a message is displayed on Frederick's computer to say that the paper has jammed.

(a) Describe the role of an interrupt in generating a message on the computer that the paper has jammed.

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..... [4]

(b) Give **two** other examples of when an interrupt signal could be generated.

1 .....

2 .....

[2]

(c) The type of data transmission between the computer and the printer is serial half-duplex data transmission.

(i) Describe how data is transmitted using serial half-duplex data transmission.

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..... [4]

(ii) Explain why the data transmission needs to be half-duplex rather than simplex.

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..... [2]

22 **(c)** The student sends the sound file to a friend. The file is transmitted across a network that uses packet switching.

(i) Identify **two** pieces of data that would be included in the header of each packet.

1 .....

2 .....

[2]

(ii) Explain how the file is transmitted using packet switching.

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..... [5]

23 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.

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..... [2]

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

1 .....

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2 .....

.....

[2]

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

.....

..... [1]

24 Complete and annotate the diagram to demonstrate how packet switching is used to transmit data across a network, including the use of routers, from Device A to Device B.

[4]

25 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]

26 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]

27 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]

28 Draw and annotate a diagram to represent the role of a router.

[4]

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

(a) Describe the structure of a data packet.

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..... [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.

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..... [3]

30 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.

A serial ☐

B simplex ☐

C parallel ☐

D parity ☐

[1]

(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]

31 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]

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

1 .....

.....

2 .....

.....

[2]

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

.....

..... [1]

32 company decides to create a network for its devices.

All the company devices are within a single room.

The employees will need to use their devices to send data to each other and share files.

The company decides to send data across the network using packet switching.

(a) An employee sends an email to another employee. The email is broken down into packets.

Describe the structure of a packet of data for the email.

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..... [4]

(b) The company decides to use parallel full-duplex data transmission to send the data across the network.

(i) Explain the reasons why the company have chosen this method of data transmission.

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..... [4]

(ii) Give **two** drawbacks of the company using this method of data transmission.

1 .....

.....

2 .....

.....

[2]

(iii) Give **one** other method of data transmission the company could have chosen.

..... [1]

33 **(b)** After a barcode is scanned, data is sent to a stock control system to update the stock value stored for that product.

The data is sent to the stock control system using serial simplex data transmission.

(i) Explain how the data is sent using serial simplex data transmission.

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..... [3]

(ii) Explain why serial simplex is the most appropriate method of data transmission for this purpose.

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..... [3]

(iii) The data is checked for errors after it has been transmitted to the stock control system.

Give **two** error detection methods that could be used for this purpose.

1 .....

2 .....

[2]