

Week 4

IGCSE Computer Science

Homework bundle for this week

本周作业合集

exercises.lol

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1. A packet header contains:
 - ☐ the sender and receiver IP addresses and the packet number
 - ☐ only the actual data
 - ☐ the end-of-packet marker
 - ☐ the whole file
2. In an even-parity system, the parity bit is set so that:
 - ☐ the total number of 1s in the byte is even
 - ☐ the byte always ends in 0
 - ☐ the number is positive
 - ☐ the data is encrypted
3. What does encryption achieve?
 - ☐ it makes intercepted data unreadable to the wrong person
 - ☐ it stops data being intercepted at all
 - ☐ it makes data travel faster
 - ☐ it compresses the data
4. Serial transmission:
 - ☐ sends one bit at a time down one wire and is good over long distances
 - ☐ sends several bits at once down several wires
 - ☐ is always faster than parallel
 - ☐ cannot be used on a network
5. A parity check catches a single flipped bit, but if TWO bits flip the 1-count's parity can still look correct, hiding the error.
 - ☐ True ☐ False
6. Symmetric encryption uses:
 - ☐ a single shared key for both encrypting and decrypting
 - ☐ a public key and a private key
 - ☐ no key
 - ☐ a parity bit

7. Simplex sends data one way only, half-duplex sends both ways but one at a time, and full-duplex sends both ways at the same time (like a phone call).
- ☐ True ☐ False
8. Asymmetric encryption is safer for sharing because only the public key is ever sent — the private key that decrypts the data never has to be shared.
- ☐ True ☐ False
9. A checksum detects errors by:
- ☐ recalculating a value from the received data and comparing it with the sent value
 - ☐ sending the data back to the sender
 - ☐ adding a parity bit
 - ☐ encrypting the data
10. In asymmetric encryption, data is encrypted with the _____ key and decrypted with the _____ key.
- ☐ public; private
 - ☐ private; public
 - ☐ same; same
 - ☐ secret; shared

1. the sender and receiver IP addresses and the packet number

The header carries control info (addresses + packet number); the payload is the data; the trailer marks the end + error check.

2. the total number of 1s in the byte is even

Even parity makes the count of 1s even; the receiver re-counts to detect a single-bit error.

3. it makes intercepted data unreadable to the wrong person

Encryption scrambles data so interception is useless — it does not prevent the interception itself.

4. sends one bit at a time down one wire and is good over long distances

Serial = one bit at a time (cheaper, long-distance reliable); parallel = many bits at once (fast, short-distance).

5. True

That blind spot is why stronger checks (checksums, CRC) are used when reliability really matters.

6. a single shared key for both encrypting and decrypting

Symmetric uses one secret key that both sides must share — the risk is that key being stolen.

7. True

The three modes differ by direction and timing: simplex (one way), half-duplex (take turns), full-duplex (both at once).

8. True

Symmetric encryption's weak point is getting the shared key to the other side safely; asymmetric removes that by keeping the private key secret.

9. recalculating a value from the received data and comparing it with the sent value

The receiver recomputes the checksum; if it differs from the sent one, the data is resent.

10. public; private

The public key encrypts; only the matching private key can decrypt — so the secret key is never shared.

2.1 Types and methods of data transmission

Name: _____ Class: _____ Date: _____

Total: 30 marks

KEY WORDS serial 串行 • packets 数据包 • packet switching 数据包交换
• universal serial bus 通用串行总线 • data transmission 数据传输

Objective

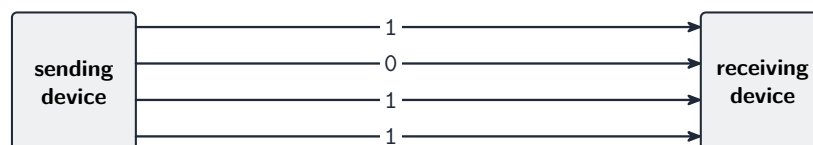
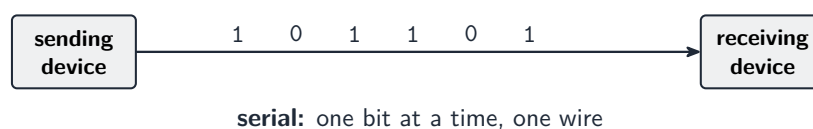
Build the skills to answer exam questions on **data transmission** 数据传输 — **packets** 数据包 and packet switching, **serial/parallel** 串行/并行, and **simplex/duplex** 单工/双工.

You must be able to:

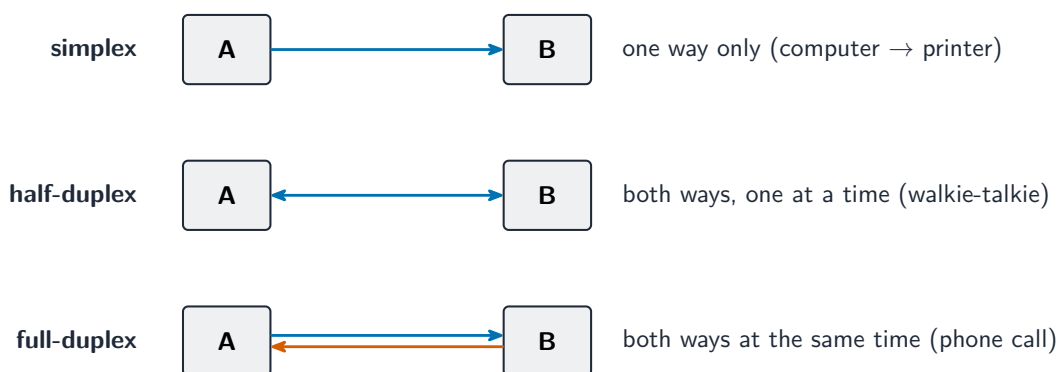
- describe a packet (header, payload, trailer) and packet switching
- compare serial and parallel transmission
- compare simplex, half-duplex and full-duplex

1 Worked examples

■ Transmission methods



Serial: one bit at a time, good over long distances, cheaper. Parallel: several bits at once, short distances



Simplex: one way. Half-duplex: both ways, one at a time. Full-duplex: both ways at once

- a **packet** has a header (addresses, packet number), payload (data) and trailer (error check).

■ Serial or parallel, simplex or duplex, and the checks

Data transmission 数据传输 is described by two independent choices.

Choice	Options	What it means
how many wires	serial 串行	one bit at a time down a single wire
	parallel 并行	several bits at once, one per wire
which directions	simplex 单工	one direction only
	half-duplex 半双工	both directions, but only one at a time
	full-duplex 全双工	both directions at the same time

Serial is used over long distances because it is reliable and cheap: with parallel, bits sent together can arrive at slightly different times (**skew**), and the wires interfere with each other, so parallel is only used over short distances such as inside a computer.

Universal serial bus (USB) is serial and half-duplex. It is widely used because the connector only fits one way, the device is detected automatically and the right driver loaded, it carries power as well as data, and it is an industry standard.

Error checking after transmission. A **parity check** 奇偶校验 adds one parity bit to each byte so that the number of 1s is even (even parity) or odd (odd parity); the receiver counts the 1s and rejects a byte whose count is wrong. It cannot detect two errors that cancel, and cannot say which bit is wrong. A **checksum** 校验和 adds up the bytes in a block and sends the total with it; the receiver recalculates and compares. An **echo check** sends the data back to the sender to be compared with the original, which is thorough but doubles the traffic and cannot say where the error happened. An **automatic repeat request (ARQ)** uses acknowledgements and a timeout to ask for a resend.

Worked example (parity). The byte 0110101 is to be sent with even parity in the eighth bit. It contains four 1s, which is already even, so the parity bit is 0 and the byte sent is 01101010. If the byte arrived as 01101011, the receiver would count five

1s, an odd number, and reject it.

2 Practice

2.1 Name the three parts of a packet. [3]

2.2 State the difference between serial and parallel transmission. [2]

2.3 Identify the type of transmission used by USB, in both senses (serial or parallel, and which directions). [2]

2.4 Complete the parity bit for the byte 1011011 using odd parity, and state the value you chose. [2]

2.5 Give two reasons why USB is widely used. [2]

3 Exam-style questions

3.1 A walkie-talkie, where only one person speaks at a time, uses: [1]

- A simplex
- B half-duplex
- C full-duplex
- D parallel

3.2 Data is sent across a network as packets.

(a) State two benefits of sending data as packets. [2]

(b) Explain why packets may need to be reordered at the receiver. [2]

3.3 A weather station sends readings to a computer 200 metres away.

(a) Identify the method of transmission that should be used over this distance, and explain why. [3]

(b) The station only ever sends data and never receives it. Give the name of this type of transmission. [1]

(c) Each reading is sent as a byte with even parity. Complete the table by giving the parity bit for each byte. [3]

Data bits	Parity bit
0110110	
1111011	
0000001	

(d) Explain why a parity check would not detect the error if two bits were changed during transmission. [2]

(e) Describe how an echo check works, and give one disadvantage of using it. [3]

(f) The computer is connected to a printer with a USB cable. Give two benefits of using USB. [2]

Solutions

2.1 header; payload; trailer.

2.2 serial sends one bit at a time down one wire; parallel sends several bits at once down several wires.

2.3 Serial and half-duplex.

2.4 1011011 has five 1s, which is already odd, so the parity bit is 0; the byte sent is 10110110.

2.5 Any two of: the connector only fits one way; the device is detected automatically and the driver is loaded; it carries power as well as data; it is an industry standard used by almost all devices.

3.1 B. One at a time both ways is half-duplex.

3.2 (a) any two of: only a lost packet is resent (not the whole file); packets can take different routes; many users share the connection.

(b) packets can take different routes and arrive out of order; the packet numbers are used to put them back in the right order.

3.3 (a) Serial transmission; over 200 metres parallel wires would suffer skew, with bits arriving at different times, and the wires would interfere with each other, so serial is more reliable and needs less cable.

(b) Simplex.

(c) 0110110 has four 1s, so the parity bit is 0; 1111011 has six 1s, so the parity bit is 0; 0000001 has one 1, so the parity bit is 1.

(d) A parity check only counts the number of 1s; if one bit changes from 0 to 1 and another from 1 to 0, the count is unchanged and the byte passes the check even though it is wrong.

(e) The data is sent to the receiver, which sends a copy straight back to the sender; the sender compares the returned copy with what it sent, and if they differ the data is sent again. Disadvantage: it doubles the traffic, or it cannot tell whether the error happened on the way out or on the way back.

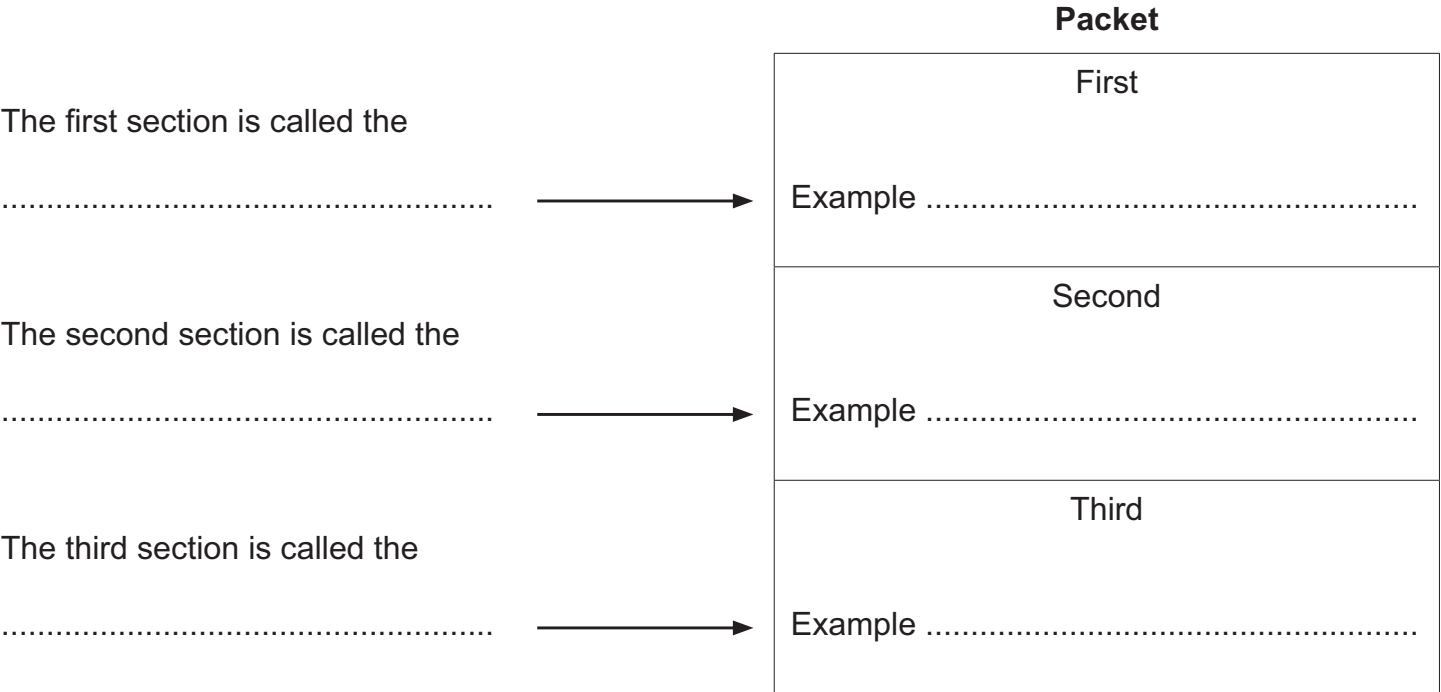
(f) Any two of: the connector fits only one way; the device and driver are detected automatically; it carries power; it is a universal standard.

3 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.



(b) Packets can be sent across a network using different methods of data transmission.

Explain how data is transmitted in the **two** given methods of data transmission.

(i) Serial full-duplex

[4]

(ii) Parallel half-duplex

[4]

4 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]

2 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]



(c) Data is often encrypted when it is transmitted from one device to another.

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

.....

.....

.....

.....

.....

.....

.....

..... [4]

(ii) Give the purpose of encryption.

.....

..... [1]

7 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]

- (d)** The company uses a proxy server to help protect the web server and the network from cyber security threats.

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

1

2

3

[3]

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

1

.....

2

.....

[2]

- (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]

[6]

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.

Explain how the odd parity check detects errors.

[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.

[1]

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]

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 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.

[2]

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

1

2

[2]

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

[1]

(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.

[1]

(ii) Describe what is meant by cloud storage.

[2]

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

2.2 Methods of error detection

Name: _____ Class: _____ Date: _____

Total: 27 marks

KEY WORDS parity check 奇偶校验 • echo check 回送校验 • checksum 校验和
 • parity bit 奇偶校验位 • check digit 校验码

Objective

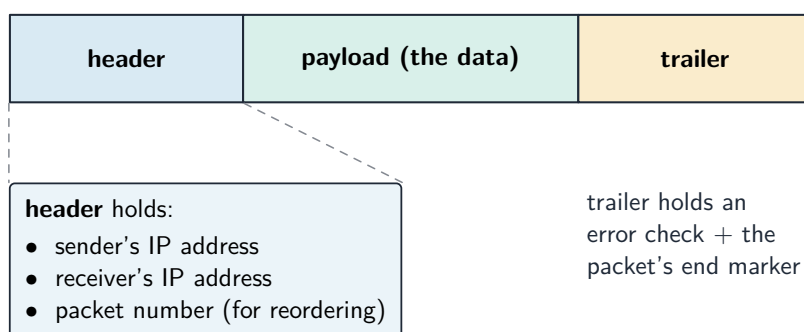
Build the skills to answer exam questions on **error detection** 错误检测 — **parity check** 奇偶校验, **checksum** 校验和, **ARQ** 自动重传请求, and **check digit** 校验码.

You must be able to:

- work out a parity bit and detect a parity error
- describe checksum, echo check and ARQ
- describe a check digit and the errors it catches

1 Worked examples

■ Parity and ARQ



The trailer carries an error check; the receiver checks the data arrived correctly

- **even parity:** total number of 1s must be even; add a parity bit to make it so.
- **ARQ:** receiver sends an acknowledgement; no positive one before the timeout → resend.

■ Networks: name it, then say what it does

LAN or WAN? A **local area network (LAN)** 局域网 covers a small area such as one building and its cabling belongs to the owner. A **wide area network (WAN)** 广域网 covers a large geographical area and uses third-party communication links; the internet is the largest WAN.

The hardware, and what each does:

Device	What it does
network interface card (NIC) 网卡	gives the device its MAC address and lets it connect
switch 交换机	joins devices on one LAN and sends a frame only to the port of the device it is addressed to, using a look-up table of MAC addresses
router 路由器	joins different networks, reads IP addresses and forwards packets towards the right network
wireless access point 无线接入点	lets Wi-Fi devices join the wired network
modem 调制解调器	converts between the computer's digital signal and the analogue signal a telephone line carries

MAC address or IP address? The **MAC address** 物理地址 is fixed in the hardware and identifies the device itself on the local network; it is written as six pairs of hexadecimal digits, such as 00-1C-B3-4F-25-FE. The **IP address** 网际协议地址 identifies the device's position on a network and can change when the device moves to another network. A switch works with MAC addresses; a router works with IP addresses.

Wired or wireless? Wired is faster, more reliable and more secure, because the signal cannot be picked up outside the building; wireless allows movement, needs no cabling and is cheaper to install, but is slower, can be blocked by walls and must be encrypted with a network key.

Worked example. A school connects 30 computers in one room and links them to the internet. Which devices does it need, and why? A NIC in each computer to connect it; a switch to join the computers in the room, because it sends each frame only to the addressed device and so wastes no bandwidth; a router to connect the room's network to the internet, because it forwards packets between different networks using IP addresses; and a wireless access point if tablets must also join.

2 Practice

2.1 State what a parity bit is used for. [1]

2.2 State one error a check digit can detect. [1]

2.3 Give two differences between a LAN and a WAN. [2]

2.4 Identify the device that uses MAC addresses to send data only to the correct port, and the device that connects two different networks. [2]

2.5 Give two advantages of a wired connection over a wireless one. [2]

3 Exam-style questions

3.1 Using **even** parity, the parity bit for the data 1101001 is: [1]

- **A** 0
- **B** 1
- **C** either
- **D** none

3.2 Data is checked using a checksum.

(a) Describe how a checksum detects an error. [2]

(b) Explain why a parity check might fail to detect an error. [2]

3.3 Describe how Automatic Repeat reQuest (ARQ) ensures data arrives correctly. [2]

3.4 A small office has eight computers, a printer and an internet connection.

(a) Identify the type of network the eight computers form, and justify your answer. [2]

(b) Complete the table by naming the device that performs each task. [3]

Task	Device
gives each computer a MAC address and connects it to the network	
sends data only to the port of the computer it is addressed to	
connects the office network to the internet	

(c) Explain the difference between a MAC address and an IP address. [3]

(d) The office adds Wi-Fi for visitors' laptops. Give one benefit and one drawback compared with wired connections. [2]

(e) Explain why the Wi-Fi should use a network key. [2]

Solutions

2.1 to detect an error in a byte after transmission.

2.2 any of: an incorrect digit; a transposition error; a missing/extra digit.

2.3 Any two of: a LAN covers a small area such as one building while a WAN covers a large geographical area; a LAN's cabling belongs to the owner while a WAN uses third-party links; a LAN is usually faster.

2.4 A switch; a router.

2.5 Any two of: it is faster; it is more reliable, with fewer dropouts; it is more secure, because the signal cannot be picked up outside the building.

3.1 A. 1101001 already has four 1s (even), so the even-parity bit is 0.

3.2 (a) the checksum is calculated from the data before sending and re-calculated at the receiver; if the two values differ, an error has occurred.

(b) if two bits flip, the number of 1s may still be correct, so the parity check passes despite the error.

3.3 the receiver sends a positive or negative acknowledgement; if the sender gets no positive acknowledgement before a timeout, it resends the packet.

3.4 (a) A LAN, because the computers are in one building over a small area and the office owns the cabling.

(b) Network interface card (NIC); switch; router.

(c) A MAC address is fixed in the hardware by the manufacturer and identifies the device itself; an IP address identifies where the device is on a network and can change when it joins a different network; a switch uses MAC addresses within the LAN while a router uses IP addresses between networks.

(d) Benefit: visitors can move around and no cabling is needed for them. Drawback: it is slower or less secure, and walls can weaken the signal.

(e) Without a key anyone within range could join the network and could intercept the data being transmitted, so the key encrypts the traffic and keeps outsiders out.

7 Data is sent from an employee’s computer to a server. The data is correct when it is sent, but an error is detected when the data is received.

(a) Describe how an error can occur in the data during transmission.

.....

.....

.....

..... [2]

(b) Methods of error detection and correction can be added to make sure that errors are identified after data is transmitted.

Complete the statements about methods of error detection and correction.
Use terms from the list. **Not** all terms need to be used. You should only use each term once.

- acknowledgement automatic repeat query (ARQ) binary bit
- byte calculation check digit checksum correct
- echo check error even incorrect negative
- number odd positive timeout

A parity check is set to be or

..... A parity is added to each byte before transmission to make it match the set parity.

An involves comparing the data sent to the data received back from the receiving device.

An uses acknowledgement and

..... The acknowledgement system can be or

[8]

5

(a) Explain how the barcode scanning system operates to check for errors.

..... [4]

(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.

..... [3]

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

[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]

- 9 A company owner has installed a new network. Data is correct before it is transmitted across the network.

The company owner is concerned that data might have errors after transmission.

- (a)** Explain how the data might have errors after transmission.

[3]

- (b)** The company owner decides to introduce an error detection system to check the data for errors after transmission.

The error detection system uses an odd parity check and a positive automatic repeat query (ARQ).

- (i) Describe how the error detection system operates to check for errors.

[illegible]

(ii) Give **two** other error detection methods that could be used.

- 1
- 2 [2]

(c) The company owner also installs a firewall to help protect the network from hackers and malware.

(i) Explain how the firewall operates to help protect the network.

-
-
-
-
-
-
-
-
-
- [5]

(ii) Give **two** examples of malware that the firewall can help protect the network from.

- 1
- 2 [2]

6 The table contains statements about error detection methods.

Complete the table by giving the correct error detection method for each statement.

error detection method	statement
.....	An odd or even process can be used.
.....	A value is calculated from the data, using an algorithm. This happens before and after the data is transmitted.
.....	A copy of the data is sent back to the sender by the receiver.
.....	Acknowledgement and timeout are used.
.....	A value is appended to data that has been calculated using the data. This value is checked on data entry.

[5]

2.3 Encryption

Name: _____ Class: _____ Date: _____

Total: 21 marks

KEY WORDS encryption 加密 • symmetric 对称 • symmetric encryption 对称加密
 • asymmetric 非对称 • asymmetric encryption 非对称加密

Objective

Build the skills to answer exam questions on **encryption** 加密 — why it is used, and **symmetric** 对称 and **asymmetric** 非对称 encryption.

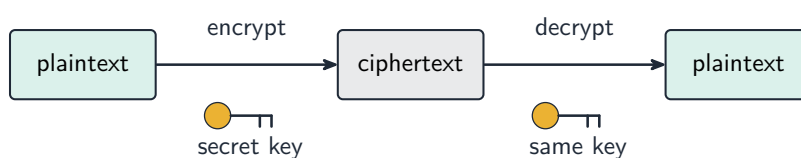
You must be able to:

- explain the purpose of encryption (plaintext → ciphertext)
- describe symmetric encryption (one shared key)
- describe asymmetric encryption (public and private keys)

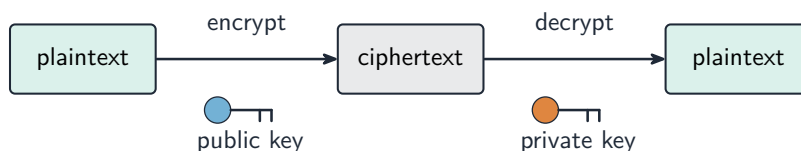
1 Worked examples

■ Symmetric vs asymmetric

Symmetric: one shared secret key



Asymmetric: a public key and a private key



Symmetric: one shared key. Asymmetric: a public key to encrypt, a private key to decrypt

- encryption scrambles data so it cannot be **understood** if intercepted (it does not stop interception).
- plaintext → (encrypt) → ciphertext.

2 Practice

2.1 State the purpose of encryption. [1]

2.2 Name the readable form of data before it is encrypted. [1]

3 Exam-style questions

3.1 In asymmetric encryption, data encrypted with a public key can be decrypted only with the: [1]

- **A** same public key
 - **B** matching private key
 - **C** shared secret key
 - **D** checksum
-

3.2 A company chooses between symmetric and asymmetric encryption.

(a) State the main risk of symmetric encryption. [1]

(b) Explain why asymmetric encryption is more secure for sharing a key. [2]

3.3 State whether encryption stops data being intercepted, and explain. [2]

3.4 A company sends confidential files between two offices over the internet.

(a) Explain why encryption is needed, even though the data is already sent over a private connection. [2]

(b) Describe how **symmetric** encryption works, and state its main weakness. [4]

(c) Describe how **asymmetric** encryption works, naming both keys and explaining which one is used to encrypt and which to decrypt. [4]

(d) Explain the difference between *plaintext* and *ciphertext*, and state why encryption does not stop data being intercepted. [3]

Solutions

2.1 to scramble data so it cannot be understood if intercepted.

2.2 plaintext.

3.1 B. It can be decrypted only with the matching private key.

3.2 (a) the shared secret key could be stolen while being sent.

(b) the public key encrypts and only the private key (kept secret) decrypts; so no secret key ever has to be shared.

3.3 no — encryption does not stop interception; it only stops the intercepted data from being understood.

3.4 (a) Data travelling over the internet passes through equipment the company does not control and can be intercepted; encryption means an interceptor cannot understand the contents even if the data is captured.

(b) The **same key** is used to encrypt and to decrypt the data; the sender encrypts the plaintext with the key and the receiver applies the same key in reverse. Its weakness is **key distribution**: the key itself has to reach the receiver somehow, and if it is intercepted on the way the whole system is broken.

(c) Two mathematically related keys are used — a **public key** and a **private key**. The public key is published and anyone may use it to encrypt a message; only the matching **private key**, which is never shared, can decrypt it; so no secret has to be sent in advance.

(d) Plaintext is the original readable data; ciphertext is the scrambled version produced by the encryption algorithm. Encryption does not hide or block the transmission — the data can still be intercepted; it simply makes the intercepted data meaningless without the key.

6 Data can be encrypted using asymmetric encryption.

(a) Complete the paragraph about asymmetric encryption.

Use the terms from the list.

Some of the terms in the list will **not** be used. You may use a term more than once.

- algorithm binary cipher text compression error
- hardware hexadecimal meaningless plain text private
- public readable transmission unreadable

Data is encrypted using an encryption key. This is a type of
that scrambles the and turns it into
..... . This makes the data
A key is used to encrypt the data. This key cannot be used
to decrypt the data. A key is used to decrypt the data. Any
device is able to request the key, but only your device
knows the key.

[8]

(b) Data can also be encrypted using symmetric encryption.

Give **one** reason why a person would use asymmetric encryption instead of symmetric encryption.

.....
..... [1]

7 Data is encrypted to keep it safe during transmission.

Complete the paragraph about asymmetric encryption.

Use the terms from the list.

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

- asymmetric certificate cipher text
- decrypted encrypted parallel key plain text private key
- protected public key serial key symmetric

..... is encrypted into
using a The encrypted data is then transmitted from the
sender to the receiver. The encrypted data is then decrypted using a
..... .

[4]

7 Data is transmitted using the internet.

(a) The data is encrypted before transmission.

(i) State the purpose of encrypting data.

..... [1]

(ii) Describe the differences between symmetric and asymmetric encryption.

..... [4]

(b) The data is transmitted using packet switching.

(i) Identify **two** items of data contained in a packet header.

1
2 [2]

(ii) Give the purpose of a router in the packet-switching process.

..... [1]

8 (a) Draw and annotate a diagram that demonstrates the cyber security threat of data interception.

[4]

(b) Identify **one** security solution that will help keep data safe from data interception and state why it will help keep the data safe.