

14.2 Circuit switching, packet switching

Name: _____ Class: _____ Date: _____ **Total: 14 marks**

KEY WORDS packet switching 分组交换 • circuit switching 电路交换 • switch 交换机
• packets 数据包 • routers 路由器

Objective

Build the skills to answer exam questions on **circuit switching** 电路交换 and **packet switching** 分组交换.

You must be able to:

- describe **circuit switching** and its trade-offs
- **describe packet switching** clearly (a frequent 4-mark question)
- compare the two and justify which the internet uses

1 Worked examples

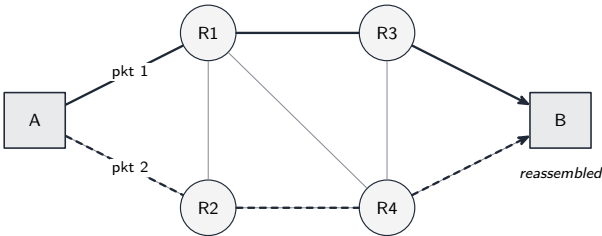
Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ Circuit switching

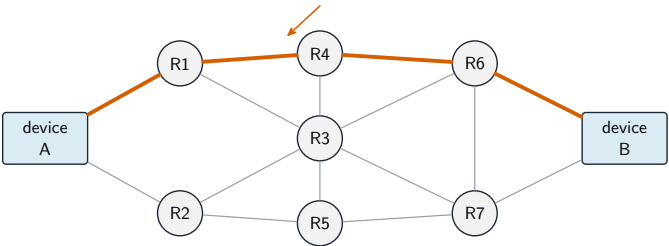
A **dedicated path** is reserved end-to-end **before** any data is sent, kept for the whole conversation, then released. It gives **reserved bandwidth** and in-order delivery, but **wastes** the link during silences and is slow to set up (the old telephone network).

■ Packet switching

The message is split into **packets** that travel **independently**; routers choose each packet's next hop, so packets may take **different routes** and arrive out of order, then are **reassembled** at the destination:



one dedicated path reserved for the whole call



Circuit switching contrasted with packet switching

How to describe it (4 marks): the message is broken into **packets**; each carries the **destination/source address** and a **sequence number**; each packet is routed **independently**; packets may take **different paths** and arrive **out of order**; the destination uses the sequence numbers to **reassemble** them.

■ Comparison

Aspect	Circuit switching	Packet switching
Path	dedicated, reserved	shared, per-packet
Setup	slow	none
Bandwidth	inefficient	efficient
Robustness	one failure cuts the call	reroutes around failures
Suits	voice (constant rate)	web/email (bursty)

2 Practice

Now apply the methods above.

2.1 State what **circuit switching** is.

[1]

2.2 State what **packet switching** is. [1]

2.3 State **one** benefit of circuit switching. [1]

2.4 State **one** benefit of packet switching. [1]

3 Exam-style questions

3.1 Describe packet switching as a method of transmitting a message across the internet. [4]

3.2 State **two** benefits and **two** drawbacks of **circuit switching**. [4]

3.3 Explain why the internet uses **packet switching** rather than circuit switching. [2]

Solutions

Each answer shows the steps, then the **result**.

2.1

- setting up a **dedicated path** between the two ends, reserved for the **whole** communication

2.2

- splitting the message into **packets** that are sent **independently** across the network and reassembled at the destination

2.3

- any one: **reserved bandwidth**; in-order delivery; consistent/low latency once set up

2.4

- any one: **efficient** use of links (shared/multiplexed); **robust** (reroutes around failures); no slow setup

3.1

- any four: message split into **packets**
- each packet has **destination/source address** and a **sequence number**
- each packet routed **independently**, routers choose the next hop
- packets may take **different routes / arrive out of order**
- destination **reassembles** using sequence numbers / requests missing packets — max 4

3.2

- benefits (any two): reserved bandwidth; guaranteed in-order delivery; predictable latency
- drawbacks (any two): wastes capacity during silences; slow to set up; a single link failure cuts the whole circuit

3.3

- packet switching uses links **efficiently** (shared between many conversations)
- and is **robust** — it can reroute packets around a failed link, so the network keeps working