

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

2.5

- **source** IP address
- **destination** IP address
- **sequence number** (packet number)

2.6

- the arrived packets are sorted by sequence number: **1, 2, 3, 5**
- packet **4** is missing, so it must be requested again

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

3.4 any three:

- a **dedicated circuit / channel** is needed
- the circuit is **established before** transmission starts
- data travels as a **stream along the same route**
- the circuit **lasts until the transmission ends**, then is released

3.5 any two, each with **both** sides:

- circuit: one **dedicated route** / packet: each packet **routed individually**
- circuit: uses the **whole bandwidth** / packet: bandwidth **shared**
- circuit: data arrives **in order** / packet: packets must be **reordered**
- circuit: data **not lost** in transit / packet: packets **can be lost**

3.6

(a)

- once set up, the circuit gives a **steady rate** using the whole bandwidth / no intermediate delays
- so the video plays in **real time**, with data arriving **in order** and no reordering delay

(b) any two:

- packets may be **lost** and must be resent
- time is needed to **reassemble** 600 packets at the specialist's end
- **variable delay**: packets on busy routes arrive late
- every packet carries a **header**, adding overhead to the transfer

(c)

- each packet is routed **independently**, so routers **send later packets by another route** round the failed router
- any packets lost at the failed router are **detected as missing** (gap in the sequence numbers)
- and **only those packets are resent**
- the specialist's computer **reassembles** all 600 packets **in order using the sequence numbers**