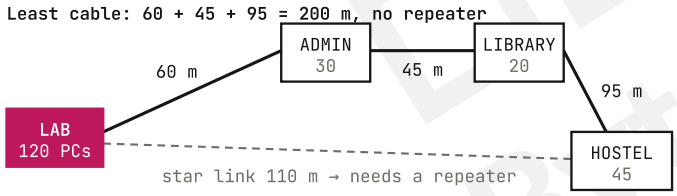
Importance ■■■■■ most asked ■■■□□ often ■□□□□ rarely

The 5-mark campus case study ■■■■■

A company or school has 4 blocks (computers in each, distances between them) and often a head office far away. Answer the parts in this order. **Every answer needs a reason**: the reason is half the mark.

IF ASKED	ANSWER
Where to put the server	Block with the **most computers** Most traffic stays inside one block. Tie: the block nearest the others.
Cable layout	Join all blocks with the **least total cable** From the server block, keep adding the shortest link to a block not yet joined. 4 blocks → 3 links. "Centralised control" → star from the server.
Device inside each block	**Switch** (hub accepted) Joins the PCs of one block into a LAN.
Where a repeater goes	On every **drawn** link over **100 m** Ethernet signal weakens after ~100 m. None over 100 m → "not needed".
Internet for all blocks	**Router** (with modem) in the server block
Type of network	Same campus **LAN** · same city ≤ 40 km **MAN** · another city **WAN** Quote the distance: "WAN, as Delhi is 600 km away".
Cable / medium	Inside campus: **twisted pair** (cheap) · fast wired link far away: **optical fibre** · hilly or very far: **microwave / satellite**
Video meeting	**VoIP**, Voice over Internet Protocol
Stop unauthorised access	**Firewall**
Use a far computer	**TELNET** (remote login)



! Check repeaters only on the links **you drew**, not every distance in the table. Write the total length next to your diagram.

Network devices ■■■■■

DEVICE	ONE JOB	QUESTION CLUE
Modem	Digital ↔ analog over a phone or cable line	"modulation / demodulation"
Hub	Joins PCs in a LAN; sends data to **all** ports	"not intelligent"
Switch	Joins PCs in a LAN; sends only to the **right** port (MAC)	"inside each block"
Repeater	Regenerates a weak signal	"signal weakens", > 100 m
Router	Joins networks; best path by **IP** address	"connect to the ISP"
Gateway	Joins networks with **different protocols**	"entry and exit point"
Ethernet card	NIC for a wired LAN; has a MAC address	"essential for a wired LAN"
RJ45	8-pin plug on an Ethernet cable	Registered Jack 45
Wi-Fi card	NIC for a wireless network	"without cables"

	HUB	SWITCH
Sends to	every port	only the receiver's port
Smart?	no	yes, learns MAC addresses
Traffic	collisions, slower	fewer collisions, faster

! **Router** joins networks using the **same** protocol; **gateway** joins **different** protocols. A firewall is not a device in the list but is the answer to "prevent unauthorised access".

Protocols ■■■■■

A **protocol** is a set of rules the communicating devices follow for successful, reliable data communication.

PROTOCOL	FULL FORM	USED FOR
HTTP	HyperText Transfer Protocol	web pages, browser ↔ server
HTTPS	… Secure	web pages, encrypted (padlock)
FTP	File Transfer Protocol	upload / download files
SMTP	Simple Mail Transfer Protocol	**send** email
POP3	Post Office Protocol 3	**receive** (download) email
TCP/IP	Transmission Control Protocol / Internet Protocol	TCP: packets in order, none lost · IP: address and route
PPP	Point-to-Point Protocol	direct link between two nodes
TELNET	Teletype Network	remote login
VoIP	Voice over Internet Protocol	voice / video calls over the Internet

! **SMTP sends, POP3 receives.** HTML is a language, not a protocol. Write VoIP's full form for the full mark.

Network types and topologies ■■■□□

TYPE	COVERS	EXAMPLE
PAN	one person, ~10 m	phone + earbuds by Bluetooth
LAN	room, building, campus	school computer lab
MAN	a city, ~30–40 km	city cable TV network
WAN	countries, the world	the Internet (largest WAN)

TOPOLOGY	LAYOUT	PLUS	MINUS
Bus	all on one backbone cable	least cable	backbone fails → all stop
Star	each PC to a central hub / switch	one PC fails → only it	centre fails → all stop
Tree	stars joined in levels (bus + star)	easy to expand	root fails → branches cut

! MCQ clues: single central cable → **bus**; needs a hub or switch → **star**; combination of two → **tree**. Ring is **not** in the syllabus; it appears only as a wrong option.

Internet, web and websites

	INTERNET	WWW
Is	the network of networks	linked web pages on it
Uses	TCP/IP	HTTP, HTML, URL
Began	1969, ARPANET	1989, Tim Berners-Lee, CERN

- **URL** (Uniform Resource Locator) = protocol + domain + path: `https://www.cbse.gov.in/index.html`
- **DNS** turns a domain name into an IP address. Domain names read right to left; last part is the TLD: `.com` `.org` `.gov` or a country, `.in` `.uk`.
- **Web page**: one document with its own URL. **Website**: related pages under one domain, starting at the home page.
- **Web server** stores and sends pages (Apache, Nginx). **Web hosting**: renting space on one so the site is on the Internet.

! "Service that puts a website on the Internet" → **web hosting**, not web server. Email and VoIP use the Internet but are **not** the Web.

Web browsers

Browser: software that finds, opens and shows web pages: Chrome, Firefox, Edge, Safari, Opera. Not a search engine (Google Search, Bing are websites).

Data communication

5 components: sender, receiver, message, communication media, protocols.

	BANDWIDTH	DATA TRANSFER RATE
Means	range of frequencies a channel carries	bits sent per second
Unit	Hz, kHz, MHz, GHz	bps, Kbps, Mbps, Gbps

IPv4: 32 bits, 4 parts of 0–255 (`192.168.1.10`). **IPv6**: 128 bits. **MAC**: 48-bit physical address burnt into the NIC; IP is logical and can change.

	CIRCUIT SWITCHING	PACKET SWITCHING
Path	dedicated path set up first	none; each packet routed alone
Order	arrives in order	may arrive out of order
Example	landline call	the Internet

! Mbps = mega**bits**; file sizes are mega**bytes**, so multiply MB by 8. `192.168.1.256` is not valid: each part ≤ 255.

Transmission media

WIRED (GUIDED)	CARRIES	KEY FACT
Twisted pair	electric, copper	cheapest LAN cable; ~100 m; UTP / STP
Coaxial	electric, copper	core + metal shield; cable TV
Optical fibre	light, glass	fastest, km, no noise; costly

WIRELESS	DIRECTION	KEY FACT
Radio	all directions	passes walls; FM radio, TV
Microwave	line of sight	towers, mobile, satellite
Infrared	line of sight	very short; TV remote

HTML and XML

	HTML	XML
Full form	HyperText Markup Language	eXtensible Markup Language
Purpose	display data	store and carry data
Tags	predefined	**user-defined**
Case	not case-sensitive	case-sensitive; close every tag

Network basics

A **computer network** is a group of interconnected computers and devices that share data and resources. A **node** is any device on it; a **link** joins two nodes.

Why network: resource sharing (one printer, one internet line), data sharing, communication, lower cost, backups on more than one computer.

ARPANET 1969, US Defense, the first network → **NSFNET** 1986, universities → **Internet** 1990s, network of networks on TCP/IP.

Expand it

MODEM	MOdulator–DEModulator
ARPANET	Advanced Research Projects Agency Network
NSFNET	National Science Foundation Network
LAN · MAN	Local · Metropolitan Area Network
URL	Uniform Resource Locator (not "Universal")
DNS	Domain Name System
WWW	World Wide Web
ISP	Internet Service Provider
NIC	Network Interface Card
RJ45	Registered Jack 45