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CUET · COMPUTER SCIENCE · CLASS XII · CODE 308

Internet and Web

CUET unit: Internet and Web

By **UniDrill** · NCERT-grounded study material

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📌 Snapshot

- The foundational concepts of computer networks: their types (LAN, MAN, WAN), and the hardware devices that make networking possible.
- The Internet works from physical connectivity through ISPs to the global backbone; key applications are WWW, Email, Chat, and VoIP.
- The web ecosystem (website, web page, web server, web hosting, DNS, browser) is laid out in detail, giving students a complete picture of how a web request travels from browser to server and back.
- This topic yields a dense cluster of definitional and conceptual MCQs on network types, topologies, network devices, URL/HTTP/HTML, static vs. dynamic pages, and browser components — all high-frequency exam topics CUET tests.
- Browser settings, cookies, add-ons and plug-ins are a broad source for statement-based and match-type questions.

📖 Detailed Notes

2.1 Core concepts

- **Network basics:** A group of two or more similar things or people interconnected with each other is called a network. A computer network is an interconnection among two or more computers or computing devices that allows sharing of data and resources. Data is divided into smaller chunks called **packets** for transmission over the network. (NCERT §5.1, p. 138)
- **Node:** In a communication network, each device that is a part of a network and that can receive, create, store, or send data to different network routes is called a **node**. A node can be a modem, hub, bridge, switch, router, digital telephone handset, printer, computer, or server. (NCERT §5.1, p. 139)
- **LAN (Local Area Network):** Connects computers and peripherals placed at a limited distance — single room, floor, building, school, or university campus. Uses wires, Ethernet cables, fibre optics, or Wi-Fi. Data transfer rate ranges from 10 Mbps (Ethernet) to 1000 Mbps (Gigabit Ethernet). LAN can be extended up to 1 km and is comparatively secure. (NCERT §5.2.1, p. 139–140)
- **MAN (Metropolitan Area Network):** An extended form of LAN covering a city or town. Data transfer rate is in Mbps but less than LAN. Can extend up to 30–40 km.

Cable TV network and cable broadband internet are examples. Multiple LANs are connected to form a MAN. (NCERT §5.2.2, p. 140–141)

- **WAN (Wide Area Network):** Connects computers, LANs, and MANs across different geographical locations — countries or continents. Formed by connecting LANs via wired or wireless media. The Internet is the largest WAN. (NCERT §5.2.3, p. 141)
- **Modem:** Stands for MOdulator DEMolulator. Converts digital data to analog signals (modulation) at the sender's end and analog signals back to digital data (demodulation) at the receiver's end. Connected to both source and destination nodes. (NCERT §5.3.1, p. 142)
- **Ethernet Card / NIC:** Network Interface Card (NIC) is a network adaptor mounted on the motherboard, used to set up a wired network. It acts as an interface between computer and network. Supports 10 Mbps to 1 Gbps. Each NIC has a unique **MAC address** that identifies the computer on the network. (NCERT §5.3.2, p. 143)
- **Repeater:** An analog device that regenerates and amplifies weakened signals on a cable. Signals can travel about 100 m before losing strength; the repeater restores them. (NCERT §5.3.3, p. 143)
- **Hub:** A network device that connects different devices through wires. Data arriving on any line is sent out on all others. Limitation: if two devices send data simultaneously, collision occurs. (NCERT §5.3.4, p. 143)
- **Switch:** A networking device central to a LAN. Unlike a hub, it extracts the destination address from the data packet, looks it up in a table, and sends the signal to only the selected device. Drops noisy or corrupted packets and asks the sender to resend. (NCERT §5.3.5, p. 144)
- **Router:** A network device that receives, analyses, and transmits data to other networks. Has advanced capabilities — can analyse data, decide how it is packaged, and repackage data into smaller packets if needed for a different type of network. Can be wired or wireless. Home Wi-Fi routers perform the dual task of router and modem/switch. (NCERT §5.3.6, p. 144–145)
- **Gateway:** Acts as a key access point or "gate" between an organisation's network and the outside Internet. All data in or out of a network must pass through the gateway. Maintains routing information about both the host network and remote networks. Usually implemented as a router configured as a gateway; integrated with a firewall. (NCERT §5.3.7, p. 145–146)
- **Network Topologies:** The arrangement of computers and peripherals in a network is its topology. Common topologies: **mesh, ring, bus, star, and tree (hybrid)**. (NCERT §5.4, p. 146)
- **Mesh topology:** Every device connected to every other device. Handles large traffic; highly reliable (node failure does not affect others); more secure because each cable carries different data. Drawback: complex wiring and high cost; requires n(n-1)/2 wires for n nodes. (NCERT §5.4.1, p. 146–147)

- **Ring topology:** Each node connected to two others on either side, forming a ring. Data transmission is unidirectional (clockwise or counterclockwise). Less secure and less reliable. (NCERT §5.4.2, p. 147)
- **Bus topology:** All devices connect to a single backbone wire called a bus. Data sent by a node travels the entire bus in both directions and can be received by any node. Cheaper and easy to maintain; less secure and less reliable. (NCERT §5.4.3, p. 147)
- **Star topology:** Each device connected to a central node (hub or switch). Very effective, efficient, and fast. Failure of one device does not affect others, but failure of the central device causes complete network failure. The central node can be broadcasting (sends to all) or unicast (sends to destination only). (NCERT §5.4.4, p. 148)
- **Tree / Hybrid topology:** Hierarchical topology with multiple branches; each branch can have star, ring, or bus topology. Used in WANs. Data first reaches the centralised device, then passes through every branch. (NCERT §5.4.5, p. 148)
- **The Internet:** The global network of computing devices — desktops, laptops, servers, tablets, mobiles, printers, scanners, smart appliances (TV, AC, refrigerator), drones, vehicles, etc. Computers connect through modem to a local ISP, which connects to a national network; national networks form the Internet backbone. The Internet is the largest WAN. (NCERT §5.5, p. 148–149)
- **Applications of Internet:** WWW, Electronic mail (Email), Chat, and Voice over Internet Protocol (VoIP). (NCERT §5.6, p. 149)
- **WWW and its three fundamental technologies:** (1) HTML — HyperText Markup Language, used to design standardised web pages; (2) URI/URL — Uniform Resource Identifier/Locator, uniquely identifies a resource on the web; (3) HTTP — HyperText Transfer Protocol, a set of rules used to retrieve linked web pages; its secure version is HTTPS. Invented by Sir Tim Berners-Lee in 1990. (NCERT §5.6.1, p. 149–150)
- **URL structure:** A URL contains protocol (http/https), subdomain (www), domain name, and path to the resource. Example: http://www.ncert.nic.in/textbook/textbook.htm — here ncert.nic.in is the domain name. (NCERT §5.6.1, p. 150)
- **Email:** Electronic mail — sending and receiving messages using the Internet. Message can be text or an attached file. Key facilities include composing, sending, receiving, CC/BCC, forwarding, filtering spam, organising in folders, setting signature, printing, and searching. (NCERT §5.6.2, p. 151)
- **Chat / Instant Messaging (IM):** Real-time text communication over the Internet where both parties must be online simultaneously using the same application. Modern IM supports text, audio, and video. Examples: WhatsApp, Skype, Google Hangout, Slack. (NCERT §5.6.3, p. 151–152)
- **VoIP:** Voice over Internet Protocol — voice calls over the Internet (also called Internet Telephony or Broadband Telephony). Works by converting analogue voice signals to digital and transmitting over broadband. Advantages: free or economical,

portable (calls routed to VoIP phone anywhere). Disadvantage: call quality depends on Internet speed. (NCERT §5.6.4, p. 152–153)

- **Website:** A collection of web pages related through hyperlinks, saved on a web server, integrated under one domain name with a common theme. Accessed by entering the URL in the browser address bar. Purposes: selling products, posting information, communication, entertainment, disseminating content/software. (NCERT §5.7, p. 153–154)
- **Web page:** A document on the WWW viewed in a browser. Created using HTML and CSS. May contain text, images, audio, video, software applications, and other interactive content. Scripts (JavaScript, Python, PHP) make a page interactive. The first page of a website is the home page. (NCERT §5.8, p. 154)
- **Static vs. Dynamic web pages:** A static web page content remains the same for all users; written in HTML/CSS/JavaScript with .htm or .html extension. A dynamic web page can be different for different users; server performs additional processing (database queries, etc.) before sending the page; created using JavaScript, PHP, ASP.NET, Python, Java, Ruby, etc. Dynamic pages take more time to load. (NCERT §5.8.1, p. 154–155)
- **Web server:** Used to store and deliver website contents to browser clients. As hardware it stores HTML pages, images, CSS, and JS files. As software it is a specialised program that understands URLs and responds to HTTP requests. If a page is not found, it returns Error 404. (NCERT §5.9, p. 156–157)
- **Web hosting:** Service to put a website onto the Internet. Can use a hardware server connected to the Internet, or rent server resources (CPU, RAM, storage) from a cloud provider. Web server is assigned a numeric IP address, which is mapped to a domain name. Domain name must be registered with an authorised agency. DNS (Domain Name System) does the mapping between domain name and IP address. (NCERT §5.10, p. 157–158)
- **Browser:** Software application to view web pages. Displays HTML documents with text, images, audio, video, and hyperlinks. Common browsers: Google Chrome, Mozilla Firefox, Internet Explorer, Opera, Apple Safari. First browser was Mosaic (NCSA). Modern browsers support dynamic websites, visual effects, encryption, and cookies. (NCERT §5.11, p. 158–159)
- **Browser settings (Mozilla Firefox panels):** General (default browser, language, download, updates, network), Home (home page, tabs), Search (search engine), Privacy and Security (tracking protection, passwords, history, cookies, pop-ups), Sync (Firefox account). (NCERT §5.11.1, p. 159–161)
- **Add-ons and Plug-ins:** Tools to extend and modify browser functionality. A plug-in is a complete/third-party program installed on the host computer usable by multiple applications (e.g., Flash, Java). An add-on (also called extension) adds only a particular functionality to the browser (e.g., sound and graphics card functionality). (NCERT §5.11.2, p. 161)

- **Cookies:** A text file containing a string of information transferred by a website to the browser. Stored in the browser and retransmitted to the server on return visits to recognise the user and customise content. Usually harmless; cannot access hard disk or transmit viruses. Can be disabled via Privacy and Security settings. First cookie software was created in 1994 at Netscape. (NCERT §5.11.3, p. 162)

2.2 Definitions to memorise

Term	Definition	Page
Computer Network	Interconnection among two or more computers/computing devices to share data and resources	138
Node	Any device in a network that can receive, create, store, or send data to different network routes	139
LAN	Network connecting devices at limited distance (room to campus); up to 1 km; 10–1000 Mbps	139
MAN	Extended LAN covering a city/town; up to 30–40 km; uses Mbps transfer rates	140
WAN	Network connecting LANs/MANs across countries or continents; Internet is the largest WAN	141
Modem	MOdulator DEMolulator; converts digital data to analog (modulation) and back (demodulation)	142
NIC / Ethernet Card	Network Interface Card; circuit board on motherboard; each has a unique MAC address	143
Repeater	Analog device that regenerates weakened signals on a cable	143
Hub	Network device connecting multiple devices; sends data arriving on any port to all other ports	143
Switch	LAN device that reads destination address from packet and forwards to selected device only	144
Router	Network device that receives, analyses, and transmits data between networks; can repackage packets	144
Gateway	Key access point between an organisation's network and the Internet; integrates with firewall	145
Topology	Arrangement of computers and peripherals in a network	146
URL	Uniform Resource Locator; provides location and access mechanism (protocol) for a resource on web	150
HTTP	HyperText Transfer Protocol; rules for retrieving linked web pages across the web	150
HTML	HyperText Markup Language; used to design standardised web pages	150
URI		150

Term	Definition	Page
	Uniform Resource Identifier; uniquely identifies a resource on the web by location or name	
WWW	World Wide Web; ocean of information stored as interlinked web pages accessible over the Internet	149
VoIP	Voice over Internet Protocol; voice calls over the Internet by converting analogue signals to digital	152
Website	Collection of web pages linked by hyperlinks, saved on a web server under one domain name	153
Web page	Document on WWW viewed in a browser; created using HTML and CSS	154
Web server	Stores and delivers website contents to clients; responds to HTTP requests	156
DNS	Domain Name System; maps domain names to IP addresses	158
Cookie	Text file transferred by website to browser; stores user browsing data for personalisation	162
Plug-in	Complete/third-party program installed on host computer to extend browser and other app functionality	161
Add-on / Extension	Adds only a specific functionality to the browser	161
MAC Address	Hardware address engraved on NIC, 48 bits, written in hexadecimal	143
IP Address	Logical address assigned by the network	158
ISP	Internet Service Provider — organisation that provides Internet access	148
Mosaic	First web browser	158
Home Page	First page of a website that a visitor sees	154
ASP.NET / PHP	Server-side technologies used to build dynamic web pages	154
Error 404	HTTP status code returned when a web page is not found	157
CC / BCC	Email features for carbon-copy and blind carbon-copy recipients	151
Filter (Email)	Email tool to organise incoming messages — e.g., move spam to junk	151
Mesh Topology	Every-node-to-every-node arrangement; n(n-1)/2 links	146-147
Star Topology	Each node connected to a single central hub/switch	148

2.3 Diagrams / processes to remember

- **Figure 5.2 (p. 138):** A computer network showing desktop, laptop, tablet, smartphone, and printer connected through a router — illustrates a basic LAN.

- **Figure 5.4 (p. 141):** Three LANs (LAN 1, LAN 2, LAN 3) connected through a central networking device to form a MAN — key for MAN questions.
- **Figure 5.5 (p. 142):** LAN 1 in India and LAN 1 in France connected through the Internet (cloud) — illustrates WAN concept.
- **Figure 5.6 (p. 142):** Modem at sender converts digital signal → analog signal → telephone line → modem at receiver converts back to digital. Central to modulation/demodulation questions.
- **Figure 5.12–5.16 (pp. 147–148):** Topology diagrams — mesh (every node to every node), ring (circular unidirectional), bus (single backbone), star (all to central node), hybrid (bus of stars). Must recall distinguishing features of each.
- **Figure 5.17 (p. 155):** Static web page — browser sends HTTP Request → server returns HTTP Response directly.
- **Figure 5.18 (p. 156):** Dynamic web page — HTTP Request → server calls application program → program executes and produces HTML → HTTP Response returned.
- **Figure 5.19 (p. 158):** Commonly used browsers — Mozilla Firefox, Internet Explorer, Google Chrome, Opera, Apple Safari.

2.4 Common confusions / NTA trap points

- **Hub vs. Switch:** A hub broadcasts data to all connected ports (causing collisions if two send simultaneously); a switch reads the destination address and sends only to the target device. NTA frequently swaps their descriptions in distractors.
- **MAN vs. WAN coverage:** MAN covers up to 30–40 km (city/town); WAN covers countries/continents. Students confuse the range. MAN examples are Cable TV and cable broadband — not the Internet.
- **URL vs. URI:** URI is the broader concept (identifies by location, name, or both); URL is a specific type of URI that provides location and protocol. NTA may present statements that mix these.
- **Static vs. Dynamic pages:** Static pages are the same for all users and have .htm/.html extensions; dynamic pages vary per user and involve server-side processing. NTA trap: stating that JavaScript makes a page dynamic — JavaScript can be used in both static and dynamic pages; true dynamic behaviour requires server-side code.
- **Plug-in vs. Add-on:** A plug-in is a complete program usable by multiple applications (e.g., Flash); an add-on/extension only adds a single functionality to the browser. Students often treat them as synonyms — the NCERT draws a clear distinction.
- **Internet vs. WWW (NCERT §5.5-5.6).** Internet is the network; WWW is an application running on it.
- **Mosaic was the first browser (NCERT §5.11, p. 158).** Not Netscape or Chrome.

- **Mesh requires n(n-1)/2 wires (NCERT §5.4.1, p. 147).** For n=10, that's 45 wires.
- **VoIP quality depends on Internet speed (NCERT §5.6.4, p. 152).** It is the key disadvantage.
- **Error 404 = page not found (NCERT §5.9, p. 157).** Different from 500/403.
- **Repeater is analog (NCERT §5.3.3, p. 143).** Hub and switch are digital.
- **Star failure is central node failure (NCERT §5.4.4, p. 148).** Single point of failure.

🎯 Practice MCQs

Q1. Which of the following network devices reads the destination address from a data packet and forwards it only to the selected device, dropping corrupted packets?

A. Hub

B. Repeater

C. Switch

D. Modem

Q2. Consider the following statements about types of networks: 1. LAN data transfer rate ranges from 10 Mbps to 1000 Mbps. 2. MAN can extend up to 30–40 km and covers a city or town. 3. WAN connects computers within a single building or campus. 4. The Internet is the largest example of a WAN. Which of the above statements are correct?

A. 1, 2, and 3 only

B. 1, 2, and 4 only

C. 2, 3, and 4 only

D. 1, 3, and 4 only

Q3. Sir Tim Berners-Lee invented the World Wide Web in 1990 by defining three fundamental technologies. Which of the following is NOT one of those three technologies?

A. HTML

B. URI

C. DNS

D. HTTP

📊 PYQ Alignment

Computer networks and the web are among the most consistently tested areas in CUET Computer Science / Informatics Practices papers; questions on network types (LAN/MAN/WAN), network topologies, network devices (hub vs. switch vs. router), and web concepts (URL, HTTP, static vs. dynamic pages, browser components) appear almost every year — typically accounting for 6–10 marks per paper. Expect straightforward definitional questions as well as statement-based questions requiring comparison of two network types or two devices. See PYQ archive for Computer Science.