



Computer Network & Topologies

STET Exam Last-Minute Revision & Concept Notes

STET Computer Science

Quick Revision

Complete Guide

1. Computer Network Kya Hota Hai?

Computer Network = 2 ya 2 se zyada computers/devices ko connect karna, taaki wo data, information aur resources share kar saken.

(Interconnection of two or more computers/devices for communication and resource sharing.)

Network Topology Definition

Topology ka matlab hota hai: Network mein computers/devices kis arrangement ya structure mein connected hain.

Simple Language: "Devices network mein kis shape/pattern mein jude hain."

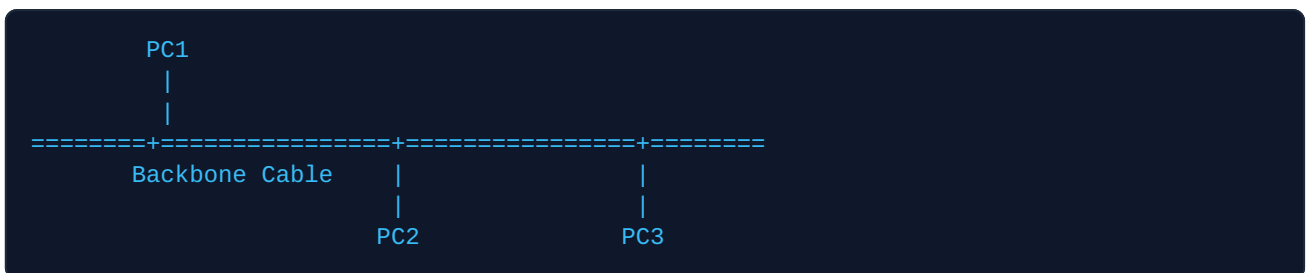
Main Topologies: Bus, Star ★, Ring, Mesh ★, Tree, Hybrid

2. Bus Topology

Bus Topology mein all computers/devices ek single main cable se connected hote hain. Is main cable ko **Backbone** kehte hain.

Simple Hinglish: One main cable + multiple devices connected to it = Bus Topology

Diagram



Characteristics

- Uses a single backbone cable.
- All devices share the same communication medium.
- Data travels along the backbone.
- Terminators are placed at both ends.
- Easy to install for a small network.
- Commonly associated with coaxial cable in traditional Ethernet networks.

✓ Advantages

- **Easy to install:** Simple structure hai.
- **Less cable required:** Star topology ke comparison mein cable requirement kam hoti hai.
- **Low cost:** Less cable + fewer networking components.
- **Easy to add devices:** Backbone par additional device connect kiya ja sakta hai.

✗ Disadvantages

- **Backbone cable failure = entire network affected** ★★★ (VERY IMPORTANT)
- **Performance decreases with more devices:** More devices → more traffic → performance decrease.
- **Difficult fault detection:** Problem kis point par hai, identify karna comparatively difficult.
- **Limited cable length:** Backbone ki length limited hoti hai.
- **Security is comparatively weaker:** Same shared medium use hone ke karan data traffic shared hota hai.

📌 STET Last-Minute Revision (BUS):

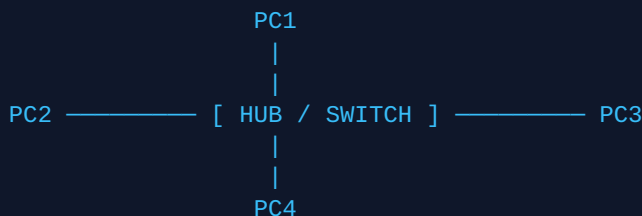
🚌 One Backbone | 🏠 Terminators at both ends | 💰 Low Cost | 📶 Less Cable | ⚠️ Backbone Failure → Network Disruption | 📊 More Devices → Performance decreases
STET ke liye Bus Topology mein itna enough hai.

★ 3. Star Topology

Star Topology mein all computers/devices ek central device se directly connected hote hain. Central device usually **Hub** ya **Switch** hota hai.

Simple Hinglish: All devices → One Central Hub/Switch = Star Topology

📌 Diagram



Iska shape star jaisa dikhta hai, isliye naam Star Topology hai.

✓ Advantages

- **Easy to install:** Network setup relatively simple hai.

✗ Disadvantages

- **Central device failure = Entire network affected** ★★★
Agar central Hub/Switch fail ho gaya → 🚨

- **Easy fault detection** ★: Agar ek PC ya uski cable mein problem hai, identify karna easy hota hai.
- **Failure of one device doesn't affect others** ★: PC3 fail ho gaya → PC1, PC2, PC4 normally continue kar sakte hain.
- **Easy to expand**: New computer ko central switch/hub se connect kar sakte hain.
- **Better performance with Switch**: Switch network traffic ko efficiently handle karta hai.

Entire network communication can stop. (This is one of the most important STET points).

- **More cable required**: Har device ko central device se separate cable chahiye.
- **More expensive than Bus**: Because more cable & central Hub/Switch required.

📌 **STET Last-Minute Revision (STAR):**

★ Central Hub/Switch | 🔗 Each device directly connected to center | ✅ Easy fault detection |
✅ Easy expansion | ❌ More cable required | 🚨 Central device failure → Entire network affected

🔥 **Bus vs Star Most Important Difference:**

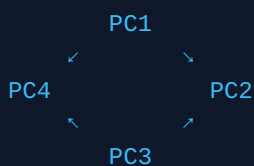
- Bus → Backbone cable is the critical point
- Star → Central Hub/Switch is the critical point

🔄 **4. Ring Topology — STET Specific**

Ring Topology mein all computers/devices circular form mein connected hote hain. Har device apne two neighboring devices se connected hota hai.

Simple Hinglish: Device → Device → Device → Device → back to first device = Ring Topology

📌 **Diagram**



Closed loop banta hai — isi wajah se iska naam Ring hai.

🔥 **Characteristics**

- Devices are connected in a closed loop.
- Each device usually has two connections — one with each neighboring device.
- Data travels from one device to another around the ring.
- No central Hub/Switch is required in a basic ring.
- 🧠 **VERY IMPORTANT: Data transmission uses Token Passing** ★★★★★ (Token ek special control frame hota hai jo network mein circulate karta hai. Jiske paas token hota hai, woh data transmit kar sakta hai.)

✓ Advantages

- **Less chance of collision:** Token-based access mein generally ek time par controlled transmission hota hai.
- **Equal access:** Har device ko transmission ka opportunity milta hai.
- **No central device required:** Basic Ring topology mein Hub/Switch required nahi hota.
- **Predictable performance:** Network load increase hone par bhi access controlled hota hai.

✗ Disadvantages

- **Failure of one link/device can affect the network** ★★★★★
Basic single-ring topology mein agar ek link/device fail ho jaye, communication around the ring disrupt ho sakta hai.
- **Troubleshooting is difficult:** Fault locate karna Bus/Star ke comparison mein difficult hota hai.
- **Adding/removing devices affects network:** Connection modify karna padta hai.
- **Data passes through intermediate devices:** Destination tak pahunchne ke liye data multiple nodes se pass ho sakta hai.

📌 STET Last-Minute Revision (RING):

🔄 Closed Loop | 🔗 Two Neighbors | 📄 Token Passing | 🚫 No central device in basic Ring | ⚠️ One link/device failure can disrupt basic ring

🕸 5. Mesh Topology

Mesh Topology mein devices multiple direct connections ke through ek-doesre se connected hote hain. Iski biggest speciality hai: ★ **Multiple Paths**. Agar ek path fail ho jaye, data ke paas alternative path hota hai.

📌 Basic Diagram



★ Full Mesh vs Partial Mesh (STET Very Important)

1. Full Mesh: Every device is directly connected to every other device. (Everyone connected to everyone)

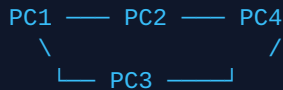
Full Mesh Link Formula ★

Number of links = $n(n - 1) / 2$ (where n = number of devices)

Example: For 4 devices $\rightarrow (4 \times 3) / 2 = 6$ links

2. Partial Mesh: Some devices directly connected hote hain, but every device is not connected to every other device.

🔗 What are Multiple Paths & Fault Tolerance?



PC1 ko PC4 ko data bhejna hai. **Path 1:** PC1 → PC2 → PC4 | **Path 2:** PC1 → PC3 → PC4.

Agar Path 1 fail ho gaya (**PC1 —X— PC2**), tab bhi data Path 2 se ja sakta hai.

🔥 **Fault Tolerance:** Failure ke baad bhi system/network ke kaam karte rehne ki ability ko Fault Tolerance kehte hain. Multiple paths provide high reliability & fault tolerance.

✅ Advantages

- **High Reliability** ★★★★★: Ek link fail hone par alternative path available.
- **Fault Tolerance** ★★★★★: Network single link failure tolerate kar sakta hai.
- **Multiple Paths:** Source se destination tak multiple routes.
- **Better Privacy/Security:** Dedicated communication paths.
- **No Single Central Device:** Basic mesh mein central Hub/Switch required nahi hota.

❌ Disadvantages

- **Very Expensive** ★★★★★: Full Mesh mein bahut saare links/cables required hote hain.
- **Complex Installation:** Connections zyada hone ke karan setup complicated hota hai.
- **Difficult Maintenance:** Large network mein links maintain karna difficult.
- **More Hardware/Cabling:** Connections bahut zyada hote hain.

📌 STET Last-Minute Revision (MESH):

🌐 Multiple Connections | 🔗 Multiple Paths | 🛡️ High Reliability & Fault Tolerance | 💰 Expensive | ⚙️ Complex

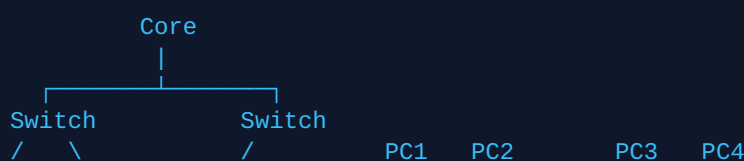
- **Full Mesh:** Everyone ↔ Everyone | **Partial Mesh:** Some ↔ Some
- ★ **Most Important Line:** Mesh topology is preferred when reliability and fault tolerance are more important than cost.

🌳 6. Tree Topology

Tree topology mein devices hierarchical structure mein connected hote hain.

Simple Hinglish: Root/central node → branches → sub-branches = Tree Topology

📌 Diagram



🔥 Characteristics

- Hierarchical structure with a root / main node.
- Lower-level devices are connected through branches.
- Combination/extension of Star + hierarchical Bus concepts.
- Suitable for large networks; easy to divide network into segments.

✅ Advantages

- **Easy to expand** ⭐: New branches/devices add karna easy hai.
- **Suitable for large networks**: Hierarchical structure helpful in large organizations.
- **Easy management**: Network ko different sections mein organize kar sakte hain.
- **Fault isolation**: Problem ko particular branch tak isolate karna possible.

❌ Disadvantages

- **Root/Main connection failure** ⭐⭐⭐⭐
Agar root/core connection fail ho jaye, uske neeche connected entire branch/segment affect ho sakta hai.
- **More cabling & Expensive**: Simple Bus ke comparison mein main cables and devices zyada lagte hain.
- **Complex**: Design aur maintain karna comparatively difficult.

💣 Failure Effect (STET Important):

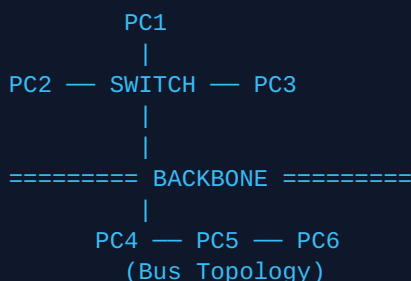
- Agar **root/core connection fail** ho → 🚨 Uske neeche ke multiple devices/branches affected ho sakte hain.
- But agar **sirf PC1 fail** ho → ✅ Usually baaki devices affected nahi hote.

🔗 7. Hybrid Topology — STET Specific

Hybrid Topology means a network made by combining two or more different topologies.

Simple Hinglish: Combination of different topologies = Hybrid Topology

📌 Example Diagram (Star + Bus)



🔥 Characteristics

- Uses two or more different topologies.
- Different sections can use different network structures based on requirements.
- Usually used in large/complex networks. Highly customizable and scalable.

✓ Advantages

- **Flexible** ★: Different departments ke liye different topology use kar sakte hain.
- **Easy to expand & Scalable:** Large network ko gradually expand kar sakte hain.
- **Better fault isolation:** Ek section ki problem poore network ko affect nahi karti.

✗ Disadvantages

- **Expensive** 💰: Different networking devices + cables required.
- **Complex design:** Design and configuration difficult hota hai.
- **Maintenance is difficult:** Troubleshooting complex multiple topologies mein hard hota hai.



OSI Model — STET Focus

Computer Networks Last-Minute Quick Revision Notes

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7-Layer OSI Model

Exam Ready

1. What is OSI Model?

OSI = *Open Systems Interconnection*

OSI Model is a **7-layer reference model** that explains how data is communicated from one computer to another over a network.

It was developed by **ISO** (*International Organization for Standardization*).



Simple Hinglish: OSI Model network communication ko 7 different layers mein divide karta hai, aur har layer ka specific job hota hai.



7 Layers of OSI Model (Top to Bottom)

- 7 Application Layer
- 6 Presentation Layer
- 5 Session Layer
- 4 Transport Layer
- 3 Network Layer
- 2 Data Link Layer
- 1 Physical Layer



One-line memory sequence:

**Application → Presentation → Session → Transport →
Network → Data Link → Physical**
A P S T N D P

OSI Model — 7 Layers in Simple Language

Layer	Name	Simple Work	Easy Example	Remember
7	 Application	User/application ko network service provide karna	Browser se website open karna	Service
6	 Presentation	Data ko format karna, encrypt/decrypt aur compress karna	Text ko encrypt karke send karna	Format
5	 Session	Communication session ko start, maintain aur end karna	Video call start → continue → end	Conversation
4	 Transport	Data ko safely source se destination tak pahunchana	Large file ko small segments mein divide karke bhejna	Delivery
3	 Network	Data ke liye route/path choose karna + IP address	Router decide karta hai data kis route se jayega	Route + IP
2	 Data Link	Data ko frames mein organize karna + MAC address use karna	Switch MAC address dekhkar data forward karta hai	Frame + MAC
1	 Physical	0 aur 1 ko actual signals ke form mein transmit karna	Cable/Fiber/Wi-Fi signal se bits bhejna	Bits + Signal

STET Quick Memory Tips:

- **Layer 1 (Physical):** Bits & Hardware (Cables, Hubs)
- **Layer 2 (Data Link):** Frames, MAC Address, Switch
- **Layer 3 (Network):** Packets, IP Address, Router
- **Layer 4 (Transport):** Segments, End-to-End Delivery (TCP/UDP)
- **Layer 5, 6, 7 (Software Layers):** Session, Presentation (Encryption/Compression), Application (User Interface)



TCP/IP Model — STET Focus

Computer Networks Last-Minute Quick Revision Notes

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4-Layer TCP/IP Model

Exam Ready

1. What is TCP/IP Model?

TCP/IP = *Transmission Control Protocol / Internet Protocol*

TCP/IP Model is a network communication model used to explain how devices communicate over the Internet and networks.



Simple Hinglish: TCP/IP Model batata hai ki data ek device se doosre device tak network/Internet ke through kaise travel karta hai.



TCP/IP Model has 4 Layers (Top to Bottom)

- 4 Application Layer
- 3 Transport Layer
- 2 Internet Layer
- 1 Network Access Layer



Memory Trick: A T I N

Application → Transport → Internet → Network Access



TCP/IP Model — 4 Layers Overview

Layer	Name	Simple Work	Easy Example	Important Protocols	Remember
4	Application	User ko network services provide karta hai	Browser se website open karna, email send karna	HTTP HTTPS FTP DNS SMTP	Network Services

Layer	Name	Simple Work	Easy Example	Important Protocols	Remember
3	Transport	Data ko source se destination tak end-to-end deliver karta hai	File ko parts mein divide karke destination tak bhejna	TCP UDP	End-to-End Delivery
2	Internet	IP addressing + routing handle karta hai	Router decide karta hai packet kis route se jayega	IPv4 IPv6 ICMP	IP + Routing
1	Network Access	Data ko local network/physical medium par transmit karta hai	Ethernet cable ya Wi-Fi se data bhejna	Ethernet Wi-Fi	Local Network + Transmission



STET Quick Comparison with OSI Model:

- TCP/IP Application Layer = OSI Application + Presentation + Session Layers
- TCP/IP Transport Layer = OSI Transport Layer
- TCP/IP Internet Layer = OSI Network Layer
- TCP/IP Network Access Layer = OSI Data Link + Physical Layers



Data Transmission — STET Focus

Modes, Encoding, Compression & Transmission Impairments

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Signal Impairments

Exam Ready

1. Data Transmission & Main Types

Data Transmission means: Data ko ek device se another device tak communication medium ke through bhejna.

Type	Meaning	Example
Simplex	Data only in one direction	TV broadcasting, Keyboard to PC
Half-Duplex	Both directions , but one at a time	Walkie-Talkie
Full-Duplex ★	Both directions simultaneously	Telephone / Mobile Call

🧠 **Remember Quick Summary:**

- **Simplex** → One way
- **Half-Duplex** → Both ways, one at a time
- **Full-Duplex** → Both ways simultaneously

2. Data Transmission Modes (Parallel vs. Serial)

Data transmission ko **Parallel** aur **Serial** modes mein divide kiya jata hai:

Type	Simple Meaning	Example
Parallel	Multiple bits at the same time (across multiple lines)	Short-distance internal bus communication
Serial	Bits travel one after another (single line)	USB, Long-distance network communication

🧠 **Easy Trick: Parallel = Many bits together | Serial = One bit after another**

3. Encoding ★★★ & Compression ★★

Encoding: Data ko signals/bits ke suitable form mein convert karna so that it can be transmitted.

Data (e.g., 101101) → **Encoding** → Electrical / Optical Signal → Transmission

 **STET Point:** Encoding = Data ko transmission ke suitable signal representation mein convert karna.

Compression: Data ka size reduce karna (Original 100 MB → Compressed 40 MB).

Why compression? Less storage, less bandwidth required, faster transmission speed.

Type	Meaning	Example
Lossless	Data ki original information completely recover ho sakti hai	ZIP, PNG, GIF, FLAC
Lossy	Some information permanently remove ho sakti hai	JPEG, MP3, MP4

4. Transmission Impairments ★★★★★

Impairment = Signal ki quality transmission medium ke through travel karte time degrade/distort hona.

Impairment	Simple Meaning & Cause	Key Effect	Solution
1. Attenuation	Signal strength decreases as distance increases (Travel karte-karte weak hona)	Weakening	Amplifier / Repeater
2. Distortion	Signal ka shape/form change hona (composite signal components traveling at different speeds)	Shape Change	Equalizers
3. Noise	External unwanted signals that interfere with original data (Electrical, Crosstalk, Thermal)	Interference	Shielded Cables / Filters

Master STET Quick Revision Table

Topic	Simple Meaning	Key Word
Data Transmission	Data ko one device se another tak bhejna	Transfer
Encoding	Data ko transmission signal representation mein convert karna	Conversion
Compression	Data size reduce karna	Reduce Size
Attenuation	Signal strength decrease hona	Weak
Distortion	Signal shape change hona	Shape Change
Noise	Unwanted signal / interference	Interference



Data Link Layer Functions — STET

Focus

Framing, Flow Control & Error Control (Revision Notes)

Layer 2 Functions

MAC & CRC

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1. Framing (Frame Organization)

Framing = Data Link Layer ka process jisme packet/data ko **Header** aur **Trailer** ke saath ek frame mein organize kiya jata hai.

HEADER (Source & Dest MAC)

DATA / PACKET

TRAILER (CRC / FCS)

- **Header:** Header mein important information ho sakti hai, jaise **Source MAC address** aur **Destination MAC address**.
- **Trailer:** Trailer mein error detection ke liye information ho sakti hai, jaise **CRC (Cyclic Redundancy Check)**.



2. Flow Control

Flow Control controls the rate of data transmission between sender and receiver.

Scenario: Suppose Computer A bahut fast data bhej raha hai, but Computer B slow hai.

Computer A ⚡⚡⚡⚡⚡ →→→→ Computer B 🐢

Computer B ek time par limited data hi receive/process kar sakta hai.



Agar Computer A continuously fast data bhejta rahe:

- ❌ Receiver ka buffer full ho sakta hai
- ❌ Data loss ho sakta hai



Flow Control ka Main Kaam:

Sender ko control karna so that receiver ko jitna data handle kar sake, utna hi data mile.



3. Error Control & Detection Techniques

Error Control ka kaam: Transmission ke during error ko detect karna aur required recovery/retransmission karna.

 **Error kaise detect hoga?** Data Link Layer kuch techniques use kar sakti hai:

Technique	Simple Meaning	STET Importance
Parity Check	Extra parity bit se error detect karna	Single Bit Error
Checksum	Calculated value compare karke error detect karna	Segment Level Check
CRC ★	Mathematical check (Polynomial division) se error detect karna	Most Reliable

STET Exam Quick Points:

- **Framing:** MAC Addresses are added at Header, CRC added at Trailer.
- **Flow Control:** Prevents buffer overflow at receiver (e.g., Stop-and-Wait, Sliding Window).
- **Error Control:** Detects & corrects/retransmits corrupted frames (e.g., ARQ techniques).



Networking, Routing & Protocols — STET Focus

Network & Transport & Application Layer Concepts (Revision Sheet)

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TCP/IP Suite

Layer 3, 4 & 7 Protocols

1. Routing ★★★★★ & Congestion Control ★★★★★

Routing: Source se destination tak data packet ke liye best path/route choose karna.

PC A → Router 1 / Router 2 (Path Selection) → PC B
Router decide karega ki kaunsa optimal path use karna hai.

Congestion Control: Jab network mein ek saath bahut zyada packets aa jaate hain (overload), to continuous congestion hota hai. Network mein excessive traffic ko control karna = **Congestion Control**.

🚨 **Result of Congestion:** Normal Traffic (🚗🚗🚗) → Overloaded (🚗🚗🚗🚗🚗🚗🚗) → Delay increases, Packets dropped, Performance decreases.

🧠 **Key Difference to Remember:**

- **Flow Control:** Sender → Receiver ke बीच data rate control (Point-to-Point).
- **Congestion Control:** Entire network mein excessive traffic control (Network-wide).

2. IPv4 Important Facts ★

Property	IPv4 Details
Full Form	Internet Protocol Version 4
Address Size ★	32 bits (4 Octets)
Format	Dotted Decimal (e.g., 192.168.1.10)
Octet Structure	4 Octets (Each octet = 8 bits)
OSI Layer	Network Layer (Layer 3)

3. ⚡ STET Super Revision (Network Layer)

Topic	One-line Meaning	Must Remember
Routing	Best/appropriate path choose karna	Router
Congestion Control	Network overload control karna	Too much traffic

Topic	One-line Meaning	Must Remember
IPv4	Logical addressing protocol	32 bits
ARP	IP address se MAC address find karna	IP → MAC

4. Transport Layer: TCP vs UDP — STET Must Learn

Feature	TCP (Transmission Control Protocol)	UDP (User Datagram Protocol)
Reliability	Reliable (Guaranteed delivery)	No delivery guarantee
Connection Type	Connection-oriented (3-way handshake)	Connectionless
Acknowledgment (ACK)	Yes	No
Retransmission	Yes (on packet loss)	No
Overhead & Speed	More overhead, Generally slower	Less overhead, Generally faster
Order	Ordered delivery	Unordered delivery
Example	File transfer (FTP), Web browsing (HTTP)	Live streaming, Video calling, DNS

5. Application Layer Protocols (HTTP, FTP, SMTP)

Protocol	Full Form	Work / Function	Key Memory
HTTP	HyperText Transfer Protocol	Web pages / web resources ko transfer karna (Browser → Web Server)	Web
FTP	File Transfer Protocol	Files ko upload/download karna (Computer → Server)	File Transfer
SMTP	Simple Mail Transfer Protocol	Email send karne ke liye use hota hai (Sender → Mail Server)	Send Email

⚠ STET Trap Alert:

- **SMTP** strictly **sending emails** ke liye associated hai.
- Emails receive/retrieve karne ke liye **POP3** ya **IMAP** use hota hai.

Computer Networks Question Bank

Comprehensive 100 Multiple-Choice Questions & Answers (STET Exam Level)

SET 1 — NETWORK TOPOLOGIES & OSI MODEL (Q1 – Q20)

Q1. A network topology refers to:

- A. Network speed
- B. Arrangement of devices in a network
- C. Network security
- D. IP address format

✓ **Correct Answer: B. Arrangement of devices in a network**

Q2. Which topology uses a central hub or switch?

- A. Bus
- B. Ring
- C. Star
- D. Mesh

✓ **Correct Answer: C. Star**

Q3. Which topology uses a single backbone cable?

- A. Star
- B. Bus
- C. Mesh
- D. Ring

✓ **Correct Answer: B. Bus**

Q4. Which topology provides multiple paths between devices?

- A. Bus
- B. Star
- C. Mesh
- D. Ring

✓ **Correct Answer: C. Mesh**

Q5. Token passing is commonly associated with which topology?

- A. Star
- B. Ring
- C. Bus
- D. Mesh

✓ **Correct Answer: B. Ring**

Q6. Which topology provides high fault tolerance because of multiple paths?

- A. Bus
- B. Ring
- C. Mesh
- D. Star

✓ **Correct Answer: C. Mesh**

Q7. How many layers are present in the OSI model?

- A. 4
- B. 5
- C. 7
- D. 8

✓ **Correct Answer: C. 7**

Q8. Which is the lowest layer of the OSI model?

- A. Data Link
- B. Network
- C. Physical
- D. Transport

✓ **Correct Answer: C. Physical**

Q9. Which OSI layer is responsible for routing?

- A. Transport
- B. Network
- C. Data Link
- D. Session

✓ **Correct Answer: B. Network**

Q10. Which OSI layer is responsible for framing?

- A. Physical
- B. Data Link
- C. Network
- D. Transport

✓ **Correct Answer: B. Data Link**

Q11. Which OSI layer provides end-to-end delivery?

- A. Network
- B. Data Link
- C. Transport
- D. Session

✓ **Correct Answer: C. Transport**

Q12. Which layer deals with data format, encryption and compression?

- A. Session
- B. Presentation
- C. Transport
- D. Network

✓ **Correct Answer: B. Presentation**

Q13. Which layer manages sessions between applications?

- A. Session
- B. Network
- C. Physical
- D. Data Link

✓ **Correct Answer: A. Session**

Q14. How many layers are present in the commonly used 4-layer TCP/IP model?

- A. 3
- B. 4
- C. 5
- D. 7

✓ **Correct Answer: B. 4**

Q15. Which is the correct TCP/IP layer order?

- A. Application → Transport → Internet → Network Access
- B. Transport → Application → Internet → Network Access
- C. Application → Internet → Transport → Network Access
- D. Internet → Transport → Application → Network Access

✓ **Correct Answer: A. Application → Transport → Internet → Network Access**

Q16. TCP belongs to which layer?

- A. Application
- B. Transport
- C. Internet
- D. Network Access

✓ **Correct Answer: B. Transport**

Q17. IP belongs to which TCP/IP layer?

- A. Application
- B. Transport
- C. Internet
- D. Network Access

✓ **Correct Answer: C. Internet**

Q18. HTTP belongs to which layer?

- A. Transport
- B. Internet
- C. Application
- D. Network Access

✓ **Correct Answer: C. Application**

Q19. IPv4 address size is:

- A. 16 bits
- B. 32 bits
- C. 64 bits
- D. 128 bits

✓ **Correct Answer: B. 32 bits**

Q20. ARP is used to find:

- A. IP from domain name
- B. MAC address from IP address
- C. IP from MAC address only
- D. Port number from IP

✓ **Correct Answer: B. MAC address from IP address**

SET 2 — DATA TRANSMISSION & DATA LINK LAYER (Q21 – Q40)

Q21. Simplex communication means:

- A. Communication in both directions simultaneously
- B. Communication in one direction only
- C. Communication in both directions alternately
- D. No communication

✓ **Correct Answer: B. Communication in one direction only**

Q22. Walkie-talkie is an example of:

- A. Simplex
- B. Half-Duplex
- C. Full-Duplex
- D. Parallel transmission

✓ **Correct Answer: B. Half-Duplex**

Q23. Telephone conversation is an example of:

- A. Simplex
- B. Half-Duplex
- C. Full-Duplex
- D. Serial transmission only

✓ **Correct Answer: C. Full-Duplex**

Q24. In full-duplex communication:

- A. Data travels only one way
- B. Data travels both ways, but not simultaneously
- C. Data travels both ways simultaneously
- D. Data cannot be transmitted

✓ **Correct Answer: C. Data travels both ways simultaneously**

Q25. In serial transmission, bits are transmitted:

- A. All simultaneously
- B. One after another
- C. In groups of 8 only
- D. Only through fiber

✓ **Correct Answer: B. One after another**

Q26. Compression is used to:

- A. Increase data size
- B. Reduce data size
- C. Increase IP address size
- D. Detect routing errors

✓ **Correct Answer: B. Reduce data size**

Q27. Which compression method allows complete recovery of original data?

- A. Lossy
- B. Lossless
- C. Analog
- D. Digital

✓ **Correct Answer: B. Lossless**

Q28. JPEG compression is generally:

- A. Lossless
- B. Lossy
- C. Error control
- D. Flow control

✓ **Correct Answer: B. Lossy**

Q29. Signal strength decreasing during transmission is called:

- A. Noise
- B. Distortion
- C. Attenuation
- D. Encoding

✓ **Correct Answer: C. Attenuation**

Q30. Change in the shape of a signal is called:

- A. Attenuation
- B. Distortion
- C. Noise
- D. Compression

✓ **Correct Answer: B. Distortion**

Q31. An unwanted signal interfering with the original signal is called:

- A. Noise
- B. Encoding
- C. Framing
- D. Routing

✓ **Correct Answer: A. Noise**

Q32. Encoding mainly involves:

- A. Choosing a route
- B. Representing data in a suitable form for transmission
- C. Reducing file size
- D. Assigning MAC address

✓ **Correct Answer: B. Representing data in a suitable form for transmission**

Q33. Which OSI layer is responsible for framing?

- A. Physical
- B. Data Link
- C. Network
- D. Transport

✓ **Correct Answer: B. Data Link**

Q34. Framing means:

- A. Packet → Frame
- B. Frame → Packet
- C. Segment → Packet
- D. Bits → Packet

✓ **Correct Answer: A. Packet → Frame**

Q35. Flow control mainly controls:

- A. IP address
- B. Data transmission rate between sender and receiver
- C. MAC address
- D. Routing path

✓ **Correct Answer: B. Data transmission rate between sender and receiver**

Q36. Flow control is mainly required when:

- A. Receiver is slower than sender
- B. Router has no IP address
- C. Data is encrypted
- D. Network has no topology

✓ **Correct Answer: A. Receiver is slower than sender**

Q37. Which technique is used for error detection?

- A. CRC
- B. HTTP
- C. FTP
- D. DNS

✓ **Correct Answer: A. CRC**

Q38. CRC stands for:

- A. Cyclic Redundancy Check
- B. Central Routing Code
- C. Cyclic Routing Control
- D. Computer Redundancy Control

✓ **Correct Answer: A. Cyclic Redundancy Check**

Q39. Which technique adds an extra bit for basic error detection?

- A. CRC
- B. Parity Check
- C. Routing
- D. Compression

✓ **Correct Answer: B. Parity Check**

Q40. ACK generally indicates:

- A. Data rejected
- B. Successful acknowledgement/receipt
- C. Network congestion
- D. Signal attenuation

✓ **Correct Answer: B. Successful acknowledgement/receipt**

SET 3 — NETWORK LAYER (Q41 – Q60)

Q41. The Network Layer is which layer of OSI?

- A. Layer 1
- B. Layer 2
- C. Layer 3
- D. Layer 4

✓ **Correct Answer: C. Layer 3**

Q42. The main function of routing is:

- A. Error detection
- B. Choosing a path for packets
- C. Data compression
- D. Encryption

✓ **Correct Answer: B. Choosing a path for packets**

Q43. Which device is primarily associated with the Network Layer?

- A. Hub
- B. Switch
- C. Router
- D. Repeater

✓ **Correct Answer: C. Router**

Q44. Routing is mainly concerned with:

- A. Selecting a path from source to destination
- B. Compressing data
- C. Converting data to bits
- D. Formatting data

✓ **Correct Answer: A. Selecting a path from source to destination**

Q45. Congestion occurs when:

- A. Network traffic exceeds available capacity
- B. Data is compressed
- C. Receiver is disconnected only
- D. IP address is 32 bits

✓ **Correct Answer: A. Network traffic exceeds available capacity**

Q46. Congestion control is concerned with:

- A. Preventing network overload
- B. Assigning MAC addresses
- C. Data formatting
- D. File compression

✓ **Correct Answer: A. Preventing network overload**

Q47. Flow control differs from congestion control because flow control mainly deals with:

- A. Entire network traffic
- B. Sender and receiver rate
- C. Routing tables
- D. IP addressing

✓ **Correct Answer: B. Sender and receiver rate**

Q48. IPv4 stands for:

- A. Internet Protocol Version 4
- B. Internet Process Version 4
- C. Internal Protocol Version 4
- D. Internet Packet Version 4

✓ **Correct Answer: A. Internet Protocol Version 4**

Q49. IPv4 uses how many bits?

- A. 16
- B. 32
- C. 64
- D. 128

✓ **Correct Answer: B. 32**

Q50. An IPv4 address contains how many octets?

- A. 2
- B. 4
- C. 6
- D. 8

✓ **Correct Answer: B. 4**

Q51. Each IPv4 octet contains:

- A. 4 bits
- B. 8 bits
- C. 16 bits
- D. 32 bits

✓ **Correct Answer: B. 8 bits**

Q52. Which is a valid IPv4-style address?

- A. 192.168.1.10
- B. 192.168.1.300
- C. 192.168.1
- D. 192.168.1.10.5

✓ **Correct Answer: A. 192.168.1.10**

Q53. ARP stands for:

- A. Address Resolution Protocol
- B. Address Routing Protocol
- C. Automatic Resolution Process
- D. Address Relay Protocol

✓ **Correct Answer: A. Address Resolution Protocol**

Q54. ARP resolves:

- A. Domain name to IP
- B. IP address to MAC address
- C. MAC address to port number
- D. IP address to domain name

✓ **Correct Answer: B. IP address to MAC address**

Q55. Which address is used at the Data Link Layer?

- A. IP address
- B. MAC address
- C. Port number
- D. URL

✓ **Correct Answer: B. MAC address**

Q56. Which address is primarily used at the Network Layer?

- A. MAC address
- B. IP address
- C. Port number
- D. Email address

✓ **Correct Answer: B. IP address**

Q57. Which protocol is used by a device to discover the MAC address associated with a known IPv4 address on a local network?

- A. HTTP
- B. FTP
- C. ARP
- D. SMTP

✓ **Correct Answer: C. ARP**

Q58. Which statement is correct?

- A. IPv4 is 128-bit
- B. IPv4 is 32-bit
- C. IPv4 is 64-bit
- D. IPv4 is 16-bit

✓ **Correct Answer: B. IPv4 is 32-bit**

Q59. Which of the following is NOT primarily a Network Layer function?

- A. Routing
- B. Logical addressing
- C. Packet forwarding
- D. Framing

✓ **Correct Answer: D. Framing**

Q60. The data unit at the Network Layer is commonly called:

- A. Bit
- B. Frame
- C. Packet
- D. Segment

✓ **Correct Answer: C. Packet**

SET 4 — TCP, UDP & APPLICATION PROTOCOLS (Q61 – Q80)

Q61. TCP stands for:

- A. Transmission Control Protocol
- B. Transfer Communication Protocol
- C. Transmission Communication Process
- D. Transport Control Process

✓ **Correct Answer: A. Transmission Control Protocol**

Q62. TCP is:

- A. Connectionless
- B. Connection-oriented
- C. Physical protocol
- D. Routing protocol

✓ **Correct Answer: B. Connection-oriented**

Q63. TCP provides:

- A. Reliable delivery
- B. No delivery mechanism
- C. Only routing
- D. Only encryption

✓ **Correct Answer: A. Reliable delivery**

Q64. Which protocol uses acknowledgements and retransmission to support reliable delivery?

- A. UDP
- B. TCP
- C. HTTP
- D. ARP

✓ **Correct Answer: B. TCP**

Q65. UDP stands for:

- A. User Datagram Protocol
- B. Universal Data Protocol
- C. User Data Process
- D. Unified Datagram Process

✓ **Correct Answer: A. User Datagram Protocol**

Q66. UDP is:

- A. Connection-oriented
- B. Connectionless
- C. A routing protocol
- D. An error detection algorithm

✓ **Correct Answer: B. Connectionless**

Q67. Which protocol generally has lower overhead?

- A. TCP
- B. UDP
- C. FTP
- D. SMTP

✓ **Correct Answer: B. UDP**

Q68. Which is more suitable when low overhead and speed are important?

- A. TCP
- B. UDP
- C. SMTP
- D. FTP

✓ **Correct Answer: B. UDP**

Q69. Which protocol is primarily used for web communication?

- A. FTP
- B. HTTP
- C. SMTP
- D. ARP

✓ **Correct Answer: B. HTTP**

Q70. HTTP stands for:

- A. HyperText Transfer Protocol
- B. High Transfer Text Protocol
- C. Hyper Transfer Transmission Process
- D. Host Text Transfer Protocol

✓ **Correct Answer: A. HyperText Transfer Protocol**

Q71. FTP is mainly used for:

- A. Email sending
- B. File transfer
- C. Routing
- D. IP resolution

✓ **Correct Answer: B. File transfer**

Q72. FTP stands for:

- A. File Transfer Protocol
- B. File Transmission Process
- C. Fast Transfer Protocol
- D. File Transport Process

✓ **Correct Answer: A. File Transfer Protocol**

Q73. SMTP is mainly associated with:

- A. Web browsing
- B. File transfer
- C. Sending email
- D. Routing

✓ **Correct Answer: C. Sending email**

Q74. SMTP stands for:

- A. Simple Mail Transfer Protocol
- B. Secure Mail Transfer Process
- C. Simple Message Transport Protocol
- D. System Mail Transfer Protocol

✓ **Correct Answer: A. Simple Mail Transfer Protocol**

Q75. Which of the following belongs to the Transport Layer?

- A. HTTP
- B. FTP
- C. TCP
- D. SMTP

✓ **Correct Answer: C. TCP**

Q76. Which pair contains only Transport Layer protocols?

- A. TCP and UDP
- B. HTTP and FTP
- C. FTP and SMTP
- D. IP and ARP

✓ **Correct Answer: A. TCP and UDP**

Q77. Which pair contains only Application Layer protocols?

- A. TCP and UDP
- B. HTTP and FTP
- C. IP and TCP
- D. ARP and UDP

✓ **Correct Answer: B. HTTP and FTP**

Q78. Which protocol is best associated with reliable file transfer?

- A. TCP
- B. UDP
- C. ARP
- D. IP

✓ **Correct Answer: A. TCP**

Q79. Which protocol is generally preferred for applications where occasional packet loss may be acceptable but low overhead is desired?

- A. TCP
- B. UDP
- C. FTP
- D. SMTP

✓ **Correct Answer: B. UDP**

Q80. Which is the correct matching?

- A. HTTP — Web
- B. FTP — Email
- C. SMTP — File transfer
- D. UDP — Routing

✓ **Correct Answer: A. HTTP — Web**

SET 5 — MIXED STET EXAM-LEVEL QUESTIONS (Q81 – Q100)

Q81. Which sequence correctly represents data units from Transport to Physical Layer?

- A. Segment → Packet → Frame → Bits
- B. Packet → Segment → Frame → Bits
- C. Frame → Packet → Segment → Bits
- D. Segment → Frame → Packet → Bits

✓ **Correct Answer: A. Segment → Packet → Frame → Bits**

Q82. Which combination is correctly matched?

- A. TCP — Internet Layer
- B. IP — Internet Layer
- C. HTTP — Transport Layer
- D. MAC — Network Layer

✓ **Correct Answer: B. IP — Internet Layer**

Q83. Which TCP/IP layer combines OSI Application, Presentation and Session layers?

- A. Transport
- B. Internet
- C. Application
- D. Network Access

✓ **Correct Answer: C. Application**

Q84. Which TCP/IP layer combines the functions of OSI Data Link and Physical layers in the common 4-layer model?

- A. Application
- B. Transport
- C. Internet
- D. Network Access

✓ **Correct Answer: D. Network Access**

Q85. Which statement about ARP is correct?

- A. It converts domain names into IP addresses
- B. It finds a MAC address corresponding to an IPv4 address on a local network
- C. It provides reliable transport
- D. It transfers web pages

✓ **Correct Answer: B. It finds a MAC address corresponding to an IPv4 address on a local network**

Q86. Which one is NOT an impairment of data transmission?

- A. Noise
- B. Distortion
- C. Attenuation
- D. Routing

✓ **Correct Answer: D. Routing**

Q87. A signal becomes weaker as it travels through a medium. This is:

- A. Distortion
- B. Attenuation
- C. Noise
- D. Framing

✓ **Correct Answer: B. Attenuation**

Q88. A network is overloaded because too many packets are being transmitted. This is:

- A. Flow control problem only
- B. Congestion
- C. Framing
- D. Encoding

✓ **Correct Answer: B. Congestion**

Q89. Which statement correctly distinguishes flow control from congestion control?

- A. Flow control manages sender-receiver rate; congestion control manages network overload
- B. Flow control manages routing; congestion control manages encryption
- C. Both mean exactly the same thing
- D. Flow control is only used at the Application Layer

✓ **Correct Answer: A. Flow control manages sender-receiver rate; congestion control manages network overload**

Q90. Which Data Link Layer function converts a packet into a frame?

- A. Routing
- B. Framing
- C. Encoding
- D. Compression

✓ **Correct Answer: B. Framing**

Q91. Which technique is based on binary/polynomial division for error detection?

- A. Parity
- B. Checksum
- C. CRC
- D. Flow control

✓ **Correct Answer: C. CRC**

Q92. Which is the correct order of OSI layers from top to bottom?

- A. Application → Presentation → Session → Transport → Network → Data Link → Physical
- B. Application → Session → Presentation → Transport → Network → Physical → Data Link
- C. Physical → Data Link → Network → Transport → Session → Presentation → Application
- D. Application → Transport → Session → Network → Data Link → Presentation → Physical

✓ **Correct Answer: A. Application → Presentation → Session → Transport → Network → Data Link → Physical**

Q93. Which OSI layer is associated with MAC addressing?

- A. Physical
- B. Data Link
- C. Network
- D. Transport

✓ **Correct Answer: B. Data Link**

Q94. Which protocol is used for email sending?

- A. HTTP
- B. FTP
- C. SMTP
- D. ARP

✓ **Correct Answer: C. SMTP**

Q95. Which protocol is connectionless?

- A. TCP
- B. UDP
- C. FTP
- D. HTTP

✓ **Correct Answer: B. UDP**

Q96. Which protocol is connection-oriented?

- A. UDP
- B. IP
- C. TCP
- D. ARP

✓ **Correct Answer: C. TCP**

Q97. Which topology is most associated with a central connecting device?

- A. Bus
- B. Ring
- C. Star
- D. Mesh

✓ **Correct Answer: C. Star**

Q98. If the central switch of a typical star topology fails, what is the likely effect?

- A. Only one link is affected
- B. The connected network is generally affected significantly
- C. Nothing happens
- D. Only the Internet Layer fails

✓ **Correct Answer: B. The connected network is generally affected significantly**

Q99. Which topology offers the highest redundancy through multiple direct paths?

- A. Bus
- B. Star
- C. Ring
- D. Mesh

✓ **Correct Answer: D. Mesh**

Q100. Which set is completely correct?

- A. TCP—Reliable, UDP—Connectionless, ARP—IP to MAC, IPv4—32 bits
- B. TCP—Connectionless, UDP—Reliable, ARP—MAC to IP, IPv4—128 bits
- C. TCP—Web, UDP—Email, ARP—Routing, IPv4—64 bits
- D. TCP—File transfer, UDP—MAC address, ARP—HTTP, IPv4—16 bits

✓ **Correct Answer: A. TCP—Reliable, UDP—Connectionless, ARP—IP to MAC, IPv4—32 bits**

Bihar STET Computer Science

⚡ Computer Network — Short Notes & Revision Sheet

TARGET EXAM: STET HIGH-YIELD POINTS

1 Computer Network

Computer Network: Do ya more devices ko connect karke data/resources share karna.

Example: Computer ↔ Router ↔ Computer

2 Network Topology ★★★★★

Topology: Network mein devices ka arrangement/structure.

Topology	Key Point	Main Advantage	Main Disadvantage
Bus	Single backbone cable	Cheap, simple	Backbone fail → entire network affected
Star	All devices → central Hub/Switch	Easy to manage	Central device fail → network affected
Ring	Devices form a ring	Token passing possible	Break can affect communication
Mesh	Multiple paths between devices	High fault tolerance	Expensive/complex
Hybrid	Combination of topologies	Flexible/scalable	Complex/costly

★ **Special Points:** Star → Central device | Ring → Token Passing | Mesh → Multiple paths + Fault Tolerance | Hybrid → Combination

3 OSI Model ★★★★★★

7 Layers Architecture:

Layer No. & Name	Main Work	Example / Keyword
7 Application	Network services	HTTP, FTP, SMTP
6 Presentation	Data format, encryption, compression	Format
5 Session	Session establish/manage/terminate	Session
4 Transport	End-to-end delivery	TCP, UDP
3 Network	Routing + logical addressing	IP, Router
2 Data Link	Framing, MAC, error/flow control	Frame, MAC
1 Physical	Bits/signals transmission	Cable, signal

🔥 **PDU (Protocol Data Unit) Mapping:**



4 & 5 TCP/IP Model vs OSI Model ★★★★★★

🧠 **Remember TCP/IP Shortcut:** A → T → I → N (Application, Transport, Internet, Network Access)

OSI Model (7 Layers)	TCP/IP Model (4 Layers)	Key Differences
7. Application 6. Presentation 5. Session	4. Application	OSI: Developed by ISO (Reference Model) TCP/IP: Developed by DARPA/DoD (Implementation Suite)
4. Transport	3. Transport	End-to-end delivery (TCP/UDP)
3. Network	2. Internet	IP + Routing
2. Data Link 1. Physical	1. Network Access	Local network + Transmission

🔥 Layer Mapping Diagram

Application / Presentation / Session → Application
 Transport → Transport
 Network → Internet
 Data Link / Physical → Network Access

6 – 9 Transmission, Encoding, Compression & Impairments ★★★★★

Mode	Meaning	Example
Simplex	One-way only	TV, Keyboard
Half-Duplex	Both directions, one at a time	Walkie-talkie
Full-Duplex	Both directions simultaneously	Phone call

Parallel vs Serial Transmission: Parallel = Multiple bits together | Serial = Bits one after another

Encoding: Data ko transmission ke suitable signal representation mein convert karna. (Data → Encoding → Signal → Transmission)

8 Compression ★★

- **Lossless:** Original data completely recoverable (ZIP, PNG)
- **Lossy:** Some information lost (JPEG, MP3)

9 Transmission Impairments ★★★★★

- **Attenuation:** Signal strength decreases (Weakening)
- **Distortion:** Signal shape changes
- **Noise:** Unwanted interference

10. Data Link Layer ★★★★★★

OSI Layer = 2 | Main Functions: Framing + Flow Control + Error Control

- **Framing:** Packet → Frame | [Header + Data + Trailer] = Frame (Header: MAC Address, Trailer: CRC)
- **Flow Control:** Speed control (Sender rate vs Receiver capacity) → Fast Sender ⚡ ↔ Slow Receiver 🐢
- **Error Control:** Parity Check, Checksum, **CRC ★ (Cyclic Redundancy Check)**, ACK, NAK, Retransmission.

CRC Key Point: CRC = Cyclic Redundancy Check → Main purpose is **Error Detection**.

11 – 13 Network Layer, IPv4 & ARP ★★★★★★

11 Network Layer (OSI Layer 3): Routing (Path selection via Router) + Congestion Control.

Concept	Flow Control	Congestion Control
Target / Protection	Receiver ko protect karta hai (Receiver slow)	Entire network ko protect karta hai (Network overloaded)
Scope	Sender ↔ Receiver	Entire Network Traffic

13 ARP (Address Resolution Protocol) ★★★★★★

1 2 IPv4 Features ★★★★★

- **Address Size:** 32 bits (4 Octets)
- **Format:** Dotted Decimal (e.g. 192.168.1.10)
- **Octet Size:** Each octet = 8 bits

Main work: **IP Address** → **MAC Address**

192.168.1.20 —(ARP)—> AA:BB:CC:DD:EE:FF

1 4 & 1 5 Transport Layer & Application Layer ★★★★★

1 4 Transport Layer (TCP vs UDP):

TCP (Transmission Control Protocol)	UDP (User Datagram Protocol)
Connection-oriented Reliable ACK used Retransmission Ordered delivery Slower (More overhead)	Connectionless No delivery guarantee No ACK No retransmission Unordered Faster (Low overhead)

1 5 Application Layer Protocols:

Protocol	Full Form	Main Work
HTTP	HyperText Transfer Protocol	Web Browsing
FTP	File Transfer Protocol	File Transfer
SMTP	Simple Mail Transfer Protocol	Email Sending

🔥 STET Last-Minute Quick Revision Chart

Question / Concept	Answer / One-Liner
OSI layers / TCP/IP layers	7 layers / 4 layers
TCP/IP shortcut	A-T-I-N
TCP vs UDP Transport behavior	TCP = Reliable UDP = Connectionless
IP / HTTP / FTP / SMTP Layer	IP = Internet HTTP, FTP, SMTP = Application
IPv4 Size	32 bits (4 Octets)
ARP Protocol	IP → MAC Address
Routing & Router Layer	Path selection → Network Layer
Packet → Frame / MAC Address	Data Link Layer
CRC Purpose	Error Detection
Flow Control vs Congestion Control	Flow = Sender/Receiver rate Congestion = Network overload
Attenuation / Distortion / Noise	Weak signal / Shape change / Interference
Simplex / Half-Duplex / Full-Duplex	One-way / Both one-at-a-time / Both simultaneously
Ring / Mesh / Star Topology	Token Passing / Fault Tolerance / Central Device

🎯 सबसे ज्यादा याद रखने वाले 15 Points (High Yield)

1 **OSI Layers** = 7

2 **TCP/IP Layers** = 4

3 **TCP/IP Order** = A-T-I-N

4 **TCP** = Connection-oriented & Reliable

5 **UDP** = Fast & Connectionless

6 **IPv4 Size** = 32-bit (4 octets)

7 **ARP** = IP → MAC Address

8 **Routing** = Path selection (Network Layer)

9 **CRC** = Error Detection

10 **Framing** = Packet → Frame

11 **MAC Address** = Data Link Layer

12 **HTTP** = Web | **FTP** = File

13 **SMTP** = Email Sending

14 **Attenuation** = Signal weakening

15 **Token Passing** = Ring Topology