

1 Define Computer Network.

👉 Definition:

A **computer network** is a collection of two or more computers (or devices) that are connected together so that they can share data, resources (like printer, files, internet), and communicate with each other.

📘 Example:

- Office मध्ये सर्व computers एकमेकांना जोडलेले असतात to share files or use a single printer.

📗 In short:

Computer network allows **communication and resource sharing** between computers.

2 Define Internet.

👉 Definition:

The **Internet** is a global system of interconnected computer networks that use the **TCP/IP** protocol to communicate.

📘 In simple words:

It is the **network of networks** which connects millions of computers around the world.

📗 Example:

When you browse Google, send emails, or use social media — you are using the Internet.

📙 Marathi explain:

Internet म्हणजे जगभरातील सर्व नेटवर्क्सना जोडणारं सर्वात मोठं नेटवर्क.

3 What do you mean by Network Topology?

👉 Definition:

Network topology means the way in which computers, cables, and other devices are arranged in a network — both physically and logically.

📘 In simple words:

It shows **how computers are connected** to each other.

📗 Types of Topology:

1. **Bus Topology** – All computers share one main cable.
2. **Star Topology** – All computers connect to one central hub/switch.
3. **Ring Topology** – Devices connected in a circular path.
4. **Mesh Topology** – Every device connected to every other device.
5. **Hybrid Topology** – Combination of two or more topologies.

📙 Marathi explain:

Topology म्हणजे नेटवर्कचा नकाशा – म्हणजेच devices कसे जोडले आहेत हे दाखवतं.

4 What is a Network? And what are the Benefits of Networks?

👉 Definition:

A **network** is a group of interconnected computers and devices that can share data and resources.

📘 Benefits:

1. **File Sharing** – Share documents or data easily.

2. **Resource Sharing** – Use one printer or internet connection for many computers.
3. **Communication** – Chat, email, or video calls between users.
4. **Data Security and Backup** – Central storage and backup possible.
5. **Cost Efficiency** – Sharing resources reduces cost.

■ Marathi explain:

Network मुळे आपण एकाच resource (उदा. printer, Wi-Fi) अनेक जण वापरू शकतो आणि communication सोपं होतं.

5 What do you mean by Data Communication?

👉 Definition:

Data communication is the exchange of data between two devices through some transmission medium like cable or wireless signal.

📘 In simple terms:

When one computer sends data to another computer — that is data communication.

📗 Five Components of Data Communication:

1. **Message** – The actual data.
2. **Sender** – Device that sends data.
3. **Receiver** – Device that receives data.
4. **Medium** – The path (cable, radio waves, etc.).
5. **Protocol** – The set of rules for communication.

■ Marathi explain:

Data communication म्हणजे एका device कडून दुसऱ्याकडे माहिती पाठवणे – उदा. message, file इ.

6 What are the fundamental characteristics for effective data communication?

👉 To have **effective data communication**, four characteristics are important:

1. **Delivery** – Data must reach the correct destination.
2. **Accuracy** – Data should be received without error.
3. **Timeliness** – Data should arrive at the right time. (No delay)
4. **Jitter** – Variation in packet arrival time should be minimal.

■ Marathi explain:

डेटा योग्य ठिकाणी, बरोबर, वेळेत आणि एकसमान वेगाने पोहोचला पाहिजे – तेव्हाच communication perfect होतं.

7 What is the difference between MAC address and IP address?

MAC Address

IP Address

It is a **physical address** given to the device's hardware (like NIC card). It is a **logical address** assigned by the network.

Works at **Data Link Layer (Layer 2)**.

Works at **Network Layer (Layer 3)**.

Permanent and unique for each device.

Can change when the device connects to a new network.

MAC Address

Example: 00-A1-B2-C3-D4-E5

IP Address

Example: 192.168.1.1

Marathi explain:

MAC म्हणजे device चा कायमचा पता (hardware level) आणि IP म्हणजे temporary network level address.

8 Explain the types of Transmission Modes.

👉 **Transmission mode** defines the direction of data flow between two devices.

Types:

1. **Simplex Mode** – Data flows in **only one direction**.

Example: Keyboard → CPU.

2. **Half Duplex Mode** – Data flows in **both directions but one at a time**.

Example: Walkie-talkie.

3. **Full Duplex Mode** – Data flows in **both directions simultaneously**.

Example: Telephone communication.

Marathi explain:

Simplex म्हणजे एकाच दिशेने, Half duplex म्हणजे दोन्ही पण एकावेळी एक, आणि Full duplex म्हणजे दोन्ही बाजूने एकाच वेळी डेटा जातो.

9 Explain the different types of addressing used in a computer network.

👉 **Addressing** means giving an identification number or name to a device so it can communicate properly.

Types:

1. **Physical Address (MAC Address)** – Hardware address of device (Layer 2).

2. **Logical Address (IP Address)** – Software-based address (Layer 3).

3. **Port Address** – Identifies a specific process (Layer 4).

4. **Specific Address (Application Layer)** – For user-level apps like URLs or email IDs.

Marathi explain:

Address म्हणजे device ला ओळखण्यासाठी दिलेला unique नंबर – जसं आपण घराचा address वापरतो तसं.

10 Explain the different network topologies.

👉 **Network topology** shows how the computers (nodes) are arranged and connected in a network.

Types:

1. **Bus Topology**

- All computers connected to a single backbone cable.
- Cheap but difficult to troubleshoot.

2. **Star Topology**

- All devices connected to one central device (hub/switch).
- Easy to maintain and expand.

3. Ring Topology

- Devices connected in a circular manner.
- Each device has exactly two neighbors.

4. Mesh Topology

- Each device connected to every other device.
- Very reliable but expensive.

5. Hybrid Topology

- Combination of two or more topologies.
- Used in large organizations.

Marathi explain:

Topology म्हणजे नेटवर्कचं physical structure — कोणता कॉम्प्युटर कुठे आणि कशाने जोडलेला आहे हे दाखवतं.

1 1 What are the different types of networks?

👉 Definition:

Networks are classified based on their **size, coverage area, and purpose**.

Types of Networks:

1. PAN (Personal Area Network)

- Smallest network, used for personal devices.
- Example: Bluetooth connection between mobile and laptop.
- Marathi: व्यक्तीगत वापरासाठी असलेलं network.

2. LAN (Local Area Network)

- Covers a small area like a room, building, or office.
- Example: College computer lab network.
- Marathi: एका ठिकाणापुरतं मर्यादित network.

3. MAN (Metropolitan Area Network)

- Covers a large area like a city.
- Example: Cable TV network in a city.

4. WAN (Wide Area Network)

- Covers large geographic area — even countries.
- Example: Internet.

In short:

PAN < LAN < MAN < WAN (in increasing size).

1 2 Explain the OSI Reference Model.

👉 Definition:

OSI (Open Systems Interconnection) model is a **theoretical framework** that explains how data travels from one computer to another over a network.

It has **7 layers**, each with a specific function.

7 Layers of OSI Model (Bottom to Top):

1. **Physical Layer** – Deals with cables, signals, and transmission.
(Marathi: actual data signal पाठवणं आणि मिळवणं)
2. **Data Link Layer** – Responsible for error detection and framing.
3. **Network Layer** – Handles logical addressing and routing (IP).
4. **Transport Layer** – Provides reliable data transfer (TCP/UDP).
5. **Session Layer** – Manages communication sessions.
6. **Presentation Layer** – Translates, encrypts, and compresses data.
7. **Application Layer** – Provides services like email, web, file transfer.

Simple trick to remember:

 “Please Do Not Throw Sausage Pizza Away” (P-D-N-T-S-P-A)

1 Explain the TCP/IP Reference Model.

Definition:

The **TCP/IP model** is a practical model used on the Internet for data communication. It is based on **Transmission Control Protocol** and **Internet Protocol**.

Layers of TCP/IP Model:

1. **Network Interface Layer** – Deals with physical transmission.
2. **Internet Layer** – Responsible for logical addressing (IP) and routing.
3. **Transport Layer** – Provides communication between processes (TCP/UDP).
4. **Application Layer** – Provides user-level network services (HTTP, FTP, DNS).

Difference from OSI Model:

- OSI has 7 layers; TCP/IP has 4 layers.
- OSI is a reference model, TCP/IP is an actual implementation.

Marathi:

TCP/IP हे इंटरनेटवर communication साठी वापरले जाणारे practical model आहे.

1 Explain different types of switching techniques.

Definition:

Switching means the method used to send data from one device to another through the network.

Types of Switching:

1. **Circuit Switching:**
 - A dedicated path is established between sender and receiver.
 - Example: Traditional telephone network.
 - Marathi: कॉल सुरु होण्याआधी एक line तयार होते.
2. **Packet Switching:**
 - Data is divided into small packets and sent independently.

- Example: Internet.
- Marathi: डेटा तुकड्यांमध्ये पाठवला जातो.

3. Message Switching:

- Entire message sent as a single unit; stored and forwarded by intermediate devices.
- Example: Old telegraph systems.

■ In short:

Circuit = Fixed path

Packet = Broken data path

Message = Store and forward

1 5 Explain the various transmission media in detail.

👉 Definition:

Transmission media are the paths through which data travels from one device to another.

■ Types:

1. Guided (Wired Media):

- Data travels through physical cables.
- Types:
 - a) **Twisted Pair Cable** – Two copper wires twisted (used in LAN).
 - b) **Coaxial Cable** – Used for cable TV.
 - c) **Optical Fiber Cable** – Very high speed, uses light signals.

2. Unguided (Wireless Media):

- Data travels through air (no cables).
- Types:
 - a) **Radio Waves** – For mobile phones, FM radio.
 - b) **Microwaves** – For satellite communication.
 - c) **Infrared** – Short range communication (remote control).

■ Marathi:

Guided म्हणजे वायरदवारे communication, आणि Unguided म्हणजे हवेतून (wireless) communication.

1 6 Define Framing.

👉 Definition:

Framing means dividing the stream of bits into manageable units called **frames** at the Data Link Layer.

■ Purpose:

- To identify where one frame starts and another ends.
- Helps in error detection and synchronization.

■ Marathi explain:

डेटा सतत बिट्सच्या स्वरूपात येतो, तो भागांमध्ये (frames) विभागणं म्हणजे framing.

1 7 What is ARQ?

👉 Definition:

ARQ (Automatic Repeat reQuest) is an **error-control technique** used in data transmission.

If the receiver detects an error in the received frame, it automatically requests the sender to resend it.

📗 Types of ARQ:

1. Stop-and-Wait ARQ
2. Go-Back-N ARQ
3. Selective Repeat ARQ

📙 Marathi:

डेटा चुकीचा गेल्यास receiver परत पाठवायला सांगतो – हीच ARQ पद्धत आहे.

1 8 What is a noiseless channel?

👉 Definition:

A **noiseless channel** is an ideal communication channel where the transmitted data reaches the receiver **without any error or disturbance**.

📘 In real life:

Such channels rarely exist, because some noise (distortion) is always present.

📙 Marathi:

Noiseless channel म्हणजे असा मार्ग जिथे डेटा बिनचूक आणि disturbance शिवाय पोहोचतो.

1 9 What are different services provided by Data Link Layer?

👉 Definition:

The **Data Link Layer** provides services to ensure reliable delivery of data between two directly connected devices.

📗 Main Services:

1. **Framing** – Divides data into frames.
2. **Physical Addressing** – Adds MAC address.
3. **Flow Control** – Prevents fast sender from overwhelming slow receiver.
4. **Error Control** – Detects and corrects transmission errors.
5. **Access Control** – Controls which device can use the channel at a time.

📙 Marathi:

ही layer दोन directly जोडलेल्या devices मध्ये बिनचूक data पाठवण्यासाठी जबाबदार असते.

2 0 What is Error? Explain types of error.

👉 Definition:

An **error** occurs when bits are changed during transmission due to noise or interference.

📗 Types of Errors:

1. **Single-bit Error** – Only one bit changes.
Example: $1001 \rightarrow 1011$
2. **Burst Error** – Two or more bits change.
Example: $11001 \rightarrow 10110$

Error Detection Techniques:

- Parity Check
- CRC (Cyclic Redundancy Check)
- Checksum

Marathi:

Error म्हणजे डेटा पाठवताना bit चुकीने बदलणं. हे टाळण्यासाठी error detection techniques वापरतात.

2 1 Define the following terms:

Let's understand each term one by one 

a) Hub

 A **Hub** is a simple network device that connects multiple computers in a LAN.

It works at the **Physical Layer (Layer 1)** of OSI Model.

It just sends incoming data to all connected devices — it **does not filter or identify** data destination.

Example:

If one computer sends data, hub forwards it to all computers.

Marathi:

Hub म्हणजे signal सर्वांनाच पाठवणारा “broadcast” device आहे.

b) Switch

 A **Switch** connects devices in a LAN like a hub, but it is **smarter**.

It works at the **Data Link Layer (Layer 2)** and uses **MAC addresses** to send data only to the correct device.

Marathi:

Switch हबपेक्षा intelligent असतो – तो फक्त ज्याला data हवा आहे त्यालाच पाठवतो.

c) Router

 A **Router** connects **different networks** together (e.g., connects LAN to the Internet).

It works at the **Network Layer (Layer 3)** and uses **IP addresses** for routing data packets.

Example:

Your Wi-Fi router connects your home network to the Internet.

Marathi:

Router म्हणजे वेगवेगळ्या नेटवर्क्सना जोडणारा device.

d) Bridge

 A **Bridge** connects two or more LAN segments and filters data based on MAC addresses.

It also works at **Data Link Layer (Layer 2)**.

Marathi:

Bridge म्हणजे दोन लहान नेटवर्क्सना जोडणारा device.

e) Gateway

👉 A **Gateway** connects networks that use **different protocols**.

It works at **all seven layers** of the OSI model.

It can translate data formats so that two different systems can communicate.

Marathi:

Gateway म्हणजे दोन वेगवेगळ्या प्रकारच्या नेटवर्क्समध्ये communication शक्य करणारा translator.

f) Repeater

👉 A **Repeater** amplifies or regenerates signals in a network.

Used in large networks to extend the range.

Works at **Physical Layer (Layer 1)**.

Marathi:

Repeater म्हणजे signal लांब पोहोचवण्यासाठी त्याला पुन्हा strong करणारा device.

g) Ethernet

👉 **Ethernet** is a technology used for **LAN communication**.

It defines how devices format data for transmission and how they access the network.

Standard: **IEEE 802.3**

Marathi:

Ethernet म्हणजे LAN मध्ये data पाठवण्याची सर्वसाधारण पद्धत.

h) Bluetooth

👉 **Bluetooth** is a short-range wireless communication technology.

It uses **radio waves (2.4 GHz)** for connecting devices like phones, headphones, etc.

Range: up to 10 meters.

Marathi:

Bluetooth म्हणजे अल्प अंतरासाठी असलेलं wireless connection.

i) Virtual LAN (VLAN)

👉 **VLAN** divides one physical LAN into multiple **logical networks**.

It improves security and performance.

Example: separating HR and Accounts department in same office network.

Marathi:

VLAN म्हणजे एका physical नेटवर्कमध्ये virtual partitions बनवून data वेगळा ठेवण्याची सोय.

2 2 Compare the following networking devices:

a) Hub vs Switch

Hub	Switch
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Works at Physical Layer Works at Data Link Layer

Sends data to all ports Sends data only to destination device

Hub	Switch
Less secure	More secure
Slower	Faster
No memory	Uses MAC address table

 **Marathi:** Hub सर्वांना data देतो, Switch फक्त योग्य device ला देतो.

b) Router vs Bridge

Router	Bridge
Connects different networks	Connects same type of LANs
Works on Network Layer	Works on Data Link Layer
Uses IP address	Uses MAC address
Smarter and more complex	Simple device

c) Router vs Switch

Router	Switch
Connects networks (LAN to WAN)	Connects devices within LAN
Uses IP address	Uses MAC address
Layer 3 device	Layer 2 device
Slower	Faster for internal LAN traffic

d) Hub vs Bridge

Hub	Bridge
Works on Physical Layer	Works on Data Link Layer
Broadcasts to all devices	Filters and forwards data selectively
No filtering	Filtering based on MAC address

2 Write a note on the following:

a) Standard Ethernet

- IEEE 802.3 standard.
- Data rate: **10 Mbps**.
- Uses **bus or star topology**.
- Uses **CSMA/CD** access method (Carrier Sense Multiple Access with Collision Detection).

b) Fast Ethernet

- IEEE 802.3u standard.
 - Data rate: **100 Mbps**.
 - Uses twisted pair or fiber optic cable.
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c) Gigabit Ethernet

- IEEE 802.3z standard.
 - Data rate: **1 Gbps** (1000 Mbps).
 - Used in modern LANs for high-speed data transfer.
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d) 10-Gigabit Ethernet

- IEEE 802.3ae standard.
 - Data rate: **10 Gbps**.
 - Used in data centers and backbone networks.
-

e) IEEE 802.11 Standards (Wi-Fi)

- Defines **Wireless LAN (WLAN)** standards.
- Example:
 - 802.11b – 11 Mbps
 - 802.11g – 54 Mbps
 - 802.11n – 600 Mbps
 - 802.11ac – up to 1 Gbps

Marathi:

हे Wi-Fi साठीचे standards आहेत ज्यामुळे wireless communication शक्य होतं.

f) Virtual LAN (VLAN)

- Logical division of a single physical network into multiple smaller networks.
 - Reduces network traffic and improves security.
 - Example: HR VLAN, Accounts VLAN.
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2 What are the responsibilities of Network Layer?

 The **Network Layer (Layer 3)** is responsible for **source-to-destination delivery** of packets across multiple networks.

Main Functions:

1. **Logical Addressing (IP Addressing)** – Assigns logical addresses to devices.
2. **Routing** – Determines the best path for data.
3. **Packet Forwarding** – Sends data to the next network.

4. **Fragmentation and Reassembly** – Breaks large packets into smaller ones.

5. **Error Handling** – Manages transmission errors.

Marathi:

Network layer data एका network वरून दुसऱ्यावर पोहोचवते – म्हणजेच ते routing आणि addressing साठी जबाबदार आहे.

2 5 Write Short Note on:

a) IPv4 Addressing

- 32-bit address (e.g., 192.168.1.1).
- Divided into 4 octets (0–255).
- Supports around **4.3 billion** addresses.
- Written in **dotted decimal format**.

b) IPv6 Addressing

- 128-bit address (e.g., 2001:0db8:85a3:0000:0000:8a2e:0370:7334).
- Provides a huge number of addresses (2^{128}).
- Better security and faster routing than IPv4.

Marathi:

IPv6 म्हणजे IPv4 ची advanced version — अधिक address space आणि सुरक्षा देते.

c) Routing Table

- A **Routing Table** is a database used by routers to decide the best path for packet forwarding.
- Contains:
 - Destination address
 - Next hop
 - Metric (cost/distance)

Marathi:

Router कोणत्या मार्गाने packet पाठवायचा हे routing table पाहून ठरवतो.

2 6 What are the types of classful addressing and function of each class?

👉 In **Classful IP Addressing**, IP addresses are divided into five classes: A, B, C, D, and E.

Class Range (1st Octet) Used For Default Mask

Class	Range (1st Octet)	Used For	Default Mask
A	1 – 126	Large networks	255.0.0.0
B	128 – 191	Medium networks	255.255.0.0
C	192 – 223	Small networks	255.255.255.0
D	224 – 239	Multicasting	–
E	240 – 255	Experimental	–

Marathi:

IP address च्या पहिल्या अंकावरून class ठरते. Class A मोठ्या network साठी, C लहान network साठी वापरतात.

2 7 Define: NetID and HostID

👉 NetID:

Part of an IP address that identifies the **network**.

👉 HostID:

Part that identifies the **specific device** (host) within that network.

💡 Example:

For IP address **192.168.1.10**,

- Network ID = 192.168.1
- Host ID = 10

Marathi:

NetID म्हणजे नेटवर्कचा address आणि HostID म्हणजे त्या नेटवर्कमधील specific computer चा address.

2 8 Define: Subnetting and Supernetting

👉 Subnetting:

Dividing a large network into smaller networks (subnets) to improve performance and security.

💡 Example:

Splitting Class B network into small Class C networks.

👉 Supernetting:

Combining smaller networks into one large network to reduce routing tables.

💡 Example:

Combining multiple Class C networks into one.

Marathi:

Subnetting म्हणजे network ला विभागण, Supernetting म्हणजे अनेक network एकत्र करण.

2 9 What is the default mask for Class A, B, C addressing?

Class Default Subnet Mask

Class A 255.0.0.0

Class B 255.255.0.0

Class C 255.255.255.0

Marathi:

Subnet mask नेटवर्कचा भाग आणि host चा भाग वेगळा दाखवतो.

3 0 What is the need for Classless Addressing?

👉 Definition:

Classless Addressing (CIDR – Classless Inter-Domain Routing) allows flexible allocation of IP addresses, unlike fixed class-based ranges.

💡 Need:

1. To avoid **wastage of IP addresses**.
2. To provide **efficient routing**.
3. To solve the **shortage of IPv4 addresses**.

Marathi:

Classless addressing मध्ये address classes नसतात, त्यामुळे IP address space अधिक effectively वापरता येतो.

3 1 What is the need for IPv6 Addressing?

Definition:

IPv6 (Internet Protocol version 6) is the **latest version of IP** developed to replace IPv4.

It provides a much larger address space and better network performance.

Need for IPv6:

1. IPv4 Address Exhaustion:

IPv4 provides only about 4.3 billion addresses, which are not enough for modern devices (mobiles, IoT, etc.).

2. Larger Address Space:

IPv6 uses **128-bit** addresses → about 3.4×10^{38} possible addresses.

3. Improved Security:

It supports **IPsec** (data encryption and authentication) by default.

4. Simpler Header Format:

Faster routing and processing.

5. Auto-configuration:

Devices can automatically get an IP address (no need for manual setup).

Marathi:

IPv6 ची गरज अशी आहे की आजच्या काळात devices खूप वाढले आहेत. IPv4 मध्ये पुरेसे addresses नाहीत, म्हणून IPv6 बनवले गेले.

3 2 Discuss the Address Resolution Protocol (ARP).

Definition:

ARP (Address Resolution Protocol) is used to find the **MAC (physical) address** of a device from its **IP (logical) address**.

Working of ARP:

1. When a computer wants to send data, it knows the **IP address** of the receiver.
2. It sends an **ARP Request** message to the network asking “Who has this IP address?”
3. The device with that IP replies with its **MAC address** (ARP Reply).
4. The sender stores this information in an **ARP Table** for future use.

Example:

If Computer A wants to send data to Computer B on the same LAN, it uses ARP to find B's MAC address.

Marathi:

ARP म्हणजे IP address वरून MAC address शोधण्याची पद्धत.

3 3 Discuss the Reverse Address Resolution Protocol (RARP).

Definition:

RARP (Reverse ARP) does the **opposite** of ARP — it finds the **IP address** when the **MAC address** is known.

Working:

1. A diskless computer (without an OS) knows only its MAC address.
2. It sends a **RARP request** to the RARP server.
3. The server replies with the corresponding IP address.

Use:

Used mainly in **booting diskless workstations**.

Marathi:

RARP म्हणजे MAC address वरून IP address मिळवण्याची पद्धत – विशेषत: जेव्हा system कडे IP नसतो.

3 What are the responsibilities of Transport Layer?

Definition:

The **Transport Layer (Layer 4)** is responsible for **end-to-end communication** between devices and reliable data delivery.

Main Responsibilities:

1. **Segmentation and Reassembly** – Breaks large messages into smaller segments and reassembles them at the destination.
2. **Connection Control** – Establishes and terminates connections (e.g., TCP handshake).
3. **Flow Control** – Prevents data overflow.
4. **Error Control** – Detects and retransmits lost data.
5. **Port Addressing** – Uses port numbers to identify different applications.

Protocols used:

- **TCP (Transmission Control Protocol)** – Reliable, connection-oriented.
- **UDP (User Datagram Protocol)** – Fast, connectionless.

Marathi:

Transport layer म्हणजे दोन systems मध्ये विश्वासार्ह data पाठवण्याचं काम करणारी layer.

3 Compare TCP and UDP.

Feature	TCP (Transmission Control Protocol)	UDP (User Datagram Protocol)
Type	Connection-oriented	Connectionless
Reliability	Reliable (error checking + retransmission)	Unreliable
Speed	Slower	Faster
Data Transmission	In sequence	May arrive out of order
Overhead	High	Low
Example	Email, Web, File Transfer	Video streaming, Voice calls, Gaming

Marathi:

TCP म्हणजे विश्वासार्ह आणि slow, UDP म्हणजे वेगवान पण कमी reliable.

3 Write Short Notes on the following:

a) Domain Name Space (DNS)

- Converts **domain names** (like www.google.com) into **IP addresses**.
- Hierarchical structure: Root → Top-level domain → Second-level → Host.
- Works on **port 53** using UDP/TCP.

Marathi:

DNS म्हणजे वेबसाइटच्या नावाला (उदा. google.com) IP address मध्ये रूपांतर करणारी प्रणाली.

b) DDNS (Dynamic DNS)

- Automatically updates a DNS record when a device's IP address changes.
- Useful for home internet where IP changes frequently.

Marathi:

Dynamic DNS म्हणजे IP बदलला तरी website कायम reachable राहते.

c) TELNET

- A protocol that allows **remote login** to another computer over a network.
- Works on **port 23**.
- Example: Managing a server from another location.

Marathi:

TELNET म्हणजे दूरच्या कॉम्प्युटरवर login करून काम करणं.

d) EMAIL (Electronic Mail)

- Used to send and receive text messages and files over Internet.
- Uses **SMTP (sending)** and **POP3/IMAP (receiving)** protocols.

Marathi:

Email म्हणजे इंटरनेटवरून संदेश पाठवण्याचं साधन.

e) FTP (File Transfer Protocol)

- Used for transferring files between client and server.
- Works on **port 21**.
- Example: Uploading website files to a web server.

Marathi:

FTP वापरून फाईल्स नेटवर्कवर share करता येतात.

f) WWW (World Wide Web)

- System of interlinked web pages accessed using browsers (Chrome, Edge).
- Uses **HTTP/HTTPS** protocol.

Marathi:

WWW म्हणजे वेबसाइट्सचा जगभर पसरलेला संग्रह.

g) HTTP (HyperText Transfer Protocol)

- Protocol for communication between **web browser** and **web server**.
- Works on **port 80** (HTTP) or **443** (HTTPS).

Marathi:

HTTP म्हणजे browser आणि server मध्ये माहिती पाठवण्याचं माध्यम.

h) Firewalls

- Security system that monitors and controls incoming and outgoing network traffic.
- Acts as a barrier between trusted and untrusted networks.

Marathi:

Firewall म्हणजे नेटवर्कला बाहेरच्या धोका (hackers, viruses) पासून वाचवणारी सुरक्षा भिंत.

3 7 Compare Connection-Oriented and Connectionless Services.

Feature	Connection-Oriented	Connectionless
Connection	Connection established before data transfer	No connection required
Reliability	Reliable (data delivery confirmed)	Unreliable
Example Protocol	TCP	UDP
Overhead	More	Less
Example	Telephone call	Sending a letter/postcard

Marathi:

Connection-oriented म्हणजे आधी link तयार करून data पाठवण, connectionless मध्ये direct data पाठवतात.

3 8 Explain the Shortest Path Algorithm.

Definition:

A **Shortest Path Algorithm** finds the minimum distance or cost path between two nodes in a network.

Most Common Algorithm:

Dijkstra's Algorithm

Steps (Simplified):

- Assign a tentative distance value to every node (start node = 0, others = ∞).
- Choose the node with the smallest tentative distance.
- Update distances to its neighboring nodes.
- Repeat until all nodes are visited.

Marathi:

Shortest Path Algorithm म्हणजे नेटवर्कमधून data पाठवण्यासाठी सर्वात कमी अंतराचा मार्ग शोधण.

3 9 Explain Distance Vector Routing in detail.

Definition:

Distance Vector Routing is a routing technique where each router shares its routing table with neighboring routers. Each router calculates the **best path** to a destination based on **distance (hops)**.

How it works:

1. Every router maintains a table (Destination, Distance).
2. Periodically, routers exchange tables with their neighbors.
3. Each router updates its own table using received information.

Example:

RIP (Routing Information Protocol) uses distance vector routing.

Advantages:

- Simple to implement.
- Automatic updates.

Disadvantages:

- Slow convergence.
- Routing loops may occur.

Marathi:

Distance vector म्हणजे प्रत्येक router आपल्या शेजाऱ्यांशी माहिती share करून मार्ग शोधतो.

4 0 List and discuss the types of DNS Records.

Definition:

DNS Records are entries in a DNS database that define how domain names are mapped to IPs and other information.

Types of DNS Records:

Record Type Description

A Record Maps a domain name to an IPv4 address.

AAAA Record Maps a domain name to an IPv6 address.

CNAME Alias for another domain name.

MX Record Mail Exchange record – for email servers.

NS Record Specifies the name servers for the domain.

PTR Record Used for reverse DNS lookup (IP → domain).

TXT Record Stores additional text info (like SPF, verification).

Marathi:

DNS records म्हणजे domain name शी संबंधित माहिती ठेवणारे database entries — जसं IP address, mail server वगैरे.

4 1 Discuss the features of HTTP and also discuss how HTTP works.

👉 Definition:

HTTP (HyperText Transfer Protocol) is the **application layer protocol** used for communication between **web browsers** and **web servers**.

It is the foundation of **data communication on the World Wide Web (WWW)**.

📘 Features of HTTP:

1. Connectionless:

After a request is sent and a response is received, the connection between client and server is closed.
(Marathi: प्रत्येक request साठी वेगळी connection तयार होते.)

2. Stateless:

HTTP does not remember previous requests — each request is treated as new.
(Marathi: प्रत्येक विनंती स्वतंत्र असते.)

3. Media Independent:

Any type of data (text, image, video, etc.) can be sent using HTTP.

4. Client–Server Model:

Browser (client) sends a request; Server responds with the webpage.

5. Secure Version:

HTTPS (HTTP Secure) uses encryption (SSL/TLS) for safe data transfer.

📗 How HTTP Works:

1. Client Request:

User enters a URL (e.g., <https://www.google.com>) in the browser.

2. DNS Resolution:

The domain name is converted into an IP address using DNS.

3. Connection Setup:

Browser connects to the server (port 80 for HTTP, 443 for HTTPS).

4. HTTP Request Sent:

Browser sends an HTTP request (GET, POST, etc.) to the server.

5. Server Response:

Server processes the request and sends back the required web page.

6. Rendering:

Browser displays the webpage to the user.

📙 Marathi:

HTTP म्हणजे browser आणि web server मधील संभाषणाचं नियमांचं सेट आहे.

Browser “request” पाठवतो आणि server “response” देतो.

4 2 Explain about the Application Layer and its services in detail.

👉 Definition:

The **Application Layer** is the **topmost layer (Layer 7)** of the OSI Model.

It provides services directly to **end users and applications** for network communication.

Main Services of Application Layer:

1. **Network Virtual Terminal:**
Allows a user to log into a remote host (e.g., using Telnet).
2. **File Transfer, Access, and Management (FTAM):**
Helps in file sharing between computers (e.g., FTP).
3. **Mail Services:**
Provides email communication between users (e.g., SMTP, POP3).
4. **Directory Services:**
Helps locate and access distributed resources (e.g., DNS).
5. **Web Services:**
Delivers content using HTTP/HTTPS.

Common Application Layer Protocols:

Protocol	Function
HTTP/HTTPS	Web browsing
FTP	File transfer
SMTP, POP3, IMAP	Email
DNS	Domain name resolution
Telnet/SSH	Remote login
SNMP	Network management

Marathi:

Application layer वापरकर्त्याला directly सेवा देते – जसं की email, file transfer, web browsing इ.

ही layer म्हणजे network वापरण्याचं entry point आहे.

4 3 Describe the role of a DNS on a computer network with reference to its components.

Definition:

DNS (Domain Name System) is a distributed database system that converts **domain names** (like www.example.com) into **IP addresses** (like 93.184.216.34).

Without DNS, you would have to remember long numerical IPs — DNS makes the internet easy to use.

Main Roles/Functions of DNS:

1. **Name-to-IP Resolution:**
Converts domain name → IP address.
2. **Hierarchical Naming Structure:**
Organized in a tree-like format — Root → TLD → Domain → Subdomain.
3. **Caching:**
Stores recent lookups to speed up future requests.

4. Load Distribution:

Distributes traffic among multiple servers using the same domain name.

Components of DNS:

Component	Description
DNS Resolver (Client)	Sends DNS queries on behalf of applications.
DNS Server	Stores DNS records and responds to queries.
Root Servers	At the top level; direct queries to TLD servers.
TLD Servers	Handle top-level domains (.com, .org, .edu).
Authoritative Servers	Hold the actual domain-to-IP mapping.

Example:

When you type www.google.com:

1. Your computer asks DNS resolver for the IP.
2. Resolver checks its cache or asks root → TLD → Authoritative server.
3. Server returns the IP address.
4. Browser connects to that IP.

Marathi:

DNS म्हणजे इंटरनेटचा “फोन बुक” आहे – नावावरून IP address शोधतो आणि वापरकर्त्याला योग्य server शी जोडतो.

4 Describe briefly about the World Wide Web (WWW).

👉 Definition:

The **World Wide Web (WWW)** is a system of **interlinked hypertext documents** that are accessed via the Internet using web browsers.

It was invented by **Sir Tim Berners-Lee** in **1989**.

Working of WWW:

1. **User enters a URL** in the web browser.
 2. **Browser sends an HTTP request** to the web server.
 3. **Server sends the web page (HTML file)** as an HTTP response.
 4. **Browser displays** the content to the user.
-

Components of WWW:

1. **Web Browser:**
 - Software used to access web pages (e.g., Chrome, Firefox).
2. **Web Server:**
 - Stores and delivers web pages (e.g., Apache, IIS).

3. Web Pages:

- Written in **HTML (HyperText Markup Language)** and may include links, images, and videos.

4. HTTP/HTTPS Protocols:

- Used for communication between browser and server.
-

■ Features of WWW:

- Uses **hyperlinks** to connect pages.
 - Provides multimedia support (text, audio, video).
 - Platform-independent and globally accessible.
 - User-friendly and interactive.
-

■ Marathi:

WWW म्हणजे इंटरनेटवरील सर्व websites चा संग्रह आहे.

जेव्हा आपण browser मध्ये address टाकतो, तेव्हा server कडून web pages येतात आणि आपल्याला दिसतात.