

Topic No.	Title	Page No.
3.1	Computer Network • Need of a Computer Network • Client Server	76
3.2	Physical Structure of Networks • Types of Connection • Network Topologies	82
3.3	Basics of Data Communication • Components of a Communication System	88
3.4	Computer Network Models • Protocols in TCP/IP Suit	91
3.5	The Need for Addressing • Importance of Addressing in Data Communication • Mapping between Telephone Addressing and Network Addressing	95
3.6	Sending HTTP Requests and Receiving HTTP Responses over the Internet • Understand IP Addressing	97
*	Exercise • Choose the Correct Option (MCQs) • Fill in the Blanks • Short Questions • Long Questions	105

3.1 COMPUTER NETWORK**LONG QUESTIONS**

Q.1 Define a computer network. Explain in detail the need of computer network. (K B+U.B)

Ans:

COMPUTER NETWORK**Definition:**

“A computer network is a group of computer systems and other computing hardware devices linked together through communication channels.”

OR

“A computer network, is a digital telecommunication network which allows nodes to share resources.”

Need of a Computer Network:

A computer network is established for the purpose of sharing resources. Examples of resource sharing are:

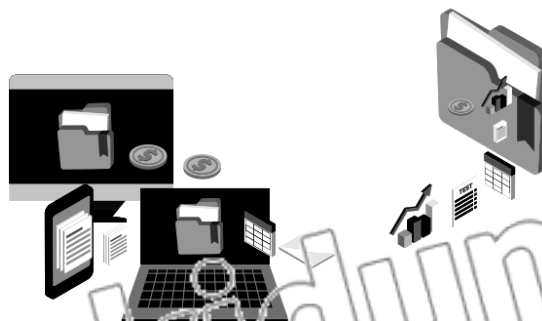
- File sharing
- Hardware sharing
- Application sharing
- Sharing a single internet connection
- User communication
- Increasing storage capacity

File Sharing:

Networking of computers helps a network user to share files. The file sharing is helpful to complete a task systematically.

Examples:

- If you need date sheet of your board examination, you can get the file through the Internet, without visiting BISE office.
- If all your school teachers want to prepare a combined result using computers, they can share files over a school network or the Internet.



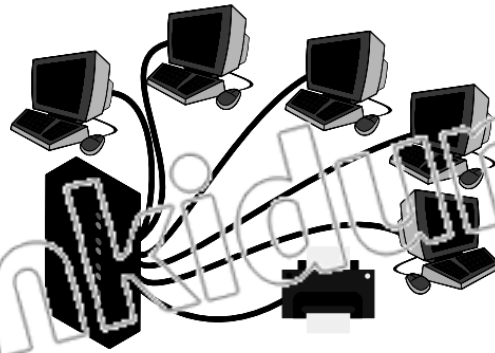
File sharing

Hardware Sharing:

Users can share devices over the computer network such as printers, scanners, CD-ROM drives, hard disk drives etc.

Example:

In an office, usually there are less number of printers and scanners than the available number of computers. Using a network, these resources are shared to get a cost-efficient solution.



Resource Sharing

Application Sharing:

Application sharing means that more than one users may use the same application over the network.

Example:

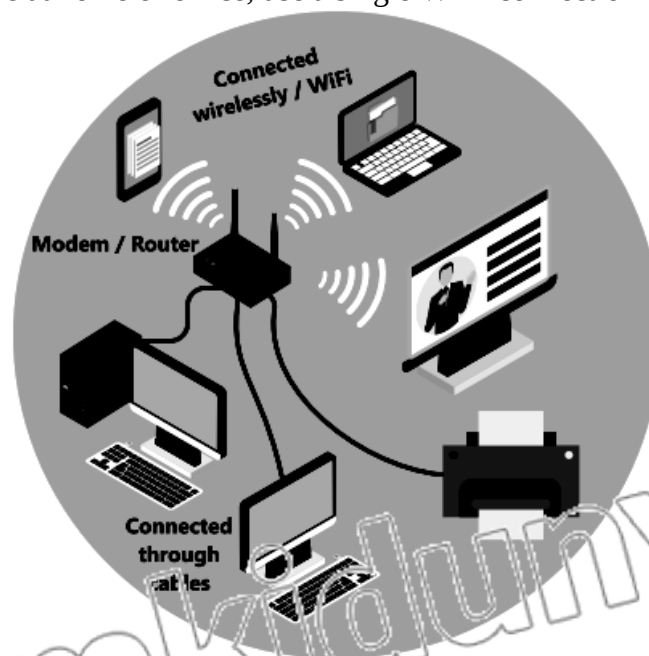
In a bank; cashier, manager, ATM users use same application over the network. Bank balance updated at one point is updated for all branches immediately.

Sharing a Single Internet Connection:

Using a network at home or office, we can share one Internet connection with more than one user.

Example:

Different people at home or office, use a single WIFI connection for internet sharing.



Sharing a Single Internet Connection

User Communication

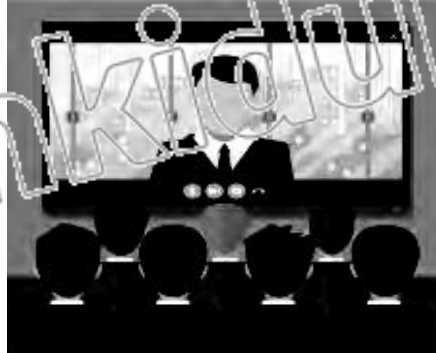
Networks allow users to communicate using e-mail, newsgroups, and video conferencing etc. So, communication with many people sitting on different locations is possible due to a network.

Example:

A video conference comprises the technologies for the reception and transmission of audio-video signals by users at different locations.

Increasing Storage Capacity:

Storage capacity means the limit to store data in a computer. If we connect our computer to another computer having more storage, then we can also use the disk space of that computer. In this way we can store and access files remotely.



Video Conference

Q.2 Write a detail note on client server model.

(K.B+U.B)

Ans:

CLIENT SERVER MODEL**Definition:**

“In a client-server model, server provides a service and a client gets that service.”

Client:

A client is a process that accesses a service provided by a server.

A Client is Hardware or Software:

It is important to know whether a client is hardware or software. In general, a client is a hardware such as a cell phone, laptop and desktop computer, but in particular the software running on that hardware is the process which makes it a client.

Examples:

- We use web browser as a client.
- An email user acts a client.

Server:

A server is a physical computer dedicated to run services to serve the needs of its clients.

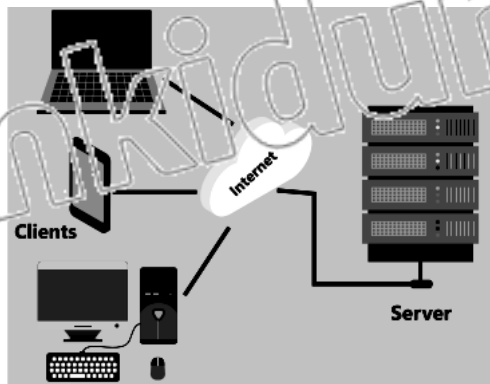
Example:

Computer providing email services like Gmail, is an example of a server.

Types of Server:

Depending on the service that is running, a server could be:

- File server
- Database server
- Print server
- Web server



Client-Server Communication

Working:

A client application requests some services from another application which acts as a server.

Examples:

- When we access a website using a web browser (a client), we get contents on our screen served by a server.
- Our emails are there on some server. The client provides a user interface to carry out actions, like giving username and password. It forwards requests to the server, which verifies credentials and serves our email records.

Advantages:

Advantages of a client server model are:

- Data and resources are shared and controlled centrally.
- It provides high security.

Disadvantages:

Disadvantages of a client server model are:

- Whole network is affected if server goes down.
- Too many requests may overload the server and become the cause of slow response.

SHORT QUESTIONS

Q.1 What is a computer network? (K.B)

Ans: COMPUTER NETWORK

A computer network is a group of computer systems and other hardware devices linked together through communication channels.

Q.2 What is meant by file sharing? (K.B)

Ans: FILE SHARING

Networking of computers helps a network user to share files. The file sharing is helpful to complete a task systematically.

Examples:

- BISE requires your picture and your bio data for admission form. They can get all these files over a network.
- Sharing files with others who are living in a different city or even country is also much helpful.

Q.3 What is application sharing? Answer with the help of an example. (Ex Q.3.3 [8]) (K.B+I.B)

Ans: APPLICATION SHARING

Application means that more than one user may use the same application over the network.

Example:

In a bank: cashier, manager, ATM users use same application over the network. Bank balance updated at one point is updated for all branches immediately.

Q.4 How can we store and access files remotely? (U.B)

Ans: ACCESSING FILES REMOTELY

If we connect our computer to another computer having more storage, then we can also use the disk space of that computer. In this way we can store and access files remotely.

Example:

DropBox is used to access files remotely.

Q.5 Define a file server. (U.B)

Ans: **FILE SERVER**

Definition:

“In a network, a computer providing the space for storing and accessing files, is called a file server.”

Example:

Google Drive is an example of file server.

Q.6 Define a workstation. (U.B)

Ans: **WORKSTATION**

Definition:

“In a network, the computer accessing the space provided by server, is called a workstation.”

Example:

Our laptop or mobile accessing Google Drive is an example of workstation.

Q.7 What is client server model? (U.B)

Ans: **CLIENT SERVER MODEL**

Definition:

“In a client-server model, server provides a service and a client gets that service.”

Examples:

- Email (Electronic Mail)
- WWW (World Wide Web)

Q.8 Differentiate between server and client. (K.B+U.B)

Ans: **DIFFERENTIATION**

Following are the differences between server and client:

Server	Client
Definition	
• “A server is a physical computer dedicated to run services to serve the needs of its clients.”	• “A client is a process that accesses a service provided by a server.”
Examples	
• Computer providing space for remote storage like Google Drive, is an example of a server.	• We use web browser as a client. • An email user acts a client.

Q.9 How client and server communicate with each other? (Ex. Q-3.3 [1]) (U.B)

Ans: **CLIENT SERVER COMMUNICATION**

A client application requests some services from another application which acts as a server.

Example:

When we access a website using a web browser (a client), we get contents on our screen served by a server.

Q.10 In a client server model, is client software or hardware? Give reason to support your answer. (Ex. Q-3.3 [10]) (U.B)

Ans: **CLIENT SOFTWARE OR HARDWARE**

In a client server model, the client is a software.

Reason:

In general, a client is a hardware such as a cell phone, laptop and desktop computer, but in particular the software running on that hardware like a web browser, is the process which makes it a client.

Q.11 What are the advantages of client-server model? (K.B)

Ans: ADVANTAGES OF CLIENT SERVER MODEL

Advantages of a client server model are:

- Data and resources are shared and controlled centrally.
- It provides high security.
- Less powerful computers can be used as clients.
- It is easy to expand.

Q.12 Write down the disadvantages of client-server model. (K.B)

Ans: DISADVANTAGES OF CLIENT SERVER MODEL

Disadvantages of a client server model are:

- Whole network is affected if server goes down.
- High cost servers are required.
- Too many requests may overload the server and become the cause of slow response.
- If server is affected by virus, the whole network may be affected.

MULTIPLE CHOICE QUESTIONS

1. Computers can be linked through: (K.B+U.B)

- (A) A wire (B) Wirelessly (C) Both A & B (D) None of these

2. Medium connecting multiple computers in a network is called: (K.B+U.B)

- (A) Communication medium (B) Communication channel
(C) Transmission medium (D) All of these

3. A computer _____ allows nodes to share resources. (K.B)

- (A) Network (B) Protocol (C) Software (D) Hardware

4. It is the most well-known example of “network of networks”. (K.B)

- (A) LAN (B) Internet (C) ATM (D) MAN

5. Using a network, hardware resources are shared to get a _____ solution. (K.B)

- (A) Costly (B) Difficult (C) Cost-efficient (D) Complex

6. ATM stands for: (K.B)

- (A) Automated Teller Machine (B) Automatic Machine
(C) Automatic Transaction Machine (D) Atomic Machine

7. Networks allow users to communicate using: (K.B)

- (A) E-mail (B) Newsgroups
(C) Video conferencing (D) All of these

8. Storage capacity means the _____ to store data in computer. (K.B)

- (A) Memory (B) Limit (C) Disk (D) All of these

9. Which of the following provides services to store files remotely? (Do you know?) (U.B)

- (A) Drop Box (B) Google Drive (C) Gmail (D) Both A & B

10. It gets the services in a network. (K.B+U.B)

- (A) Client (B) Server (C) Both A & B (D) None of these

11. Our emails are stored on: (K.B)

- (A) PC (B) Mobile (C) Server (D) Tab

12. Depending on the services that the server is running, it could be: (K.B)

- (A) File server (B) Database server (C) Web server (D) All of these

3.2 PHYSICAL STRUCTURE OF NETWORKS

LONG QUESTIONS

Q.1 Write a detail note on bus topology with a diagram. (Ex. Q-3.4 [1]) (K.B+U.B)

Ans: BUS TOPOLOGY

Definitions:

A bus topology connects all devices of the network through a single common cable having exactly two end point.

Way of Connection:

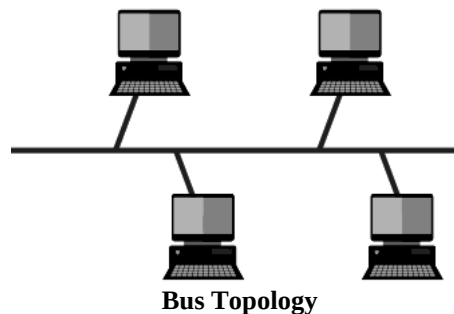
Bus topology offers a simple way to connect devices. All the communication occur through common transmission medium.

Backbone:

The common cable is called backbone of the topology.

Working:

In bus topology, a computer sends data to common cable. It reaches each computer in a network. The computer checks the destination address. If the address matches with the computer's address, it receives the data. The terminals at both ends of the cables are used to absorb the data, if no one receives the data.



Advantages:

- In bus topology, failure of any single device does not affect other devices connected with the cable.
- It is easy to add or remove a computer.
- It is simple and easy to use.
- It is inexpensive.

Disadvantages:

- If there is some problem in the shared communication cable, then all other devices can stop functioning.
- It does not work well for large number of computers.
- It is difficult to troubleshoot a problem.
- It gets slow, as the number of computer increases.

Q.2 Explain star topology with a diagram. (Ex. Q-3.4 [1]) (K.B+U.B)

Ans: STAR TOPOLOGY

Definition:

A star topology connects all devices using point to point connections via cables to a central point.

Central Device:

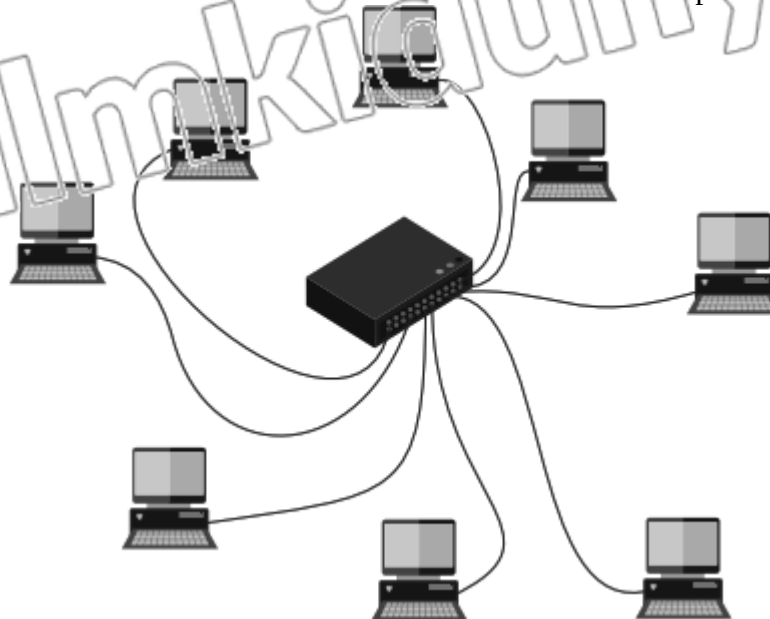
The central device controls all the traffic. Therefore, devices can transfer data to each other only through central point.

Hub or Switch:

The central point (device) in star topology is known as a Hub or Switch.

Working:

In star topology, a computer sends data to the central device. The central device recognizes the destination address. It then sends the data to the destination computer.



Star Topology

Advantages:

- It is easy to install and reconfigure.
- If there is some problem in a cable, then only the respective computer gets disconnected from the network.
- It is easy to add or remove a computer.
- It is easy to troubleshoot a problem.

Disadvantages:

- If there is some problem in the Hub or Switch, whole network becomes dead.
- Star topology consumes more cable than the bus topology.
- It requires additional hardware i.e. hub or switch.
- It becomes expensive.

Q. 3 Write a detail note on ring topology.

(Ex. C-3.4 (1)) (K.B+U.B)

Ans:

RING TOPOLOGY**Definition:**

A ring topology connects a computer with exactly two other computers forming a ring of computers.

Types:

A ring topology can be.

- Unidirectional
- Bidirectional

Unidirectional:

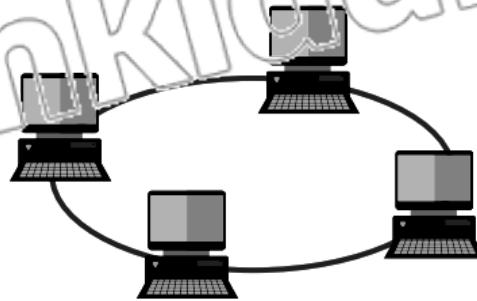
In a unidirectional ring topology, data is sent either clockwise or anticlockwise.

Bidirectional:

In a bidirectional ring topology, data can travel in any direction (both clockwise and anticlockwise).

Working:

In ring topology, a computer can send data to its immediate neighbor. Upon receiving data, a computer may pass data to its next neighbor. In this way, data reaches the desired destination.



Ring Topology

Advantages:

- Ring topology does not require a central device to manage the connectivity between the devices.
- All the computers in this network have equal access to network resources.
- It is less expensive than star topology.

Disadvantages:

- In ring topology, a failure of connection between two computers may down the whole network.
- Adding or removing new computer is not easy.
- It is slower than bus topology.
- It is difficult to troubleshoot a problem.

Q.4 Describe mesh topology with a diagram.

(Ex. Q-3.4 [1]) (K.B+U.B)

Ans:

MESH TOPOLOGY**Definition:**

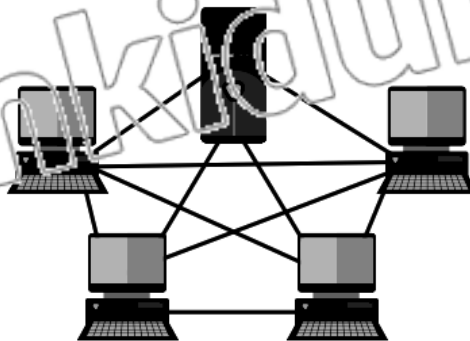
Mesh topology connects all devices with each other through a direct link.

Mesh VS Ring:

As compared to ring topology, data may reach its destination quickly.

Working:

Mesh topology involves the concept of routes. A data can be sent to different possible paths from source to destinations. If one of the connections goes down, the data can take alternate route to destination.



Mesh Topology

Advantages:

- The mesh topology is more reliable as it offers point-to-point connection.
- It is also considered more secure as data travels only between a sender and a receiver.
- It has high tolerance due to multiple routes.
- It is easy to troubleshoot a problem.

Disadvantages:

- The mesh topology is expensive in terms of cable cost as it uses a lengthy cable to connect computers.
- It is difficult to install and configure.

SHORT QUESTIONS

Q.1 How a physical structure of networks can be classified? (U.B)

Ans: CLASSIFICATION OF PHYSICAL STRUCTURE

Physical structure of networks can be classified in terms of:

- Types of Connection
- Topology

Q.2 How can two devices communicate with each other? (U.B)

Ans: COMMUNICATION

Two devices can communicate with each other when they are connected in some way to the same link at the same time.

Q.3 Write down the types of connections. (K.B)

Ans: TEYPS OF CONNECTIONS

There are two possible types of connections that are:

- Point to Point
- Multipoint

Q.4 What is the difference between point-to-point and multipoint connections?(Ex. Q-3.2 [7]) (U.B)

Ans: DIFFERENTIATION

Following are the differences between point-to-point and multipoint connections:

Point-to-Point Connection	Multipoint Connection
• A point-to-point connection is a direct link only between two devices, i.e., a sender and receiver.	• In multipoint connection, there is a link between a sender and multiple receivers.
• In this connection, only two devices can share a single link.	• In this connection, more devices can share a single link.
• There is a point to point connection between a remote control and a TV.	• In a Wi-Fi based network a single link is shared among multiple devices.

Q.5 Define network topology. Also write names of its types. (K.B)

Ans: TOPOLOGY

Definition:

Network topology is the physical arrangements of devices and connecting lines in a network.”

Types of Topology:

The four basic network topologies are:

- Bus topology
- Star topology
- Ring topology
- Mesh topology

Q.6 What is bus topology? (K.B)

Ans: **BUS TOPOLOGY**

A bus topology connects all devices of the network through a single common cable having exactly two end point.

Backbone:

The common cable is called backbone of the topology.

Q.7 What are the advantages of star topology? (K.B)

Ans: **ADVANTAGES**

Following are the advantages of star topology:

- It is easy to install and reconfigure.
- If there is some problem in a cable, then only the respective computer gets disconnected from the network.
- It is easy to add or remove a computer.
- It is easy to troubleshoot a problem.

Q.8 Differentiate between bus and star topologies. (U.B)

Ans: **DIFFERENTIATION**

Following are the differences between bus and star topologies:

Bus Topology	Star Topology
• A bus topology connects all devices of the network through a single common cable having exactly two end point.	• A star topology connects all devices using point to point connections via cables to a central point (device).
• It consumes less cable.	• It consumes more cable.
• It works well for small number of computers.	• It can handle large number of computers.
• It is inexpensive.	• It is expensive.

Q.9 How does ring topology work? (U.B)

Ans: **WORKING OF RING TOPOLOGY**

In a ring topology, a computer can send data to its immediate neighbor. Upon receiving data, a computer may pass data to its next neighbor. In this way, data reaches the desired destination.

Q.10 What is the difference between unidirectional and bidirectional ring topologies? (U.B)

Ans: **DIFFERENTIATION**

Following are the differences between unidirectional and bidirectional ring topologies:

Unidirectional	Bidirectional
• In a unidirectional ring topology, data is sent either clockwise or anticlockwise.	• In a bidirectional ring topology, data can travel in any direction.
• It is easy to maintain.	• It is difficult to maintain.

Q.11 Write down the disadvantages of mesh topology.

Ans: **DISADVANTAGES**

Following are the disadvantages of mesh topology:

- The mesh topology is expensive in terms of cable cost as it uses a lengthy cable to connect computers.
- It is difficult to install and configure.

Q.12 Differentiate between ring and mesh topologies.

(U.B)

Ans: **DIFFERENTIATION**

Following are the differences between ring and mesh topologies:

Ring Topology	Mesh Topology
A ring topology connects a computer with exactly two other computers forming a ring of computers.	Mesh topology connects all devices with each other through a direct link.
In this topology, a failure of connection between two computers may down the whole network.	In this topology, a failure of connection between two computers does not affect whole network.
It is slow.	It is fast.
It is difficult to troubleshoot a problem.	It is easy to troubleshoot a problem.

MULTIPLE CHOICE QUESTIONS

- There are _____ types of connections. **(K.B)**
(A) 2 (B) 3 (C) 4 (D) 5
- A point-to-point connection is a _____ link between two devices. **(K.B)**
(A) Same (B) Direct (C) Indirect (D) None of these
- In multipoint connection, there is a link between a sender and _____ receiver(s). **(K.B)**
(A) 1 (B) 3 (C) 5 (D) Multiple
- Wi-Fi based network is a type of connection: **(K.B)**
(A) Point-to-point (B) Multipoint (C) Both A & B (D) None of these
- Physical layout of a network is called: **(K.B)**
(A) Tautology (B) Network model (C) Topology (D) Protocol
- The common cable (medium) in bus topology is called: **(K.B)**
(A) Backbone (B) Brain (C) Header (D) Hub
- Which topology works well for small number of computers? **(U.B)**
(A) Mesh (B) Star (C) Bus (D) None of these
- The central device in star topology is called: **(K.B+U.B)**
(A) Hub (B) Switch (C) Backbone (D) Both A & B
- In which topology, a computer can send data to its immediate neighbor? **(K.B+U.B)**
(A) Mesh (B) Star (C) Bus (D) Ring
- Which topology connects all devices with each other through a direct link? **(K.B+U.B)**
(A) Star (B) Mesh (C) Ring (D) Bus
- The most reliable topology is: **(K.B+U.B)**
(A) Mesh (B) Star (C) Ring (D) Bus
- Which topology involves the concept of routes? **(K.B+U.B)**
(A) Bus (B) Star (C) Mesh (D) Ring

3.3 BASICS OF DATA COMMUNICATION

LONG QUESTIONS

Q.1 Define a communication system. Also explain its components. (K,B+U,B)

Ans: COMMUNICATION SYSTEM

Definition:

“A communication system is used to transfer data from one point to other.”

Components:

The main components of a communication system are:

- Sender
- Receiver
- Message
- Protocol
- Transmission medium

Sender:

Sender is a device that initiates the communication process. It sends messages consisting of text, numbers, pictures etc. Normally, computer is used as a sender in a communication system.

Other Name:

Sender is also called ‘source’ or ‘transmitter’.

Receiver:

Receiver is a device that receives a message. The receiver can be a computer, printer or another device. The receiver must be capable of accepting a message.

Other Name:

Receiver is also called ‘sink’.

Message:

Message is the data or information to be communicated. It may consist of text, numbers, pictures, sound, video or any combination of these. In a data communication system, a message is sent in the form of packets.

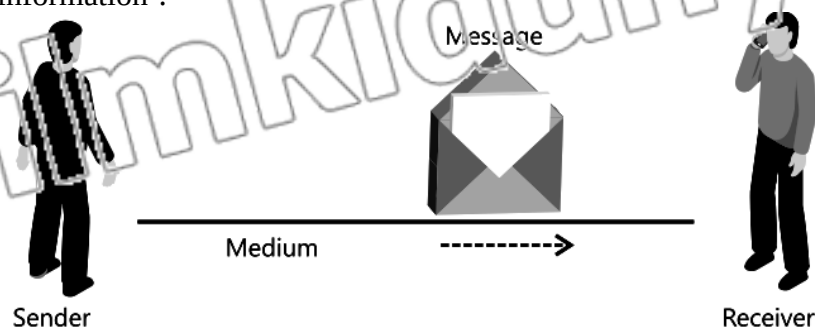
Parts of a Message:

Each message has two parts:

- Payload
- Control information OR Header of a message

Example:

Suppose you write a letter along with the information about its sender and receiver. In this example, your letter is the ‘payload’ and information about its sender and receiver is ‘control information’.



Sending a Message Over Some Medium

Protocol:

A network protocol defines a set of rules and procedures for communication between a sender and a receiver.

Transmission Medium:

Transmission Medium is the physical path that connects a sender and a receiver.

Use:

It is used to transmit data.

Other Name

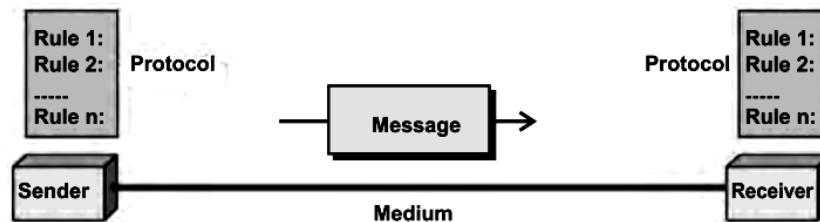
It is also called a 'communication channel'.

Nature of Medium:

The medium can:

- Copper wire
- Fiber optic cable
- Microwaves etc.

Following figure shows that a message is transmitted from a sender to a receiver through some transmission medium.



Components of a Communication System.

SHORT QUESTIONS

Q.1 What is data communication? (K.B)

Ans: DATA COMMUNICATION

Data communication refers to exchange of messages between sending and receiving devices through some communication medium.

Q.2 What are the different forms of message or information? (K.B+U.B)

OR

How message or information is presented?

Ans: FORMS OF MESSAGE

Messages are actually the information which can be presented in many forms like:

- Text
- Numbers
- Images
- Audio
- Video.

Q.3 What is the use communication system? (K.B)

Ans: COMMUNICATION SYSTEM

A communication system is used to transfer data from one point to other.

Example:

If you want to send your picture from your computer or cell phone to someone else, you need a communication system.

Q.4 How does the process of data transmission take place? (U.B)

Ans: **DATA TRANSMISSION**

The process of data transmission has well defined steps and they are executed in a particular sequence.

Q.5 What are the main components of communication? (Ex. Q-3.3 [2]) (K.B)

Ans: **COMPONENTS OF COMMUNICATION**

The main components of a communication system are:

- Sender
- Receiver
- Message
- Protocol
- Transmission medium

Q.6 Define payload. Also write an example. (K.B+U.B)

Ans: **PAYLOAD**

Definition:

“Payload is the actual contents of a message.”

Example:

Suppose you write a letter along with the information about its sender and receiver. In this example, your letter is the ‘payload’.

Q.7 What is control information? Also write an example. (K.B+U.B)

Ans: **CONTROL INFORMATION**

Definition:

“The control information contains information about the sender and the receiver.”

Header of a Message:

Control information is also called header of a message.

Example:

Suppose you write a letter along with the information about its sender and receiver. In this example, information about its sender and receiver is ‘control information’.

Q.8 What is meant by a protocol (network protocol)? (K.B)

Ans: **PROTOCOL**

A protocol (network protocol) defines a set of rules and procedures for communication between a sender and a receiver. It is a formal agreement between two parties (devices).

Q.9 Define communication channel. (Ex. Q-3.3 [5]) (K.B)

Ans: **COMMUNICATION CHANNEL**

Definition:

“Communication channel is the physical path that connects a sender and receiver.”

Use:

It is used to transmit data.

Other Name:

It is also called a ‘transmission medium’ or ‘communication medium’.

Q.10 What are the different forms of communication medium? (K.B+U.B)

OR

Write names of different communication mediums.

Ans: **FORMS OF MEDIUM**

The communication medium can:

- Twisted pair cable
- Copper wire
- Fiber optic cable
- Microwaves

Q.11 How many channels can a device use at a time? (K.B+U.B)

Ans: NUMBER OF CHANNELS

A device may use multiple channels at the same time.

Example:

If a cell phone is connected with the Internet, it uses a data channel (3G / 4G / LTE) for using the Internet services, and a voice channel for calling purpose.

MULTIPLE CHOICE QUESTIONS

1. **The main components of a communication system are: (K.B+U.B)**
 (A) Five (B) Four (C) Three (D) Two
2. **It initiates the communication process. (K.B+U.B)**
 (A) Protocol (B) Receiver (C) Sender (D) Medium
3. **Sender is also called: (K.B)**
 (A) Source (B) Transmitter (C) Sink (D) Both A & B
4. **Receiver is also called: (K.B)**
 (A) Source (B) Sink (C) Transmitter (D) Both A & C
5. **Parts of a message are: (K.B+U.B)**
 (A) 2 (B) 3 (C) 4 (D) 5
6. **It contains information about sender and receiver. (U.B)**
 (A) Payload (B) Header of message
 (C) Control information (D) Both B & C
7. **It defines a set of rules and procedures for communication in a network. (U.B)**
 (A) Topology (B) Protocol (C) Sink (D) None of these
8. **A device may use _____ channels at the same time. (K.B)**
 (A) One (B) Two (C) Four (D) Multiple

3.4 COMPUTER NETWORK MODELS

LONG QUESTIONS

Q. 1 Write a detail note on computer network models. (K.B+U.B)

OR

What is TCP/IP model? Correlate its layers with postal system.

Ans: COMPUTER NETWORK MODELS

The whole communication process over network is carried out in different layers, where each layer performs one or more specific tasks.

TCP/IP:

TCP/IP stands for Transmission Control Protocol / Internet Protocol. It is a layered communication model used by internet. The TCP/ IP is a suit of protocols that provides end-to-end connectivity between devices.

TCP/IP Layers:

It consists of five layers:

- Application Layer
- Transport Layer
- Network Layer
- Data Link Layer
- Physical Layer

Explanation:

Here we relate an example of posting a letter with the layered network model of TCP/ IP. Assume that two persons are chatting using a computer network.

Postal System	Layered Network
In writing a letter, you consider only writing proper message without concerning about detail of post office and mail delivery system. You simply put it in an envelope and write the street address.	While chatting you are concerned only about the messages without bothering about the kind of network i.e., wireless or wired. This is called application layer where you type a message and send on the network. The address of the receiving device is provided in the form of header before message content.
You write sender and receiver information over the envelope and put it in the letterbox. If the address is incomplete, you may get your letter back. If everything is fine, you simply trust on the postal system. The name of the specific person is mentioned who can open and read the letter.	Transport layer establishes connection between a client and a server. It tries to send message but if there is some error like your computer is disconnected from the network then it informs the application program. If the network is fine, then the application trusts the transport layer that the message will reach at its destination. At this stage, port number is added with message header to identify the application at destination.
A letter is moved to other city by road or air. Handling of letters is same either if they are letters with photographs, Eid card or containing text etc.	A program running on the network layer moves the data to the other network. So, a chat message is transferred to other Wi-Fi router of your friend from where it is delivered to your friend and he/she can see it on screen. A network handles all messages in the same way either if they are emails, pictures, or voice messages etc.
Bikes or vans may carry your letter from letterbox to general post office.	Data link layer sends a message to the server connected with sender. If you are chatting at home with a Wi-Fi connection, then the data link layer sends message from your computer to the Wi-Fi router.
For your letter delivery, there is usage of roads, train tracks and may be airlines.	Physical layer is about the physical medium used in communication, like cabling etc.

Q. 2 Define protocols. Discuss some protocols of TCP/IP suit.

(K.B+U.B)

Ans:

PROTOCOL

Definition:

Protocols are the rules defined for the communication between sender and receiver in a network

Protocols of TCP/IP Suit:

Each layer of TCP/IP model has its own protocol(s). Every protocol is designed to perform some specific task. Some of the most widely used application layer protocols are:

- FTP
- HTTP
- SMTP

FTP:

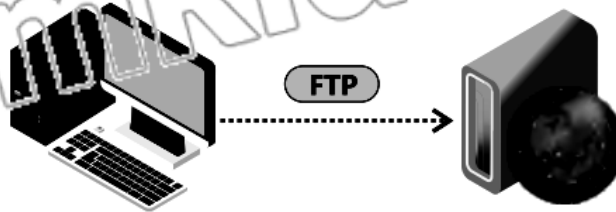
FTP stands for File Transfer Protocol.

Use:

It is the standard TCP/IP protocol which is used to transfer files from one computer to another.

Example:

If we want to transfer a document file to a remote computer, then we can use this protocol.



Transferring Files Over Network

HTTP:

HTTP stands for Hypertext Transfer Protocol.

Use:

It is a protocol used by World Wide Web (WWW) to transfer webpages between a client and a web server. We use this protocol while browsing Internet.

HTTP Server:

A web server is also called an HTTP server.

HTTPS:

HTTPS stands for Hyper Text Transfer Protocol Secure. It is used for secure data transfer.

SMTP:

SMTP stands for Simple Mail Transfer Protocol.

Use:

It is a standard protocol to transmit emails. It provides intermediary services between the remote email provider and the local user assessing it.

SHORT QUESTIONS

Q.1 What is TCP/IP suit?

(K.B)

Ans:

TCP/IP SUIT

TCP/IP stands for Transmission Control Protocol / Internet Protocol. It is a layered communication model used by internet. The TCP/ IP is a suit of protocols that provides end-to-end connectivity between devices.

Q.2 Write names of TCP/IP layers?

(K.B)

Ans:

TCP/IP LAYERS

TCP/IP model consists of five layers:

- Application Layer
- Transport Layer
- Network Layer
- Data Link Layer
- Physical Layer

Q.3 What is the use of port number in data communication? (K.B)

Ans: PORT NUMBER

Port number is added with message header to identify the application at destination which can accept a message.

Q.4 What is physical layer of TCP/IP model? (K.B)

Ans: PHYSICAL LAYER

Physical layer is about the physical medium used in communication, like cabling etc. This layer drives the signals on the network.

Q.5 Write down the protocols of TCP/IP Suit? (K.B+U.B)

Ans: PROTOCOLS OF TCP/IP SUIT

Some of the most widely used protocols of TCP/IP suit are:

- FTP
- HTTP
- SMTP

Q.6 What is FTP? (K.B)

Ans: FTP

FTP stands for File Transfer Protocol.

Use:

It is the standard TCP/IP protocol which is used for the purpose of transferring files from one computer to another.

Example:

If we want to transfer a document file to a remote computer, then we can use this protocol.

Q.7 What do you know about SMTP? (K.B)

Ans: SMTP

SMTP stands for Simple Mail Transfer Protocol.

Use:

It is a standard protocol to transmit emails. It provides intermediary services between the remote email provider and the local user assessing it.

MULTIPLE CHOICE QUESTIONS

1. The internet uses a _____ communication model. (K.B+U.B)

- (A) Paired (B) Layered (C) Non layered (D) None of these

2. TCP/IP is a suit of _____ that provides end-to-end connectivity between devices. (K.B+U.B)

- (A) Protocols (B) Hardware (C) Applications (D) All of these

3. TCP/IP consists of layers: (K.B)

- (A) 2 (B) 3 (C) 4 (D) 5

4. The top most layer of TCP/IP suit is: (K.B)

- (A) Application (B) Transport (C) Network (D) Physical

5. The address of receiving device is provided at this layer of TCP/IP. (K.B)

- (A) Transport (B) Network (C) Application (D) Data link

6. At which layer of TCP/IP, port number is added with message header? (K.B+U.B)

- (A) Application (B) Network (C) Physical (D) Transport

7. Data is in form of _____ at network layer of TCP/IP. (K.B+U.B)

- (A) Frames (B) Packets (C) Segments (D) None of these

8. This layer of TCP/IP sends a message to the server connected with sender. (K.B+U.B)

- (A) Application (B) Transport (C) Data link (D) Network

9. Data is in form of _____ at data link layer of TCP/IP. (K.B)
(A) Packets (B) Frames (C) Segments (D) None of these
10. Which protocol is used for the purpose of transferring files from one computer to another? (K.B)
(A) HTTP (B) IP (C) SMTP (D) FTP
11. The protocol used by WWW to transfer webpages between client and server is: (K.B)
(A) HTTP (B) FTP (C) SMTP (D) IP
12. This is the standard protocol to transmit emails. (K.B)
(A) HTTP (B) FTP (C) SMTP (D) IP

3.5 THE NEED FOR ADDRESSING

LONG QUESTIONS

- Q.1** What is the need and importance for addressing in a network? Also discuss mapping between telephone and network addressing. (K.B+U.B)

Ans: ADDRESSING

Packet:

When data has to be transmitted over the network, it is broken down into smaller units of similar structure. The unit of data sent from one device to another is called packet or data packet.

Need for Addressing:

Proper addressing is required for reliable data transfer. A packet requires its destination address just like we write address on an envelope while sending a letter.

Recipient Application:

An application running on the recipient side accepts packets from sender (source) and assembles them to show a meaningful information.

Multiple Recipient Application:

If there are more than one applications ready to accept a packet, then a number called port number distinguishes the targeted application from the other applications.

Importance of Addressing:

Addressing has great importance in data communication. Before sending a message, source must know the destination address. Devices on a network need addresses in order to communicate with each other. So, giving an address to a message is the first step and the second step is to transmit the packet to its intended recipients.

Mapping:

Mapping between telephone addressing and network addressing is:

Telephone Addressing	Network Addressing
To make a phone call you need to know exact telephone address that is the telephone number.	In a network, the telephone number corresponds to an IP address (Internet Protocol). Each device in network is assigned a number, called its IP address.
Telephone numbers are unique.	IP addresses are also unique. Each device gets its own unique IP address when it gets connected to a network.

Types of IP Addresses:

IP Addresses are of two types:

- Static IP Address
- Dynamic IP Address

Static IP Address:

If an IP address of a device is fixed in a network, it is called static IP address.

Dynamic IP Address:

If each time a new connection is made, a new IP address is assigned, it is called dynamic IP address.

SHORT QUESTIONS

Q.1 What is meant by a packet or data packet? (K.B)

Ans: PACKET

When data has to be transmitted over the network, it is broken down into smaller units of similar structure. The unit of data sent from one device to another is called packet or data packet.

Q.2 What are the parts of a packet or data packet? (K.B)

Ans: PARTS OF A PACKET

A data packet consists of two parts:

- Payload (Actual message)
- Control Information (Header of message)

Q.3 What does a recipient application do? (K.B+U.B)

Ans: RECIPIENT APPLICATION

An application running on the recipient side accepts packets coming from sender (source) and assembles them to show a meaningful information.

Q.4 How telephone addressing relate with network addressing? (Ex. Q-3.3 [3]) (U.B)

OR

Write mapping between telephone addressing and network addressing.

Ans: TELEPHONE AND NETWORK ADDRESSING

Relation between telephone addressing and network addressing is:

Telephone Addressing	Network Addressing
• To make a phone call, you need to know exact telephone address that is the telephone number.	• In a network, the telephone number corresponds to an IP address (Internet Protocol). Each device in network is assigned a number called its IP address.
• Telephone numbers are unique.	• IP addresses are also unique. Each device gets its own unique IP address when it gets connected to a network.

Q.5 Write down the types of IP addresses?

Ans: TYPES OF IP ADDRESSES

IP Addresses are of two types:

- Static IP Address
- Dynamic IP Address

Q.6 What is the difference between static and dynamic IP?

(Ex. Q-3.3 [4]) (U.B)

Ans: **DIFFERENTIATION**

Following is the difference between static and dynamic IP addresses

Static IP	Dynamic IP
If an IP address of a device is fixed in a network, it is called static IP address.	If each time a new connection is made, a new IP address is assigned, it is called dynamic IP address.
Usually, servers have static IP addresses.	Usually, clients have dynamic IP addresses.

MULTIPLE CHOICE QUESTIONS

1. It is the unit of data sent from one device to another. (K.B)
(A) Bit (B) Segment (C) Byte (D) Packet
2. It is used to distinguish the target application. (K.B)
(A) IP address (B) Port number (C) Byte address (D) None of these
3. Each device gets its own unique _____ when it gets connected to the internet. (K.B+U.B)
(A) Byte address (B) Port number (C) IP address (D) None of these
4. Types of IP addresses are: (K.B)
(A) 2 (B) 3 (C) 4 (D) 5
5. If an IP address of a device is fixed in a network, it is called: (K.B+U.B)
(A) Static (B) Dynamic (C) Random (D) All of these
6. If an IP address of a device is not fixed in a network, it is called: (K.B+U.B)
(A) Static (B) Dynamic (C) Random (D) All of these

3.6 SENDING HTTP REQUESTS AND RECEIVING HTTP RESPONSES OVER THE INTERNET

LONG QUESTIONS

Q.1 Explain the process of HTTP requests and receiving HTTP responses over the internet.

(K.B+U.B)

Ans: **HTTP REQUESTS AND RESPONSES**

HTTP:

HTTP stands for Hypertext Transfer Protocol. It is a protocol used by Word Wide Web (WWW) to transfer webpages between a client and a web server.

HTTP Client:

The computer that sends request to a web server for a webpage, is called HTTP client.

HTTP Server:

The computer serving you a webpage is called HTTP server or web server.

HTTP Request:

The request sent by client to a web server is called HTTP request.

Example:

Using a web browser when you type a URL (Uniform Resource Locator) like <http://www.pakistan.gov.pk>, you are sending a request. In this case, your computer works as HTTP client.

HTTP Response:

The World Wide Web (WWW) is a system of Internet servers. Servers serve a request sent by a client. This is called HTTP response.

Example:

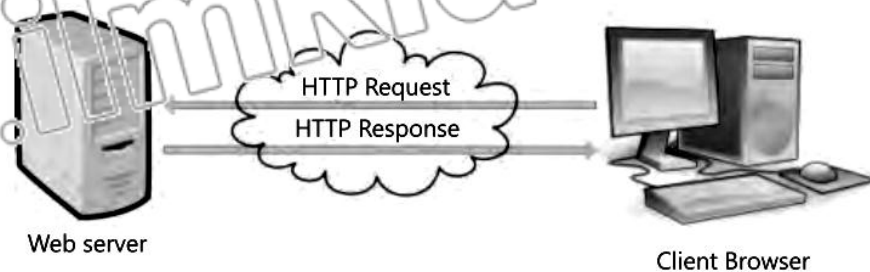
When you send a URL request, in its response you get the contents of website that may contain:

- Text
- Images
- Sounds etc.

These contents are embedded in an HTML (Hypertext Markup Language).

Explanation:

The communication between a server and a client is based on requests and their respective responses.



HTTP Request and Response

Web browsers are used to access the World Wide Web in an easy manner. Web browsers and web servers function together as a client-server system. Client-server is a standard method for designing applications where data is kept in central locations (server computers) and efficiently shared with any number of other computers (the clients) on request.

Q.2 What is an IP address? Explain its different standards.

(K.B+U.B)

OR

What are the sizes of IPv4 and IPv6? Explain the method to calculate the size of these both standards.

(Ex. Q-3.4 [4])

Ans:

IP ADDRESS

Definition:

IP address stands for Internet Protocol address. It is a unique identifier that is associated with a device when it is connected to a network.

DHCP Server:

DHCP stands for Dynamic Host Configuration Protocol. DHCP server assigns an IP address to a computer connected in a network.

Standards of IP Addressing:

There are two standards of IP addressing:

- IPv4
- IPv6

IPv4:

When the Internet Protocol was originally designed, the standard was known as Internet Protocol Version 4 (IPv4).

Size:

32 bits are required to store the whole IP address in IPv4 standard.

Calculation:

- The IPv4 is divided in four groups separated by dot (.).
- Each group can contain a decimal value from 0 to 255.
- $(255)_{10} = (11111111)_2$, it shows that maximum 8 bits are required for every group of IPv4.
- 4 groups require $4 \times 8 = 32$ bits.

Example:

IPv4 address is like: **172.16.54.1**

IPv6:

Internet Protocol Version 6 (IPv6) was developed by the Internet Engineering Task Force (IETF). It became a Draft Standard in December 1998 and an Internet Standard on 14 July 2017.

Need of IPv6:

Due to more and more devices connecting to the Internet, IPv4 addresses are running out. To accommodate the increase in devices, another standard of IP addressing is introduced, which is called IPv6.

Size:

128 bits are required to store the whole IP address in IPv6 standard.

Calculation:

- The IPv6 is divided in 8 groups separated by colon (:).
- Each group can contain 4 hexadecimal digits.
- 1 hexadecimal digit requires 4 bits.
- 4 hexadecimal digits require $4 \times 4 = 16$ bits.
- 1 group has 4 hexadecimal digits, so each group requires 16 bits.
- 8 groups require $8 \times 16 = 128$ bits.

Example:

IPv6 address is like: **2001:db8:0:1234:0:567:8:1**

SHORT QUESTIONS

Q.1 Define HTTP Client and HTTP server (web server). (K.B)

Ans: **HTTP CLIENT**

The computer that sends request to a web server for a webpage, is called HTTP client.

HTTP SERVER

The computer serving you a webpage is called HTTP server or web server.

Q.2 What do know about URL? (K.B)

Ans: **URL**

URL stands for Uniform Resource Locator. URL is a reference to a web resource that specifies its location on a computer network.

Example:

<http://www.pakistan.gov.pk/index.html>

Q.3 What is HTML? (K.B)

Ans: **HTML**

HTML stands for Hypertext Markup Language. It is simple language to create webpage. HTML consists of elements which are represented by tags.

Q.4 Describe the working of web browser. (Ex. Q-3.3 [6]) (K.B)

OR

What is a web browser?

Ans: **WEB BROWSER**

Web browser is an application software that is used to access the World Wide Web (www) in an easy manner. It acts as a client that sends request to a web server.

Examples:

Following are some examples of web browser:

- Internet Explorer
- Google Chrome

Q.5 On which, the communication between a server and client is based? (U.B)

Ans: SERVER AND CLIENT COMMUNICATION

The communication between a server and a client is based on requests and their respective responses.

Q.6 How web browser and web server function together? (U.B)

Ans: WEB BROWSER AND WEB SERVER

Web browsers and web servers function together as a client-server system. Client-server is a standard method for designing applications where data is kept in central locations (server computers) and efficiently shared with any number of other computers (the clients) on request.

Q.7 What is an IP address? (K.B)

Ans: IP ADDRESS

Definition:

IP address stands for Internet Protocol address. It is a unique identifier that is associated with a device when it is connected to a network.

Examples:

Following are the examples of IP addresses:

- IPv4 address is like: **172.16.54.1**
- IPv6 address is like: **2001:db8:0:1234:0:567:8:1**

Q.8 Define DHCP server. (K.B)

Ans: DHCP SERVER

Definition:

“DHCP stands for Dynamic Host Configuration Protocol. DHCP server assigns an IP address to a computer connected in a network.”

Q.9 What is an IPv4? (K.B)

Ans: IPv4

When the Internet Protocol was originally designed, the standard was known as Internet Protocol Version 4 (IPv4).

- It is composed of 32 bits.
- It is divided in four groups separated by dot (.).

Example:

IPv4 address is like: **172.16.54.1**

Q.10 What do you know about IPv6? (K.B)

Ans: IPv6

Internet Protocol Version 6 (IPv6) was developed by the Internet Engineering Task Force (IETF). It became a Draft Standard in December 1998 and an Internet Standard on 14 July 2007.

- It is composed of 128 bits.
- It is divided in 8 groups separated by colon (:).

Example:

IPv6 address is like: **2001:db8:0:1234:0:567:8:1**

Q.11 What is the need of IPv6? (K.B)

Ans: NEED OF IPv6

Due to more and more devices connecting to the Internet, IPv4 addresses are running out. To accommodate the increase in devices, another standard of IP addressing is introduced which is called Internet Protocol Version 6 (IPv6).

MULTIPLE CHOICE QUESTIONS

1. The World Wide Web (WWW) is a system of: (K.B+H.B)
(A) Local servers (B) FTP servers (C) Internet servers (D) None of these
2. URL stands for: (K.B)
(A) Union Rectifier Locator (B) Unified Resource Locator
(C) Universal Resource Location (D) Uniform Resource Locator
3. Web browser and web server function together as _____ system. (K.B)
(A) Peer-to-peer (B) Client-server (C) Client-client (D) Server-server
4. Standards of IP addressing are: (K.B)
(A) 2 (B) 3 (C) 5 (D) 7
5. Each group in IPv4 is separated by: (K.B)
(A) Semicolon (;) (B) Colon (:) (C) Dot (.) (D) Comma (,)
6. Binary of $(255)_{10}$ is: (A.B)
(A) $(1111111)_2$ (B) $(11111111)_2$ (C) $(111111110)_2$ (D) $(10111111)_2$
7. Each group of IPv4 can contain decimal value from: (K.B)
(A) 0 – 256 (B) 1 – 255 (C) 0 – 128 (D) 0 – 255
8. Every group of IPv4 requires _____ bits. (K.B)
(A) 8 (B) 4 (C) 2 (D) 16
9. IPv6 is divided into _____ groups. (K.B)
(A) 2 (B) 4 (C) 6 (D) 8
10. Each group of IPv6 can contain _____ digits. (K.B)
(A) 4 decimal (B) 8 hexadecimal (C) 4 hexadecimal (D) 8 binary
11. One hexadecimal digit needs _____ bits for storage. (K.B+A.B)
(A) 2 (B) 4 (C) 8 (D) 16
12. Every group of IPv6 requires _____ bits. (K.B)
(A) 8 (B) 4 (C) 2 (D) 16
13. IPv6 was developed by: (Do you know?) (K.B)
(A) IETF (B) IEEE (C) CISCO (D) ISO
14. IPv6 became draft standard in December: (Do you know?) (K.B)
(A) 1988 (B) 2000 (C) 1998 (D) 2017
15. IPv6 became Internet Standard on: (Do you know?) (K.B)
(A) 14 July 2017 (B) 14 May 2017 (C) 14 Dec 1998 (D) 28 May 1998
16. IPv4 provides approximately _____ addresses. (K.B)
(A) 3.3 billion (B) 4.3 billion (C) 4.3 million (D) 5.3 billion
17. Addresses provided by IPv6 are: (K.B)
(A) 2^{128} (B) 2^{64} (C) 2^{32} (D) 2^{16}
18. Addresses in IPv6 are _____ times more than the number of address in IPv4. (K.B)
(A) 79×10^{28} (B) 7.9×10^{128} (C) 7.9×10^{208} (D) 7.9×10^{28}

3.7 ROUTING

LONG QUESTIONS

Q. 1 Define a router. Also explain the process of routing. (K.E+U.B)

Ans:

ROUTER

Definition:

“A router is a networking device that forwards data packets from one network to another.”



Router

Working:

A router analyses the destination IP address of an incoming data packet, determines the best route to forward the packet, and then sends it accordingly. A router is usually placed at the meeting point of two or more networks.

ROUTING

Definition:

“Routing is a process of taking data from one device and sending it to another device on a different network.”

Every data packet has two addresses:

- Destination address
- Source address

Destination Address:

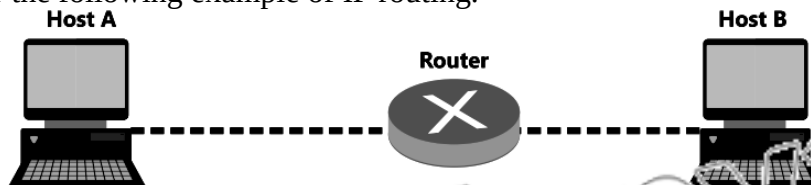
Destination address is used to deliver the data packet at destination.

Source Address:

Source address is used to identify the sender device.

Example:

Consider the following example of IP routing.



Message Routing between Source and Destination

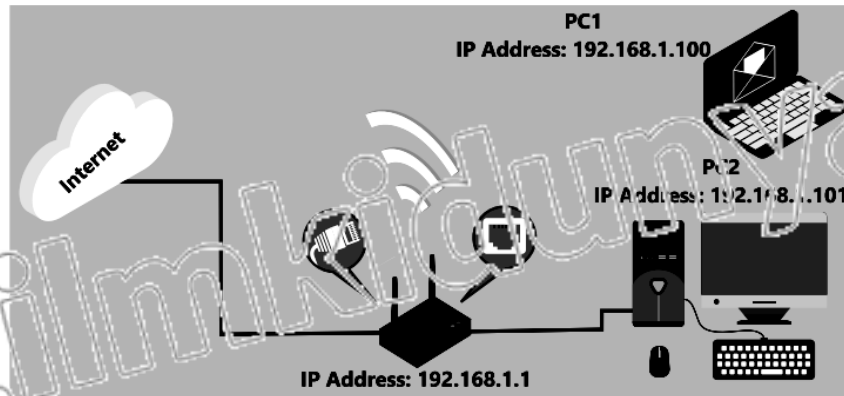
Host ‘A’ wants to communicate with host ‘B’, but host ‘B’ is on another network. Host ‘A’ is configured to send all packets, destined for remote networks, to the router. The router receives the packets, checks the routing table to see if it has an entry for the destination address. If the entry exists, the router forwards the packet out of the appropriate interface port. If the router doesn't find the entry, it discards the packet.

Routing Table:

A routing table is used by routers to determine the path to the destination network.

Routing in the Internet:

Internet is called network of networks, so a router also directs the traffic on the Internet. We get the Internet service from some Internet Service Provider (ISP). When we send a request from a device it reaches an ISP where router is installed.



Usage of Router in Internet

The router forwards our request according to header of our message. For communication over the Internet, there may be hundreds of networks between the source and the destination. Hundreds of routers might forward a single packet as it moves from one network to the next on the way to its final destination.

SHORT QUESTIONS

Q.1 What is a router? (K.B)

Ans: ROUTER

A router is a networking device that forwards data packets from one network to another.

Q.2 Write about the process of routing in the Internet. (K.B)

Ans: ROUTING IN THE INTERNET

When we send a request from a device over the internet, it reaches an ISP where router is installed. The router forwards our request according to header of our message. For communication over the Internet, hundreds of routers might forward a single packet as it moves from one network to the next on the way to its final destination.

Q.3 What is an ISP? (K.B)

Ans: ISP

ISP stands for Internet Service Provider. It is a company that provides internet services to the users.

Example:

Following are the some ISPs in Pakistan:

- PTCL
- Wi-Tibe

Q.4 Define routing. (K.B)

Ans: ROUTING

Definition:

“Routing is a process of taking data from one device and sending it to another device on a different network.”

Q.5 Write an example of routing process. (K.B)

Ans:

ROUTING PROCESS

Suppose host 'A' wants to communicate with host 'B', but host 'B' is on another network. Host 'A' is configured to send all packets to the router. The router receives the packets, checks the routing table to see if it has an entry for the destination address. If the entry exists, the router forwards the packet otherwise it discards the packet.

MULTIPLE CHOICE QUESTIONS

1. **A networking device that forwards data packets from one network to another is: (K.B)**
(A) Switch (B) Router (C) Hub (D) All of these
2. **It directs messages or traffic on the internet. (K.B)**
(A) Switch (B) Hub (C) Router (D) Wi-Fi
3. **Internet is called: (K.B)**
(A) Local area network (LAN) (B) Metropolitan area network (WAN)
(C) Network of networks (WAN) (D) Low level network
4. **We get internet services from some: (K.B)**
(A) ISI (B) ISO (C) OSI (D) ISP
5. **Every data packet has _____ addresses. (K.B)**
(A) 2 (B) 3 (C) 4 (D) Many

EXERCISE

Q-3.1 Choose the correct option.

1. The IPv4 address is made up of _____ binary bits. (K.B)
 (i) 31 (ii) 29 (iii) 32 (iv) 30
2. Routing is process of taking data from one device and sending it to another device in different _____. (K.B)
 (i) Channel (ii) Network (iii) Path (iv) Area
3. DHCP stands for _____. (K.B)
 (i) Data Hosting Computer Protocol (ii) Dynamic Host Computer protocol
 (iii) Dynamic Host Connection protocol (iv) None of the above
4. Communications protocols cover _____. (K.B+U.B)
 (i) Authentication (ii) Error detection (iii) Correction (iv) Above all
5. The receiver must be capable of accepting the _____. (K.B+U.B)
 (i) Protocol (ii) Message (iii) Address (iv) Information

Q-3.2 Fill in the blanks.

1. A _____ is a computer device that accesses a service made available by a server. (K.B+U.B)
2. _____ allow users to communicate using e-mail, newsgroups, etc. (U.B)
3. Web browsers and web servers function together as a _____ system. (K.B)
4. A protocol defines _____ and _____ for communication between a sender and a receiver. (K.B+U.B)
5. Routers connect multiple _____ together. (K.B)
6. Every data packet has an _____ addresses. (K.B)
7. IP addressing must be understood as part of the _____ for conversations over the Internet. (K.B)
8. Email stands for _____. (K.B)
9. In a computer network, devices are connected through communication _____. (K.B)
10. A _____ accesses a service made available by a server. (K.B)

Q-3.3 Write short answers.

1. How client and server communicate with each other? (U.B)
 Ans: See SQ. 9 (Topic 3.1)
2. What are the main components of communication? (K.B)
 Ans: See SQ. 5 (Topic 3.3)
3. How telephone addressing relate with network addressing? (U.B)
 Ans: See SQ. 4 (Topic 3.5)
4. What is the difference between static and dynamic IP? (K.B+U.B)
 Ans: See SQ. 6 (Topic 3.5)
5. Define communication channel. (K.B)
 Ans: See SQ. 9 (Topic 3.3)
6. Describe the working of web browser. (K.B+U.B)
 Ans: See SQ. 4 (Topic 3.6)
7. What is the difference between point-to-point and multipoint connection? (K.B+U.B)
 Ans: See SQ. 4 (Topic 3.2)
8. What is application sharing? Answer with the help of an example. (K.B+U.B)
 Ans: See SQ. 3 (Topic 3.1)

9. What are the advantages and disadvantages of star topology over bus topology? (K.B)

Ans: ADVANTAGES OF STAR TOPOLOGY

Following are the advantages of star topology over bus topology:

- Unlike bus topology, multiple computers can communicate at the same time in star topology.
- It can handle large number of computers.

DISADVANTAGES OF STAR TOPOLOGY

Following are the disadvantages of star topology over bus topology:

- Star topology consumes more cable than the bus topology.
- It becomes expensive.

10. In a client server model, is client software or hardware? Give reasons to support your answer. (K.B+U.B)

Ans: See SQ. 10 (Topic 3.1)

Q-3.4 Answer the following questions.

1. What is network topology? Describe bus, star, ring and mesh topologies with a diagram of each. (K.B)

Ans: NETWORK TOPOLOGY

Definition:

“Network topology is the physical arrangements of devices and connecting lines in a network.”

Types of Topology:

The four basic network topologies are:

- Bus topology [for description See LQ. 1 (Topic 3.2)]
- Star topology [for description See LQ. 2 (Topic 3.2)]
- Ring topology [for description See LQ. 3 (Topic 3.2)]
- Mesh topology [for description See LQ. 4 (Topic 3.2)]

2. What is TCP/IP? Describe its five layers with their functions. (K.B)

Ans: TCP/IP

Definition:

“TCP/IP stands for Transmission Control Protocol / Internet Protocol. It is a layered communication model used by internet. The TCP/ IP is a suit of protocols that provides end-to-end connectivity between devices.”

TCP/IP Layers:

TCP/IP model consists of five layers:

- Application Layer
- Transport Layer
- Network Layer
- Data Link Layer
- Physical Layer

Application Layer:

Application layer is the top most layer in TCP/IP model. It provides applications with standardized data exchange. User sends and receives messages without bothering about the kind of network, i.e., wireless or wired. The address of the receiving device is provided in the form of header before message content.

This layer includes the protocols like:

- FTP
- HTTP
- SMTP

Transport Layer:

Transport layer establishes connection between a client and a server. It tries to send message but if there is some error then it informs the application program. At this stage, port number is added with message header that is used to identify the application at destination which can accept a message.

Network Layer:

A program running on the network layer moves the data to the other network. At this stage data is in form of packets. A network handles all messages in the same way either if they are emails, pictures, or voice messages etc.

Data Link Layer:

Data link layer sends a message to the server connected with sender. At this stage data is in form of frames. If you are chatting at home with a Wi-Fi connection, then the data link layer sends message from your computer to the Wi-Fi router.

Physical Layer:

Physical layer is about the physical medium used in communication, like cabling etc. This layer drives the signals on the network.

Encapsulation:

Each layer adds some control information, called header, with the data received from the layer above it. The actual content of message, called payload, is hidden inside the header at each layer, like a letter is hidden inside an envelope. This is called encapsulation.

3. **What are the advantages and disadvantage of star topology over bus topology? (K.B)**

Ans: See Ex. Q. 3.3 (Part - 9)

4. **What are the sizes of IPv4 and IPv6? Explain the method to calculate the size of these both standards. (K.B+U.B)**

Ans: See LQ. 2 (Topic 3.6)

ANSWER KEY

Q-3.1 Choose the correct option.

1 iii 2 ii 3 Iv 4 iv 5 ii

Q-3.2 Fill in the blanks.

1	Client	2	Mail server	3	Client-server	4	Rules, procedures	5	Networks
6	IP	7	Protocol	8	Electronic mail	9	Channels	10	Client

ANSWER KEY

3.1 COMPUTER NETWORK

1	C	2	D	3	A	4	B	5	C	6	A
7	D	8	B	9	D	10	A	11	C	12	D

3.2 PHYSICAL STRUCTURE OF NETWORKS

1	A	2	B	3	D	4	B	5	C	6	A
7	C	8	D	9	D	10	B	11	A	12	C

3.3 BASICS OF DATA COMMUNICATION

1	A	2	C	3	D	4	B	5	A	6	D	7	B	8	D
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

3.4 COMPUTER NETWORK MODELS

1	B	2	A	3	D	4	A	5	C	6	D
7	B	8	C	9	B	10	D	11	A	12	C

3.5 THE NEED FOR ADDRESSING

1	D	2	B	3	C	4	A	5	A	6	B
---	---	---	---	---	---	---	---	---	---	---	---

3.6 SENDING HTTP REQUESTS AND RECEIVING HTTP RESPONSES OVER THE INTERNET

1	C	2	D	3	B	4	A	5	C	6	B	7	D	8	A	9	D
10	C	11	B	12	D	13	A	14	C	15	A	16	B	17	A	18	D

3.7 ROUTING

1	B	2	C	3	C	4	D	5	A
---	---	---	---	---	---	---	---	---	---