

PART A
UNIT – I
DATA COMMUNICATION

1. What is mean by data communication?

Data communication is the exchange of data (in the form of 1s and 0s) between two devices via some form of transmission medium (such as a wire cable).

2. What are the three criteria necessary for an effective and efficient network?

The most important criteria are performance, reliability and security.

Performance of the network depends on number of users, type of transmission medium, the capabilities of the connected h/w and the efficiency of the s/w.

Reliability is measured by frequency of failure, the time it takes a link to recover from the failure and the network's robustness in a catastrophe.

Security issues include protecting data from unauthorized access and viruses.

3. What are the three fundamental characteristics determine the effectiveness of the data communication system?

The effectiveness of the data communication system depends on three fundamental characteristics:

Delivery: The system must deliver data to the correct destination.

Accuracy: The system must deliver data accurately.

Timeliness: The system must deliver data in a timely manner.

4. What are the advantages of distributed processing?

Advantages of distributed processing include security/encapsulation, distributed databases, faster problem solving, security through redundancy and collaborative processing.

5. Why are protocols needed?

In networks, communication occurs between the entities in different systems. Two entities cannot just send bit streams to each other and expect to be understood. For communication, the entities must agree on a protocol. A protocol is a set of rules that govern data communication.

6. Why are standards needed?

Co-ordination across the nodes of a network is necessary for an efficient communication. If there are no standards, difficulties arise. A standard provides a model or basis for development to which everyone has agreed.

7. For n devices in a network, what is the number of cable links required for a mesh and ring topology?

Mesh topology – $n(n-1)/2$

Ring topology – n

8. What is the difference between a passive and an active hub?

An active hub contains a repeater that regenerates the received bit patterns before sending them out. A passive hub provides a simple physical connection between the attached devices.

9. Distinguish between peer-to-peer relationship and a primary-secondary relationship.

Peer-to-peer relationship: All the devices share the link equally.

Primary-secondary relationship: One device controls traffic and the others must transmit through it.

10. Assume 6 devices are arranged in a mesh topology. How many cables are needed? How many ports are needed for each device?

$$\text{Number of cables} = n(n-1)/2 = 6(6-1)/2 = 15$$

$$\text{Number of ports per device} = n-1 = 6-1 = 5$$

11. Group the OSI layers by function.

The seven layers of the OSI model belonging to three subgroups. Physical, data link and network layers are the network support layers; they deal with the physical aspects of moving data from one device to another. Session, presentation and application layers are the user support layers; they allow interoperability among unrelated software systems. The transport layer ensures end-to-end reliable data transmission.

12. What are header and trailers and how do they get added and removed?

Each layer in the sending machine adds its own information to the message it receives from the layer just above it and passes the whole package to the layer just below it. This information is added in the form of headers or trailers. Headers are added to the message at the layers 6,5,4,3, and 2. A trailer is added at layer 2. At the receiving machine, the headers or trailers attached to the data unit at the corresponding sending layers are removed, and actions appropriate to that layer are taken.

13. The transport layer creates a communication between the source and destination. What are the three events involved in a connection?

Creating a connection involves three steps: connection establishment, data transfer and connection release.

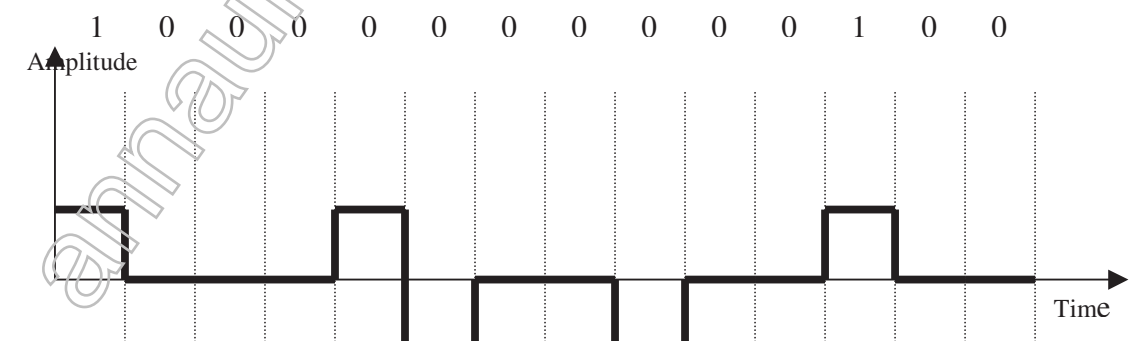
14. What is the DC component?

Direct current is a zero-frequency signal with constant amplitude.

15. How does NRZ-L differ from NRZ-I?

In the NRZ-L sequence, positive and negative voltages have specific meanings: positive for 0 and negative for 1. In the NRZ-I sequence, the voltages are meaningless. Instead, the receiver looks for changes from one level to another as its basis for recognition of 1s.

16. Using HDB3, encode the bit stream 1000000000100. Assume the number of 1s so far is odd and the first 1 is positive.



17. What are the functions of a DTE? What are the functions of a DCE?

Data terminal equipment is a device that is an information source or an information sink. It is connected to a network through a DCE.

Data circuit-terminating equipment is a device used as an interface between a DTE and a network.

18. What does the electrical specification of EIA-232 describe?

The electrical specification of EIA-232 defines that signals other than data must be sent using OFF as less than -3 volts and ON as greater than +3 volts. The data must be transmitted using NRZ-L encoding.

19. Discuss the mode for propagating light along optical channels.

There are two modes for propagating light along optical channels, multimode and single mode.

Multimode: Multiple beams from a light source move through the core in different paths.

Single mode: Fiber with extremely small diameter that limits beams to a few angles, resulting in an almost horizontal beam.

20. What is refraction?

The phenomenon related to the bending of light when it passes from one medium to another.

21. How are the guided media differing from unguided transmission media?

Guided transmission media

1. Guided indicate, medium is contained have any within physical boundary
2. Transmission takes place through wire.

Unguided transmission media

1. Unguided medium does not Physical boundary
2. It is a wireless transmission.

22. What are the disadvantages of optical fiber as a transmission medium?

The disadvantages of optical fiber are

- Very expensive.
- Installation and maintenance is difficult.
- Fragility.

23. What are the criteria used to evaluate transmission medium?

The criteria used to evaluate transmission medium are

- Throughput
- Propagation speed
- Propagation time
- Wavelength

24. Give the relationship between propagation speed and propagation time?

$\text{Propagation time} = \text{distance} / \text{propagation speed}$

The time required for a signal or a bit to travel from one point to another is called **Propagation time**.

Propagation speed is the distance, a signal or a bit travel through a medium in one second.

25. Explain cross talk and what is needed to reduce it?

Effect of one wire on another is called as cross talk. One wire will be the sending antenna and the other wire will be the receiving antenna. We can use the shielded twisted pair cable or coaxial cable for transmission, which contains metal foil to reduce cross talk.

UNIT-II DATA LINK LAYER

1. What are the responsibilities of data link layer?

Specific responsibilities of data link layer include the following.

- a) Framing
- b) Physical addressing
- c) Flow control
- d) Error control
- e) Access control

2. Mention the types of errors.

There are 2 types of errors

- a) Single-bit error.
- b) Burst-bit error.

3. Define the following terms.

Single bit error: The term single bit error means that only one bit of a given data unit (such as byte character/data unit or packet) is changed from 1 to 0 or from 0 to 1.

Burst error: Means that 2 or more bits in the data unit have changed from 1 to 0 from 0 to 1.

4. What is redundancy?

It is the error detecting mechanism, which means a shorter group of bits or extra bits may be appended at the destination of each unit.

5. List out the available detection methods.

There are 4 types of redundancy checks are used in data communication.

- a) Vertical redundancy checks (VRC).
- b) Longitudinal redundancy checks (LRC).
- c) Cyclic redundancy checks (CRC).
- d) Checksum.

6. Write short notes on VRC.

The most common and least expensive mechanism for error detection is the vertical redundancy check (VRC) often called a parity check. In this technique a redundant bit called a parity bit, is appended to every data unit so, that the total number of 0's in the unit (including the parity bit) becomes even.

7. Write short notes on LRC.

In longitudinal redundancy check (LRC), a block of bits is divided into rows and a redundant row of bits is added to the whole block.

8. Write short notes on CRC.

The third and most powerful of the redundancy checking techniques is the cyclic redundancy checks (CRC) CRC is based on binary division. Here a sequence of redundant bits, called the CRC remainder is appended to the end of data unit.

9. Write short notes on CRC generator.

A CRC generator uses a modulo-2 division.

- In the first step, the 4-bit divisor is subtracted from the first 4 bit of the dividend.
- Each bit of the divisor is subtracted from the corresponding bit of the dividend without disturbing the next higher bit.

10. Write short notes on CRC checker.

A CRC checker functions exactly like a generator. After receiving the data appended with the CRC it does the same modulo-2 division. If the remainder is all 0's the CRC is dropped and the data accepted. Otherwise, the received stream of bits is discarded and the data are resent.

11. Give the essential properties for polynomial.

A polynomial should be selected to have at least the following properties.

- a) It should not be
- b) It should be divisible by $(x+1)$.

12. Define checksum.

The error detection method used by the higher layer protocol is called checksum. Checksum is based on the concept of redundancy.

13. What are the steps followed in checksum generator?

The sender follows these steps

- a) The units are divided into k sections each of n bits.
- b) All sections are added together using 2's complement to get the sum.
- c) The sum is complemented and become the checksum.
- d) The checksum is sent with the data.

14. List out the steps followed in checksum checker side.

The receiver must follow these steps

- a) The unit is divided into k section each of n bits.
- b) All sections are added together using 1's complement to get the sum.
- c) The sum is complemented.
- d) If the result is zero.

15. Write short notes on error correction.

It is the mechanism to correct the errors and it can be handled in 2 ways.

- a) When an error is discovered, the receiver can have the sender retransmit the entire data unit.
- b) A receiver can use an error correcting coder, which automatically corrects certain errors.

16. Mention the types of error correcting methods.

There are 2 error-correcting methods.

- a) Single bit error correction
- b) Burst error correction.

17. What is the purpose of hamming code?

A hamming code can be designed to correct burst errors of certain lengths. So the simple strategy used by the hamming code to correct single bit errors must be redesigned to be applicable for multiple bit correction.

18. Define flow control.

Flow control refers to a set of procedures used to restrict the amount of data. The sender can send before waiting for acknowledgment.

19. What is a buffer?

Each receiving device has a block of memory called a buffer, reserved for storing incoming data until they are processed.

20. Mention the categories of flow control.

There are 2 methods have been developed to control flow of data across communication links.

- a) Stop and wait- send one from at a time.
- b) Sliding window- send several frames at a time.

21. What is the function of stop and wait flow control?

In this method, the sender sends one frame and waits for an acknowledgement before sending.

22. Mention the advantage and disadvantage of stop and wait flow control.

Advantage: simplicity

Disadvantage: inefficiency.

23. Define ARQ.

Error control in the data link layer is based on Automatic repeat request (ARQ), which means retransmission of data in 3 cases.

- a) Damaged frame
- b) Lost frame
- c) Lost acknowledgment.

24. Mention the function of go-back N-ARQ.

It is the popular mechanism for continuous transmission error control. In the method, if our frame is lost or damaged, all frames sent since the last frame acknowledged are retransmitted.

25. What is selective reject ARQ?

In selective reject ARQ only the specific damaged or lost frame is retransmitted. If a frame is corrupted in transit, a NAK is returned and the frame is resent out of sequence.

26. Define HDLC.

It is a bit-oriented data link protocol designed to support both half-duplex and full duplex communication over point to point and midpoint links.

27. List the types of stations in HDLC.

HDLC differentiates between 3 types of stations.

- a) Primary
- b) Secondary
- c) Combined

28. Define configuration.

The bond configuration refers to the relationship of hardware devices on a link.

29. List the various ways of station configuration.

The stations are configured in 3 ways

- a) Unbalanced configuration
- b) Symmetrical configuration
- c) Balanced configuration

30. What are the different communication modes in HDLC?

HDLC supports 3 modes of communication between stations.

- a) Normal response mode (NRM)
- b) Asynchronous response mode (ARM)
- c) Asynchronous balanced mode (ABM)

31. Mention the types of frames in HDLC.

There are 3 types of HDLC frames.

- a) Information frames (I-frames)
- b) Supervisory frames (S-frames)
- c) Unnumbered frames (U-frames)

32. Give the usage of I, S, U frames.

I frames – used to transport user data and control information relating to user data.

S frames – used only to transport control information, primarily data link layer and error controls.

U frames – reserved for systems management.

33. Write the types of frame fields contained in HDLC.

Each frame in HDLC may contain up to 6 fields.

- a) Beginning flag field
- b) An address field
- c) A control field
- d) An information field
- e) A frame check sequence (FCS) field
- f) An ending flag field.

34. What is meant by bit stuffing?

Bit stuffing is the process of adding one extra 0 whenever there are 5 consecutive 1s in the data so that the receiver doesn't mistake the data for a flag.

35. Define LAN.

A Local Area Network (LAN) is a data communication system that allows a number of independent devices to communicate directly with each other in a limited geographic area.

36. Mention the various architecture in a LAN.

LAN is dominated by 4 architectures.

- a) Ethernet
- b) Token bus
- c) Token ring
- d) Fiber distributed data interface (FDDI)

37. Define a standard 802.3

IEEE 802.3 supports a LAN standard originally developed by Xerox and later extended by a joint venture between digital equipment corporations. Intel Corporation and Xerox. This was called 'Ethernet'.

38. List the most common kinds of Base band 802.3 LAN.

- a) 10 Base 5
- b) 10 Base 2
- c) 10 Base T
- d) 1 Base 5
- e) 100 Base T

39. Mention the different kinds of Ethernet networks.

- a) Switched Ethernet
- b) Fast Ethernet
- c) Gigabit Ethernet

40. Write short notes on FDDI.

Fiber distributed data interface is a local areas. Network protocol standardized by ANSI and ITU-7. It supports data rates of 100 Mbps and provides a high-speed

alternative to Ethernet and token ring access method used here is token passing.

41. Describe the three HDLC station types?

The three HDLC station types are:

Primary station: The primary station has the complete control of the link. The Primary station sends commands to the secondary station.

Secondary station: The secondary station sends responses.

Combined station: The combined station is one, which acts either as a primary or a Secondary, depending upon the nature and direction of the transmission. Combined station sends both commands and responses.

42. What is piggy backing?

Piggybacking means combining data to sent and acknowledgement of the frame received in one single frame.

Piggy backing can save bandwidth because the overhead from a data frame and an ACK frame can be combined into just one frame

43. Name the four types of S-frames?

The four types of S-frames are

Receive ready (RR). The value of the code sub field is 00

Receive not ready (RNR). The value of the code sub field is 10

Reject (REJ). The value of the code sub field is 01

Selective reject (SREJ). The value of the code sub field is 11

44. Name the five categories of U-frames?

The five categories of U-frames are

- ❖ Mode setting
- ❖ Unnumbered exchange
- ❖ Disconnection.
- ❖ Initialization mode.
- ❖ Miscellaneous mode

UNIT III
NETWORK LAYER

1. What are the network support layers and the user support layers?

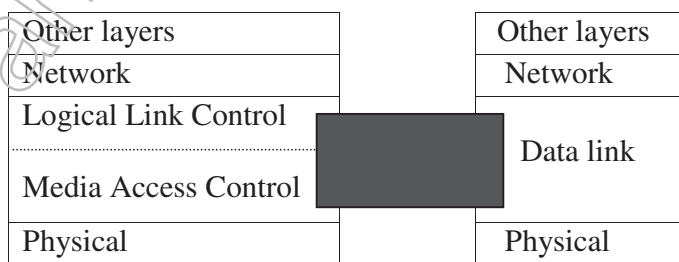
Network support layers:

The network support layers are Physical layer, Data link layer and Network layer. These deals with electrical specifications, physical connection, transport timing and reliability.

User support layers:

The user support layers are: Session layer, Presentation layer, Application layer. These allow interoperability among unrelated software system.

2. With a neat diagram explain the relationship of IEEE Project to the OSI model?



The IEEE has subdivided the data link layer into two sub layers:

- * Logical link control (LLC)
- * Medium access control (MAC)

LLC is non-architecture specific. The MAC sub layer contains a number of distinct modules, each carries proprietary information specific to the LAN product being used.

3. What are the functions of LLC?

The IEEE project 802 models takes the structure of an HDLC frame and divides it into 2 sets of functions. One set contains the end user portion of the HDLC frame - the logical address, control information, and data. These functions are handled by the IEEE 802.2 logical link control (LLC) protocol.

4. What are the functions of MAC?

MAC sub layer resolves the contention for the shared media. It contains synchronization, flag, flow and error control specifications necessary to move information from one place to another, as well as the physical address of the next station to receive and route a packet.

5. What is protocol data unit?

The data unit in the LLC level is called Protocol Data Unit (PDU). It contains four fields.

- Destination Service Point Address (DSAP)
- Source Service Access Point
- Control field
- Information field

| | | | |
|------|------|---------|-------------|
| DSAP | SSAP | Control | Information |
|------|------|---------|-------------|

6. What are headers and trailers and how do they get added and removed?

The control data added to the beginning of a data is called headers. The control data added to the end of a data is called trailers. At the sending machine, when the message passes through the layers each layer adds the headers or trailers. At the receiving machine, each layer removes the data meant for it and passes the rest to the next layer.

7. What are the responsibilities of network layer?

The network layer is responsible for the source-to-destination delivery of packet across multiple network links. The specific responsibilities of network layer include the following:

- Logical addressing.
- Routing.

8. What is a virtual circuit?

A logical circuit made between the sending and receiving computers. The connection is made after both computers do handshaking. After the connection, all packets follow the same route and arrive in sequence.

9. What are data grams?

In datagram approach, each packet is treated independently from all others. Even when one packet represents just a place of a multipacket transmission, the network treats it although it existed alone. Packets in this technology are referred to as datagram.

10. What are the two types of implementation formats in virtual circuits?

Virtual circuit transmission is implemented in 2 formats.

- Switched virtual circuit
- Permanent virtual circuit.

11. What is meant by switched virtual circuit?

Switched virtual circuit format is comparable conceptually to dial-up line in circuit switching. In this method, a virtual circuit is created whenever it is needed and exists only for the duration of specific exchange.

12. What is meant by Permanent virtual circuit?

Permanent virtual circuits are comparable to leased lines in circuit switching. In this method, the same virtual circuit is provided between two uses on a continuous basis. The circuit is dedicated to the specific uses.

13. Define Routers.

Routers relay packets among multiple interconnected networks. They Route packets from one network to any of a number of potential destination networks on Internet routers operate in the physical, data link and network layer of OSI model.

14. What is meant by hop count?

The pathway requiring the smallest number of relays, it is called hop-count routing, in which every link is considered to be of equal length and given the value one.

15. How can the routing be classified?

The routing can be classified as,

- Adaptive routing
- Non-adaptive routing.

16. What is time-to-live or packet lifetime?

As the time-to-live field is generated, each packet is marked with a lifetime, usually the number of hops that are allowed before a packet is considered lost and accordingly, destroyed. The time-to-live determines the lifetime of a packet.

17. What is meant by brouter?

A brouter is a single protocol or multiprotocol router that sometimes act as a router and sometimes act as a bridge.

18. Write the keys for understanding the distance vector routing.

The three keys for understanding the algorithm are

- Knowledge about the whole networks
- Routing only to neighbors
- Information sharing at regular intervals

19. Write the keys for understanding the link state routing.

The three keys for understanding the algorithm are

- Knowledge about the neighborhood.
- Routing to all neighbors.
- Information sharing when there is a range.

20. How the packet cost referred in distance vector and link state routing?

In distance vector routing, cost refer to hop count while in case of link state routing, cost is a weighted value based on a variety of factors such as security levels, traffic or the state of the link.

21. How the routers get the information about neighbor?

A router gets its information about its neighbors by periodically sending them a short greeting packets. If the neighborhood responds to the greeting as expected, it is

assumed to be alive and functioning. If it does not, a change is assumed to have occurred and the sending router then alerts the rest of the network in its next LSP.

22. What are the four internetworking devices?

The four internetworking devices are,

- Repeaters
- Bridges
- Routers
- Gateway

23. Define IP address.

IP address is the 32-bit number for representing a host or system in the network. One portion of the IP address indicates a networking and the other represents the host in a network.

24. What is Token Bus?

Token Bus is a physical bus that operates as a logical ring using tokens. Here stations are logically organized into a ring. A token is passed among stations. If a station wants to send data, it must wait and capture the token. Like Ethernet, station communicates via a common bus.

25. What is token passing?

Stations may attempt to send data multiple times before a transmission makes it onto a link. This redundancy may create delays of indeterminable length if the traffic is heavy. Token ring resolves this uncertainty by requiring that stations take turns sending data. Each station may transmit only during its turn and may send only one frame during each turn. The mechanism that coordinates this rotation is called token passing.

26. Define Masking?

Masking is the process that extracts the address of the physical network from an IP address.

27. What are the rules of boundary-level masking?

The rules of boundary-level masking

- The bytes in the IP address that corresponds to 255 in the mask will be repeated in the subnetwork address
- The bytes in the IP address that corresponds to 0 in the mask will change to 0 in the subnetwork address

28. What are the rules of nonboundary-level masking?

- The bytes in the IP address that corresponds to 255 in the mask will be repeated in the subnetwork address
- The bytes in the IP address that corresponds to 0 in the mask will change to 0 in the subnetwork address
- For other bytes, use the bit-wise AND operator

29. Define Gateway.

A device used to connect two separate networks that use different communication protocols.

30. What is LSP?

In link state routing, a small packet containing routing information sent by a router to all other router by a packet called link state packet.

UNIT IV
TRANSPORT LAYER

1. What is function of transport layer?

The protocol in the transport layer takes care in the delivery of data from one application program on one device to an application program on another device. They act as a link between the upper layer protocols and the services provided by the lower layer.

2. What are the duties of the transport layer?

The services provided by the transport layer

- End-to- end delivery
- Addressing
- Reliable delivery
- Flow control
- Multiplexing

3. What is the difference between network layer delivery and the transport layer delivery?

| Network layer delivery | Transport layer delivery |
|--|--|
| The network layer is responsible for the the source-to-destination delivery of packet across multiple network links. | The transport layer is responsible for source-to-destination delivery of the entire message. |

4. What are the four aspects related to the reliable delivery of data?

The four aspects are,

- Error control
- Sequence control
- Loss control
- Duplication control

5. What is meant by segment?

At the sending and receiving end of the transmission, TCP divides long transmissions into smaller data units and packages each into a frame called a segment.

6. What is meant by segmentation?

When the size of the data unit received from the upper layer is too long for the network layer datagram or data link layer frame to handle, the transport protocol divides it into smaller usable blocks. The dividing process is called segmentation.

7. What is meant by Concatenation?

The size of the data unit belonging to single sessions are so small that several can fit together into a single datagram or frame, the transport protocol combines them into a single data unit. The combining process is called concatenation.

8. What are the types of multiplexing?

The types of multiplexing are,

- Upward multiplexing
- Downward multiplexing

9. What are the two possible transport services?

Two basic types of transport services are,
 Connection service
 Connectionless services

10. The transport layer creates the connection between source and destination.

What are the three events involved in the connection?

For security, the transport layer may create a connection between the two end ports. A connection is a single logical path between the source and destination that is associated with all packets in a message. Creating a connection involves three steps:

- Connection establishment
- Data transfer & Connection release.

11. What is meant by congestion?

Congestion in a network occurs if user sends data into the network at a rate greater than that allowed by network resources.

12. Why the congestion occurs in network?

Congestion occurs because the switches in a network have a limited buffer size to store arrived packets.

13. What is meant by quality of service?

The quality of service defines a set of attributes related to the performance of the connection. For each connection, the user can request a particular attribute each service class is associated with a set of attributes.

14. What are the two categories of QoS attributes?

The two main categories are

- User Oriented
- Network Oriented

15. List out the user related attributes?

User related attributes are

- SCR – Sustainable Cell Rate
- PCR – Peak Cell Rate
- MCR- Minimum Cell Rate
- CVDT – Cell Variation Delay Tolerance

16. What are the networks related attributes?

The network related attributes are,

- Cell loss ratio (CLR)
- Cell transfer delay (CTD)
- Cell delay variation (CDV)
- Cell error ratio (CER)

17. What is the difference between service point address, logical address and physical address?

| Service point addressing | Logical addressing | Physical addressing |
|---|---|---|
| The transport layer header includes a type of address called a service point address or port address, which makes a data delivery | If a packet passes the network boundary we need another addressing to differentiate the source and destination systems. The | If the frames are to be distributed to different systems on the network, the data link layer adds the header, which defines the |

| | | |
|--|---|---|
| from a specific process on one computer to a specific process on another computer. | network layer adds a header, which indicate the logical address of the sender and receiver. | source machine's address and the destination machine's address. |
|--|---|---|

UNIT – V APPLICATION LAYER

1. What is the purpose of Domain Name System?

Domain Name System can map a name to an address and conversely an address to name.

2. Discuss the three main division of the domain name space.

Domain name space is divided into three different sections: generic domains, country domains & inverse domain.

Generic domain: Define registered hosts according to their generic behavior, uses generic suffixes.

Country domain: Uses two characters to identify a country as the last suffix.

Inverse domain: Finds the domain name given the IP address.

3. Discuss the TCP connections needed in FTP.

FTP establishes two connections between the hosts. One connection is used for data transfer, the other for control information. The control connection uses very simple rules of communication. The data connection needs more complex rules due to the variety of data types transferred.

4. Discuss the basic model of FTP.

The client has three components: the user interface, the client control process, and the client data transfer process. The server has two components: the server control process and the server data transfer process. The control connection is made between the control processes. The data connection is made between the data transfer processes.

5. What is the function of SMTP?

The TCP/IP protocol supports electronic mail on the Internet is called Simple Mail Transfer (SMTP). It is a system for sending messages to other computer users based on e-mail addresses. SMTP provides mail exchange between users on the same or different computers.

6. What is the difference between a user agent (UA) and a mail transfer agent (MTA)?

The UA prepares the message, creates the envelope, and puts the message in the envelope. The MTA transfers the mail across the Internet.

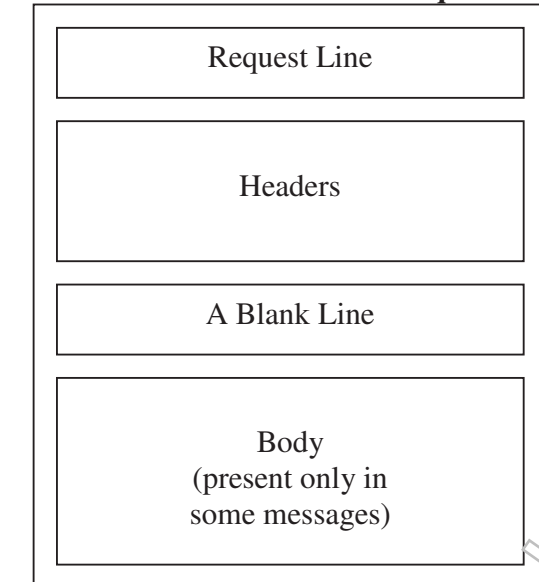
7. How does MIME enhance SMTP?

MIME is a supplementary protocol that allows non-ASCII data to be sent through SMTP. MIME transforms non-ASCII data at the sender site to NVT ASCII data and delivers it to the client SMTP to be sent through the Internet. The server SMTP at the receiving side receives the NVT ASCII data and delivers it to MIME to be transformed back to the original data.

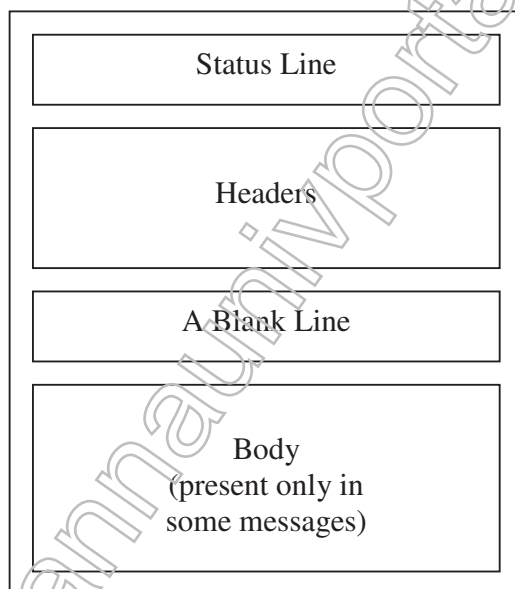
8. Why is an application such as POP needed for electronic messaging?

Workstations interact with the SMTP host, which receives the mail on behalf of every host in the organization, to retrieve messages by using a client-server protocol such as Post Office Protocol, version 3(POP3). Although POP3 is used to download messages from the server, the SMTP client still needed on the desktop to forward messages from the workstation user to its SMTP mail server.

9. Give the format of HTTP request message.



10. Give the format of HTTP response message.



11. Write down the three types of WWW documents.

The documents in the WWW can be grouped into three broad categories: static, dynamic and active.

Static: Fixed-content documents that are created and stored in a server.

Dynamic: Created by web server whenever a browser requests the document.

Active: A program to be run at the client side.

12. What is the purpose of HTML?

HTML is a computer language for specifying the contents and format of a web document. It allows additional text to include codes that define fonts, layouts, embedded graphics and hypertext links.

13. Define CGI.

CGI is a standard for communication between HTTP servers and executable programs. It is used in creating dynamic documents.

14. Name four factors needed for a secure network.

Privacy: The sender and the receiver expect confidentiality.

Authentication: The receiver is sure of the sender's identity and that an imposter has not sent the message.

Integrity: The data must arrive at the receiver exactly as it was sent.

Non-Reputation: The receiver must be able to prove that a received message came from a specific sender.

15. How is a secret key different from public key?

In secret key, the same key is used by both parties. The sender uses this key and an encryption algorithm to encrypt data; the receiver uses the same key and the corresponding decryption algorithm to decrypt the data.

In public key, there are two keys: a private key and a public key. The private key is kept by the receiver. The public key is announced to the public.

16. What is a digital signature?

Digital signature is a method to authenticate the sender of a message. It is similar to that of signing transactions documents when you do business with a bank. In network transactions, you can create an equivalent of an electronic or digital signature by the way you send data.

17. What are the advantages & disadvantages of public key encryption?

Advantages:

- a) Remove the restriction of a shared secret key between two entities. Here each entity can create a pair of keys, keep the private one, and publicly distribute the other one.
- b) The no. of keys needed is reduced tremendously. For one million users to communicate, only two million keys are needed.

Disadvantage:

If you use large numbers the method to be effective. Calculating the cipher text using the long keys takes a lot of time. So it is not recommended for large amounts of text.

18. What are the advantages & disadvantages of secret key encryption?

Advantage:

Secret Key algorithms are efficient: it takes less time to encrypt a message. The reason is that the key is usually smaller. So it is used to encrypt or decrypt long messages.

Disadvantages:

- a) Each pair of users must have a secret key. If N people in world want to use this method, there needs to be $N(N-1)/2$ secret keys. For one million people to communicate, a half-billion secret keys are needed.
- b) The distribution of the keys between two parties can be difficult.

19. Define permutation.

Permutation is transposition in bit level.

Straight permutation: The no. of bits in the input and output are preserved.

Compressed permutation: The no. of bits is reduced (some of the bits are dropped).

Expanded permutation: The no. of bits is increased (some bits are repeated).

20. Define substitutional & transpositional encryption.

Substitutional: A character level encryption in which each character is replaced by another character in the set.

Transpositional: A Character level encryption in which the characters retain their plaintext but the position of the character changes.

PART B

UNIT I

Data communications

1. Explain ISO/OSI reference model.

- Physical layer
- Data link layer
- Network layer
- Transport layer
- Session layer
- Presentation layer
- Application layer

2. Explain the topologies of the network.

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

3. Explain the categories of networks.

- Local Area Network(LAN)
- Metropolitan Area Network(MAN)
- Wide Area Network(WAN)

4. Explain coaxial cable & fiber optics.

- Coaxial cable
 - ❖ Coaxial cable standards
 - ❖ Coaxial cable connectors
- Fiber optics
 - ❖ Propagation modes
 - ❖ Fiber sizes
 - ❖ Cable composition
 - ❖ Light sources for optical cable
 - ❖ Fiber optic connectors
 - ❖ Advantages & disadvantages of optical fiber

5. Explain line coding (digital to digital conversion).

- Unipolar

- ❖ DC component
- ❖ Synchronization
- Polar
 - ❖ Non return to zero(NRZ)
 - NRZ-L
 - NRZ-I
 - ❖ Return to zero
 - ❖ Biphasic
 - Manchester
 - Differential Manchester
- Bipolar
 - ❖ Alternate Mark Inversion(AMI)
 - ❖ Bipolar 8-zero substitution(B8ZS)
 - ❖ High-Density Bipolar 3(HDB3)

UNIT II Data link layer

1. Explain error detection and error correction techniques.

- Types of errors
 - ❖ Single bit error
 - ❖ Burst error
- Error detection
 - ❖ Vertical redundancy check(VRC)
 - ❖ Longitudinal redundancy check(LRC)
 - ❖ Cyclic redundancy check(CRC)
 - ❖ Checksum
- Error correction
 - ❖ Single-bit error correction
 - ❖ Hamming code
 - ❖ Burst error correction

2. Explain error control mechanism.

- Stop and wait ARQ
- Sliding window ARQ
 - ❖ Go back-n
 - ❖ Selective-reject

3. Explain the flow control mechanism

- Stop and wait
- Sliding window.

4. Explain the timers and time registers in FDDI.

- Time registers
 - ❖ Synchronous allocation(SA)
 - ❖ Target token rotation time(TTRT)
 - ❖ Absolute maximum time(AMT)
- Timers
 - ❖ Token rotation timer(TRT)

- ❖ Token holding timer(THT)

5. Explain about Ethernet.

- Access method :CSMA/CD
- Addressing
- Electrical specification
- Frame format
- Implementation:
 - ❖ 10 base 5 :Thick Ethernet
 - ❖ 10 base 2 :Thin Ethernet
 - ❖ 10 base T :Twisted-pair Ethernet
 - ❖ 1 base 5 :Star LAN

6. Explain the frame format for token ring and token bus.

- Access method: Token passing
 - ❖ Priority and reservation
 - ❖ Time limits
 - ❖ Monitor stations

7. Explain about HDLC.

- Station types:
 - ❖ Primary station
 - ❖ Secondary station
- Configurations:
 - ❖ Unbalanced configuration
 - ❖ Symmetrical configuration
 - ❖ Balanced configuration
- Modes of communication:
 - ❖ Normal Response Mode(NRM)
 - ❖ Asynchronous Response Mode(ARM)
 - ❖ Asynchronous Balanced Mode(ABM)
- Frames :
 - ❖ Flag field
 - ❖ Address field
 - ❖ Control field
 - ❖ Information field
 - ❖ FCS field

UNIT III

Network layer

1. Explain the two approaches of packet switching techniques.

- Datagram approach
- Virtual circuit approach
 - ❖ Switched virtual circuit(SVC)
 - ❖ Permanent virtual circuit(PVC)
- Circuit – switched connection versus virtual – circuit connection
 - ❖ Path versus route
 - ❖ Dedicated versus shared

2. Explain IP addressing method.

- Internetwork protocol (IP)
- Datagram
- Addressing
 - ❖ Classes
 - ❖ Dotted decimal notation
 - ❖ A sample internet

3. Define routing & explain distance vector routing and link state routing.

- Distance vector routing
 - ❖ Sharing information
 - ❖ Routing table
 - Creating the table
 - Updating the table
 - Updating algorithm
- Link state routing
 - ❖ Information sharing
 - Packet cost
 - Link state packet
 - Getting information about neighbors
 - Initialization
 - Link state database

4. Define bridge and explain the type of bridges.

- Bridges
- Types of bridges
 - ❖ Simple bridge
 - ❖ Multiport bridge
 - ❖ Transparent bridge

5. Explain subnetting

- Subnetting
- Three levels of hierarchy
- Masking
 - ❖ Masks without subnetting
 - ❖ Masks with subnetting
- Finding the subnetwork address
 - ❖ Boundary level masking
 - ❖ Non-boundary level masking

6. Write short notes about repeaters, routers and gateways.

- Repeaters
- Routers
 - ❖ Routing concepts
 - Least-cost routing
 - Non adaptive routing
 - Adaptive routing
 - Packet lifetime
- Gateways

UNIT IV
Transport layer

1. Explain the duties of transport layer.

End to end delivery

Addressing

Reliable delivery

- Error control
- Sequence control
- Loss control
- Duplication control

Flow control

Multiplexing

2. Explain socket in detail.

- Introduction
- Explanation
- program

3. Explain UDP & TCP.

- User Datagram Protocol(UDP)
 - ❖ Source port address
 - ❖ Destination port address
 - ❖ Total length
 - ❖ Checksum
- Transmission Control Protocol(TCP)
 - ❖ Source port address
 - ❖ Destination port address
 - ❖ Sequence number
 - ❖ Acknowledgement number
 - ❖ Header length
 - ❖ Reserved
 - ❖ Control
 - ❖ Window size
 - ❖ Check sum
 - ❖ Urgent pointer
 - ❖ Options and padding

4. Explain about congestion control.

- Congestion avoidance
 - ❖ BECN
 - ❖ FECN
 - ❖ Four situations
- Discarding

5. Explain leaky bucket and token bucket algorithm

- Leaky bucket algorithm
 - ❖ Leaky bucket
 - ❖ Switch controlling the output rate
 - ❖ Flowchart

UNIT V
Application Layer

1. **Explain the functions of SMTP.**
 - System for sending messages to other computer users based on e-mail addresses. SMTP provides mail exchange between users on the same or different computers.
 - User Agent
 - Mail Transfer Agent
 - Multipurpose Internet Mail Extensions
 - Post Office Protocol
2. **Write short notes on FTP.**
 - Transfer a file from one system to another.
 - TCP connections
 - Basic model of FTP
3. **Explain about HTTP.**
 - HTTP transactions
 - HTTP messages
 - URL
4. **Explain the WWW in detail.**
 - Hypertext & Hypermedia
 - Browser Architecture
 - Categories of Web Documents
 - HTML
 - CGI
 - Java
5. **Explain the type of encryption/decryption method.**

Conventional Methods:

 - Character-Level Encryption: Substitutional & Transpositional
 - Bit-Level Encryption: Encoding/Decoding, Permutation, Substitution, Product, Exclusive-Or & Rotation

Public key Methods
6. **Explain about RSA algorithm.**
 - Public key Encryption technique.
 - Encryption algorithm
 - Decryption algorithm
 - Security in RSA
7. **Explain about secret key encryption algorithm.**
 - Data Encryption Standard
 - Algorithm
 - Sub key generation