

CS1302 – COMPUTER NETWORKS

PART – A

UNIT I

1. Identify the components of data communication system?

Message : The message is the information to be communicated.

Sender : The sender is the device that sends the data message.

Receiver : The receiver is the device that receives the message.

Medium : The transmission medium is the physical path by which a message travels from sender to receiver.

Protocol : A protocol is a set of rules that governs data communications.

2. What are the advantages of distributed processing?

- ❖ Security/Encapsulation.
- ❖ Distributed database.
- ❖ Faster-problem solving.
- ❖ Security through redundancy.
- ❖ Collaborative processing.

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

- Delivery : The system must deliver data to the correct destination.
- Accuracy : The system must deliver the data accurately.
- Timeliness : The system must deliver data in a timely manner.

4. Why protocols are needed?

- ❖ A protocol is a set of rules that governs data communications.
- ❖ Without a protocol, two devices may be connected but they cannot communicate with each other.
- ❖ A protocol defines what is communicated, how and when it is communicated.

5. Why standards are needed?

- ❖ Standards are essential in creating and maintaining an open and competitive market for equipment manufacturers and in guaranteeing national and international interoperability of data and telecommunications technology and processes.
- ❖ They provide guidelines to manufacturers, vendors, government agencies and other service providers to ensure the kind of interconnectivity necessary in today's marketplace and in international communications.

6. Difference between de facto and de jure standard?

- | | |
|---|--|
| De facto | De jure |
| 1. Meaning “by fact” or “by convention” | 1. Meaning “by law” or “by regulation” |

2. Standards that have not been approved by an organized body but have been adopted as standards through widespread use are de facto standards.

2. Those that have been legislated by an officially recognized body are de jure standards.

7. Write the formula to find the number of links in mesh topology?

The number of links in mesh topology = $n(n - 1) / 2$, Where n is the number of devices.

8. Describe the three characteristics of sine wave?

The three characteristics of sine wave are:

Amplitude: Amplitude represents the height of the signal either in positive or negative direction.

Frequency and period: Period refers to the amount of time a signal needs to complete one cycle.

Frequency refers to the number of periods in one second.

Phase: Phase describes the position of the waveform relative to time zero.

9. What is a spectrum of a signal?

The spectrum of a signal consists of the sine waves that make up the signal. The description of a signal using the frequency domain and containing all its components is called the frequency spectrum of that signal.

10. Difference between information and signal?

Information	Signal
1. Information means the data to be transmitted from sender to receiver.	1. The data to be transmitted are sent in the form of signals through the transmission media.
2. The data usable to an application are not in a form that can be transmitted over a network.	2. The transmission media accept the information in the form of signals.

11. Give two examples for analog and digital information?

Analog information: Eg) Human voice.
Sine wave.

Digital information: Eg) Data stored in computer memory.
Square wave.

12. Compare analog with digital signal?

Analog signal	Digital signal
1. Analog signals can have an infinite	1. Digital signals can have only a limited

number of values in a range.
 2. Signal that varies continuously with time discrete is called analog signal

number of values.
 2. Signal that have values only at instance of time is called digital signal

13. Compare periodic and aperiodic signal?

Periodic signal

1. A periodic signal completes a pattern within a measurable time frame called period and repeats that pattern over subsequent identical periods.
2. In data communication we use periodic analog signals.

Aperiodic signal

1. Aperiodic signal changes without exhibiting a pattern or cycle that repeats over time
2. In data communication we use a periodic digital signals

14. Give the relationship between period and frequency?

- ❖ Period refers to the amount of time a signal needs to complete one cycle.
 - ❖ Frequency refers to the number of periods in one second.
 - ❖ Period is the inverse of frequency and frequency is the inverse of period.
- $$f = 1/T \quad \text{and} \quad T = 1/f$$
- f = frequency in hertz, T = period in second.

15. What are the units of period and frequency?

Period is expressed in seconds and frequency is expressed in hertz.

TABLE: Units of period and frequency.

Unit	Equivalent	Unit	Equivalent
Seconds	1s	Hertz	1 Hz
Milliseconds	10^{-3} s	Kilohertz	10^3 Hz
Microseconds	10^{-6} s	Megahertz	10^6 Hz
Nanoseconds	10^{-9} s	Gigahertz	10^9 Hz
Picoseconds	10^{-12} s	Terahertz	10^{12} Hz

16. Difference between high frequency signal and low frequency signal?

High frequency signal

1. If the value of the signal changes over a very short span of time, then the signal is called as high frequency signal.

Low frequency signal

1. If the value of the signal changes over a long span of time, then the signal is called as low frequency signal

17. What do the amplitude, frequency and phase of the signal measure?

The amplitude, frequency and phase of the signal measure the characteristics of the sine wave.

Amplitude is measured in volts.

Frequency is measured in hertz.

Phase is measured in degrees or radians.

18. Difference between simple periodic and composite periodic signal?

Simple periodic Signal	composite periodic signal
1.Simple periodic signal consists of only one frequency.	1.Composite signal consists of multiple Frequencies.
2.Simple signals are periodic which cannot be decomposed into number of sine waves	2.Composite signals are periodic which can be decomposed into a collection of sine waves.

19. What is the bit rate and bit interval? How are they related?

Bit interval: It is the time required to send one single bit.

Bit rate: It is the number of bit intervals per second. It is measured in bits per second.

Bit rate = 1/ Bit interval.

20.A sine wave has a frequency of 6Hz. What is its period?

$$f = 1/ T \quad \text{and} \quad T = 1/ f$$

f = frequency in hertz.

T = period in seconds.

Given f = 6 Hz

$$T = 1/6$$

$$= 0.167 \text{ seconds}$$

21. The sine wave completes one cycle in 4seconds.What is its frequency?

Answer in Hz.

$$\text{Given } T = 4 \text{ seconds}$$

$$f = 1/4 = 0.25 \text{ Hertz.}$$

22. The sine wave completes one cycle in 25micro seconds. What is its frequency?

Answer in KHz.

$$\text{Given } T = 25 \text{ micro seconds.}$$

$$f = 1/(25 * 10^{-6})$$

$$= 40000 \text{ Hz}$$

$$= 40 \text{ KHz}$$

23. Which parts of the electromagnetic spectrum are used for communication?

The section of electro magnetic spectrum defined as radio waves and microwaves that ranges from 3 kHz to 300 GHz is used for communication. This section is divided into eight ranges called bands.

24. How are the guided media differ from unguided transmission media?

Guided transmission media

Unguided transmission media

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

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

25. Why is coaxial cable superior to twisted pair cable?

Coaxial cable carries signals of higher frequency ranges than twisted pair cable. Coaxial cable provides high bandwidth and high data rate. Because of these reasons coaxial cable is superior to twisted pair cable.

26. What happens to a beam of light as it travels to a less dense medium?

If a ray of light traveling through one substance suddenly enters another medium the ray changes direction. If the angle of incidence is equal to the critical angle the light bends along the interface. If the angle of incidence is greater than the critical angle the ray reflects and travels again in the same medium. If the angle of incidence is less than the critical angle the ray refracts.

27. What is reflection?

Reflection means the ray takes a turn and travels in the same medium. If the angle of incidence is greater than the critical angle the ray reflects and travels again in the same medium.

28. Name the advantages of optical fiber over twisted pair and coaxial cable?

The advantages of optical fiber over twisted pair and coaxial cable are

- ❖ Noise resistance.
- ❖ Less signal attenuation.
- ❖ Higher bandwidth.

29. 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.

30. What does a decibel measure?

To check whether a signal has loosed or gained strength we use the concept decibel. Decibel measures the relative strength of two signals or a signal at a two different points. Decibel is negative if a signal is attenuated and positive if a signal is amplified.

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

The criteria used to evaluate transmission medium are

- ❖ Throughput

- ❖ Propagation speed
- ❖ Propagation time
- ❖ Wavelength

32. 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.

33. 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.

34. 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.

35. What is a peer-to-peer process?

When a message travels from A to B, it may pass through many intermediate nodes, which contains only the first three layers. Within a single machine, each layer gets the service from the below layer. Layer X on one machine communicates with layer X on another machine by a set of rules and conventions called as protocols. The processes on each machine that communicate at a given layer are called peer-to-peer process.

36. 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.

37. What are the concerns of physical layer?

The physical layer coordinates the functions required to transmit a bit

stream over a physical medium. The physical layer is concerned with the following:

- ❖ Physical characteristics of interfaces and media.
- ❖ Representation of bits.
- ❖ Data rate.
- ❖ Synchronization of bits.
- ❖ Line configuration.
- ❖ Physical topology & Transmission mode.

38. What are the responsibilities of data link layer?

The data link layer is responsible for delivering data units from one station to the next without errors. The specific responsibilities of data link layer include the following:

- ❖ Framing.
- ❖ Physical addressing.
- ❖ Flow control.
- ❖ Error control.
- ❖ Access control

39. 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.

40. What are the responsibilities of transport layer?

The transport layer is responsible for source-to-destination delivery of the entire message. The specific responsibilities of transport layer include the following:

- ❖ Service-point addressing.
- ❖ Segmentation and reassembly.
- ❖ Connection control.
- ❖ Flow control.
- ❖ Error control

41. 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.

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

Service point addressing	Logical addressing	Physical addressing
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The transport layer header includes a type of address called a service point address or port address, which makes a data delivery from a specific process on one computer to a specific process on another computer.	If a packet passes the network boundary we need another addressing to differentiate the source and destination systems. The network layer adds a header, which indicate the logical address of the sender and receiver.	If the frames are to be distributed to different systems on the network, the data link layer adds the header, which defines the source machine's address and the destination machine's address.
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43. What are the responsibilities of session layer?

The session layer establishes, maintains and synchronizes the interactions between communicating devices. The specific responsibilities of session layer include the following:

- ❖ Dialog control
- ❖ synchronization

44. What is the purpose of translation by presentation layer?

The processes in two systems are usually exchanging information in the form of character strings, numbers, and so on. The information should be changed to bit streams before being transmitted. Because different computers use different encoding systems, the presentation layer is responsible for interoperability between these different encoding methods. The presentation layer at the sender changes the information from its sender-dependent format into a common format. The presentation layer at the receiving machine changes the common format into its receiver-dependent format.

45. Name some services provided by the application layer

The services provided by the application layer include the following:

- ❖ Network virtual terminal.
- ❖ File transfer, access, and management.
- ❖ Mail services
- ❖ Directory services.

UNIT – II

1. What is the difference between the information field in HDLC I- frame and U- frame?

Information field in HDLC I-frame	Information field in HDLC U-frame
In an I-frame the information field contains the user data.	In an U-frame the information field contains the network management information.

2. How the asynchronous protocols are primarily used?

The asynchronous protocols are primarily used as modems, future start and stop bits and variable length gap between characters.

3. How the character-oriented protocols convey the control information?

The character-oriented protocols convey the control information in the form of Code words taken from existing character set such as ASCII and EBCDIC. In character oriented protocols a packet is treated as a sequence of characters or bytes.

4. Describe the types of BSC frame?

There are two types of BSC frames. They are

Control frame: Control frames carry the control information. Control frames are used to establish a communication between the communicating devices to control the flow of information, to request for the error correction and to disconnect the devices at the end of communication.

Data frame: Data frames carry the data and the control information applicable to that data unit.

5. How can a receiver distinguish between the end of a frame and the end of a message in a multi frame BSC transmission?

In a multiframe BSC transmission the transmitter indicates the end of a message by a one and end of a frame by a zero.

6. 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.

7. In HDLC what is bit stuffing and why it is needed?

To guarantee that the flag field sequence does not appear inadvertently anywhere else in the frame, HDLC uses a process called bit stuffing.

Bit stuffing is the process of adding one extra zero whenever there are five consecutive one's in the data so that the receiver does not mistake the data for a flag.

8. What is piggy backing?

Piggy backing 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

9. 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

10. Name the five categories of U-frames?

The five categories of U-frames are

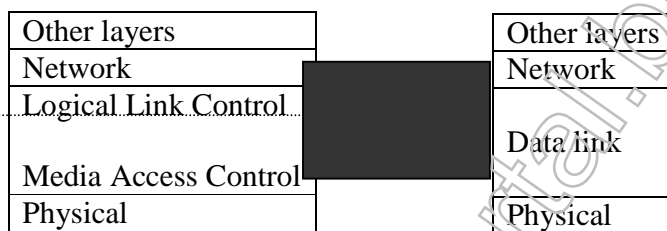
- ❖ Mode setting
- ❖ Unnumbered exchange
- ❖ Disconnection.
- ❖ Initialization mode.
- ❖ Miscellaneous mode

11. What is LAN? What are the dominating architectures?

A Local Area Network (LAN) is a data communication system that allows a number of independent devices to communicate directly within a limited geographical area. LANs are dominated by four dominating architectures,

- Ethernet
- Token Bus
- Token ring
- Fiber Distributed Data Interface

12. 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.

13. What are the functions of LLC?

The IEEE project 802 model 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.

14. 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 .

15. 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
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16. What are collisions? What are the mechanisms that can be used to avoid collisions?

Whenever multiple users have unregulated access to a single line, there is a danger of signals overlapping and destroying each other. Such overlaps, which turn the signals into unusable noise are called collisions. The access mechanism used to coordinate traffic, minimize the number of collisions occur, and maximize the number of frames that can be delivered successfully is Carrier Sense Multiple Access with collision detection (CSMA\CD).

17. What is thick Ethernet?

The first of the physical standards defined in the IEEE 892.3 model is called 10Base5,thick Ethernet, or thicknet. This is a bus topology LAN that uses base band signaling and has a maximum segment length of 500 meters. The data rate is 10MBPS.To reduce collisions the bus should not exceed 2500meters(5 segments).

18. What are advantages and disadvantages of thin Ethernet over thicknet?

The advantages are

- Reduced cost
- Ease of installation

The disadvantages are

- Shorter range (185meters)
- Smaller capacity

19. What is twisted pair Ethernet?

Twisted pair Ethernet is a star topology LAN using unshielded twisted pair cable (UTP) instead of coaxial cable. It supports a data rate of 10MBPS and has a maximum length of 100meters.

20. 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.

21. 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.

22. What is FDDI?

Fiber Distributed Data Interface (FDDI) is a local area network protocol standardized by ANSI and the ITU-T. It supports data rates of 100MBPS and provides a high-speed alternative to Ethernet and Token Ring. It uses Fiber Optic cable.

23. What are the configurations in which wireless LANs can operate?

Wireless LANs can operate in two configurations. They are,

- With base band station
- Without base band station

24. What is BSS?

The smallest building block of a wireless LAN is a Basic Service Set (BSS), which consists of some number of stations executing the same MAC protocol and competing for access to the same shared medium.

25. What is an ESS?

An Extended Service Set is one which consists of two or more BSS interconnected by a distributed system. The ESS appears as a single logical LAN to the LLC level.

26. What are the types of stations defined by 802.11 standard?

802.11 standard defined three types of stations based on the mobility,

No transition: A station of this type is either stationary or moves only within the direct communication range of the communication stations of a single BSS.

BSS transition: This is defined as a station movement from one BSS to another BSS within the same ESS.

ESS transition: This is defined as a station transition from a BSS in one ESS to a BSS within Another ESS.

27. What is the transmission schemes defined in the current 802.11 standard?

The transmission schemes defined in the current 802.11 standard are,

Infrared: At 1 Mbps and 2Mbps operating at a wavelength between 850 and 950 nm

Direct Sequence Spread Spectrum: Operating in the 2.4GHz ISM band. Up to 7 channels, each with a data rate of 1Mbps or 2 Mbps, can be used.

Frequency Hopping Spread Spectrum: operating in the 2.4GHz ISM band, with data rate of 1 Mbps or 2 Mbps.

28. What is the use of sliding window?

Sliding window is used to make data transmission more efficient as well as to control data flow so that receiver does not become overwhelmed. The sliding window used at the transport layer are byte –oriented.

29. Define redundancy.

The concept of appending a shorter group of bits at the end of each unit is called redundancy since the extra bits are redundant to the information. They are discarded as soon as the accuracy of the transmission has been determined.

UNIT - III

1. What is the use of switching?

Switches are used to route all the incoming cells from a source endpoint to the destination end point.

2. What is an IP address?

An IP address (Internet Protocol address) is a unique [number](#) that devices use in order to identify and communicate with each other on a [computer network](#) utilizing the [Internet Protocol](#) standard. An IP address- is 32 bits long. It consist of a network number and a host number. IP addresses are written in a dotted decimal notation

3. What is classful addressing?

IP distinguishes 5 classes of addresses

- Class A:
 - For very large organizations
 - 16 million hosts allowed
- Class B:
 - For large organizations
 - 65 thousand hosts allowed
- Class C
 - For small organizations
 - 255 hosts allowed
- Class D
 - Multicast addresses
 - No network/host hierarchy

4. What are the operations carried out by the network layer?

The operations carried out by the network layer are

- [forwarding](#): move packets from router's input to appropriate router Output.
- [routing](#): determine route taken by packets from source to destination.

5. What is internetworking?

Internetworking is a scheme for interconnecting multiple networks of dissimilar technologies

- Uses both hardware and software
 - Extra hardware positioned between networks
 - Software on each attached computer
- System of interconnected networks is called an internetwork or an internet

6. What is subnet?

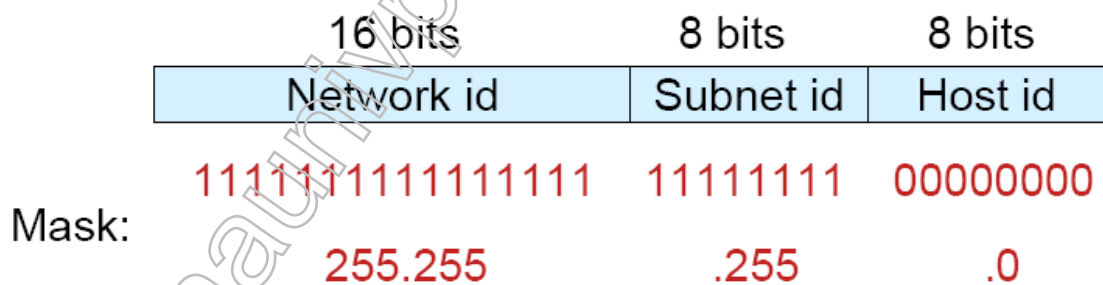
- Subnetting is a technique used to allow a single IP network address to span multiple physical networks.
- IP hosts should support subnetting.
- Subnetting is done by using some of the bits of the host-id part of the IP address as a physical network identifier.
- The subnet mask is used to determine the bits of the network identifier.
- All hosts on the same network should have the same subnet mask

7. What is classless addressing?

Classless addressing have variable length blocks that belong to no class. It can have a block of 2 addresses, 4 addresses, 128 addresses, 128 addresses and so on.

8. Define subnet mask.

Subnet masks allow hosts to determine if another IP address is on the same subnet or the same network.



9. What is default mask?

A default mask is a 32-bit binary number that gives the network address when ANDed with an address in the block..

Class	In Binary	In Dotted-decimal
A	11111111 00000000 00000000 00000000	255.0.0.0
B	11111111 11111111 00000000 00000000	255.255.0.0
C	11111111 11111111 11111111 00000000	255.255.255.0

10. What is LSA?

To share information about their neighbors each entity distributes link state advertisements. An LSA announces the states of entity links. Depending on the type of entity there are five different LSAs

- Router Link
- Network link
- Summary link to Network
- Summary link to AS boundary Router
- External link

11. Discuss the types of routing techniques.

Next-hop Routing:

- the routing table only specifies the next hop (next router to forward to) on the path towards the destination.
- the next hop is always to a directly connected router.

Network specific Routing:

Instead of having an entry for every host connected to the same physical network there is only one entry to define the address or the network itself.

Host specific routing:

The destination host address is given in the routing table.

12. Define circuit switching.

In circuit switching a physical link is dedicated between a source and a destination. Data can be sent as a stream of bits without the need for packetizing.

13. Define packet switching .

In packet switching data are transmitted in discrete units of potentially variable length blocks called packets. The maximum length of the packet is established by the network. Each packet contains not only data but also a header with control information. Two approaches to packet switching are datagram approach and the virtual circuit approach.

14. What is virtual circuit approach?

In the virtual circuit approach to packet switching the relationship between all packets belonging to a message or session is preserved. A single route is chosen between receiver and sender at the beginning of the session. When the data are sent all the packets of the transmission travel one after another along that route.

15. Define datagram approach.

In the datagram approach to packet switching, each packet is treated independently of all others. Even if one packet is a piece of multipacket transmission, the network treats it as though it existed alone. Packets in this approach are referred to as datagrams.

UNIT - IV

1. List the transport protocols in transport layer.

TCP and UDP

2. What is TCP?

TCP is a reliable, point-to-point, connection-oriented, full-duplex protocol.

3. What is UDP?

UDP is a connectionless unreliable transport protocol—extends IP's host-to-host delivery service into a process-to-process communication service

4. Define Port number.

- UDP (and TCP) use port numbers to identify applications
- A globally unique address at the transport layer (for both UDP and TCP) is a tuple <IP address, port number>
- There are 65,535 UDP ports per host.

5. What is socket address?

IP Address and the port number are referred as socket.

6. What is the difference between reliable and unreliable?

Reliable: If the application layer program needs reliability, we use a reliable transport layer protocol by implementing flow and error control at the transport layer.

Unreliable: If the application layer program does not need reliability, because it uses its own flow and error control mechanism or it needs fast service or the nature of the service does not demand flow and error control.

7. Define multiplexing in transport layer.

At the sender site there may be several processes that need to send packets. This is a many-to-one and requires multiplexing. The protocol (TCP or UDP) accepts messages from different processes differentiated by their assigned port numbers. After adding the header the transport layer passes the packet to the network layer.

8. Define demultiplexing in transport layer.

At the receiver site the relationship is one-to-many and requires demultiplexing. The transport layer receives a datagram from the network layer. After error checking and dropping of the header, the transport layer delivers each message to the appropriate process based on the port number.

9. Define datagram.

UDP packets are called user datagram.

10. Define segment.

TCP groups a number of bytes together into a packet.

11. What is Quality of Service?

The QoS 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.

12. What is silly window syndrome?

If either the sending application program creates data slowly or the receiving application program consumes data slowly results in sending data in very small segments which reduces the efficiency of the operation. This is called silly window syndrome. For example, If TCP sends segments containing only 1 byte of data, it means that we are sending a 41 byte datagram that transfers only 1 byte of user data which indicates the capacity of the network is used very inefficiently.

UNIT – V

1. Why polyalphabetic encryption technique is used?

The polyalphabetic encryption technique is used to find the position of Character in the text & use that value as the key.

2. Contrast straight, compressed & expanded permutation

In straight permutation the number of bits in the i/p & o/p are preserved; Only the positions are changed. In compressed permutation the number of bits is reduced. In expanded permutation the number of bits is increased.

3. What is authentication?

Authentication means verifying the identity of a sender. In other words Authentication tries to verify that a message is coming from a authentic sender and not from an imposter.

4. What is cryptography?

The art of transforming messages to make them secure and immune to attacks is called cryptography.

Part B

UNIT – I

1. Explain with a neat sketch, the functions of the protocols in each of the layer of the OSI model and illustrate how communication is taking place between two end systems

- ❖ Layered architecture
- ❖ Physical layer functions (physical characteristics, data rate, synchronization, line configuration, topology, transmission mode)

- ❖ Data link layer functions (framing, physical addressing, flow control, error control, access control)
 - ❖ Network layer functions (logical addressing, routing)
 - ❖ Transport layer functions (service-point addressing, segmentation & reassembly, connection control, flow control, error control)
 - ❖ Session layer functions (Dialog control, synchronization)
 - ❖ Presentation layer (Translation, Encryption, Compression)
 - ❖ Application layer functions
 - ❖ Explanation on data exchange using ISO model
2. Discuss in detail the various Digital-to-Digital conversion methods.
- ❖ Unipolar
 - ❖ Polar
 - NRZ (NRZ-L, NRZ-I)
 - RZ
 - Biphasic (Manchester, Differential Manchester)
 - ❖ Bipolar
 - AMI
 - B8ZS
 - HDB3

UNIT-II

1. Discuss the various types of redundancy checks
- ❖ Concept of Redundancy
 - ❖ Vertical Redundancy Check
 - ❖ Longitudinal Redundancy Check
 - ❖ Cyclic Redundancy Check
 - ❖ Checksum
- Explanations with suitable examples.
2. Explain in detail the HDLC protocol architecture
- ❖ HDLC basics (Station types, configuration, communication mode)
 - ❖ HDLC Frame formats (I-frame, U-frame, S-frame)
 - ❖ Data transparency
3. Explain in detail the Ethernet architecture
- ❖ Access Method: CSMA/CD
 - ❖ Addressing
 - ❖ Frame format
 - ❖ Implementation: 10Base5, 10Base2, 10Base-T, 1Base5
4. Explain in detail the Token Ring architecture
- ❖ Access method: token passing
 - ❖ Addressing
 - ❖ Frame format
 - ❖ Implementation: Ring, Switch, Multi station Access Unit
5. Write notes on FDDI
- ❖ Access method: token passing (time registers, timers, station procedure)

- ❖ Addressing
 - ❖ Electrical Specification
 - ❖ Frame format
 - ❖ Implementation: Dual Ring
6. Explain IEEE 802.11 architecture for Wireless LAN
- ❖ Architecture(BSS, ESS)
 - ❖ Medium Access Control Layer Architecture
 - Distributed Coordination Function (access method: CSMA)
 - Point Coordination Function
7. Explain SONET with a suitable diagram.
- ❖ Diagram of SONET
 - ❖ Explanation of devices in SONET
 - ❖ Frame format
8. Explain how to avoid looping problem in bridges
- ❖ Explanation of looping problem with diagram
 - ❖ Give Spanning tree algorithm
 - ❖ Explanation of algorithm with an example.
9. Discuss the STOP-AND-WAIT ARQ flow and error control mechanism.
- ❖ Explanation of features
 - ❖ Operation
 - Normal operation
 - Lost or damaged frame
 - Lost Acknowledgement
 - Delayed Acknowledgement
 - Piggybacking
- 10 Discuss the GO-BACK-N ARQ flow and error control mechanism.
- ❖ Explanation of features
 - ❖ Sequence number
 - ❖ Sender sliding window
 - ❖ Receiver sliding window
 - ❖ Operation
 - Normal operation
 - Lost or damaged frame
 - Lost Acknowledgement
 - Delayed Acknowledgement
- 11 Discuss the SELECTIVE REPEAT ARQ flow and error control mechanism.
- ❖ Explanation of features
 - ❖ Sender window
 - ❖ Receiver window
 - ❖ Operation
 - Normal operation
 - Lost or damaged frame
 - Lost and delayed Acknowledgement & NAK
 - Piggybacking.

UNIT III

1. Describe the two methods that are used to calculate the shortest path between two routers

- ❖ Routing concepts
- ❖ Distance vector routing
 - Sharing information
 - Routing Table (Creation, updation - algorithm)
 - Example
- ❖ Link state routing
 - Information sharing
 - Link state packet
 - Link state database
 - Dijkstra's algorithm
 - Routing table construction
 - Example

2. Write notes on circuit switching and packet switching

There are two different principles for switching in the network;

Circuit Switching:

During a connection setup phase the switches are signaled and made to establish a path between the endpoints. Resources are allocated statically along the path for the whole duration of the call. Circuit switching naturally offers a connection oriented service, while it is less suited for datagram service due to setup delays. The advantage is that no congestion occurs and that service quality and real-time properties can easily be guaranteed. The problem is that there is no sharing of unused capacity and therefore the utilization can be very low during periods when sources need less than the allocated capacity.

Packet Switching:

Instead of allocating resources statically the data is put in variable length packets that are sent over the network. This allows more sharing and saves resources, especially if the sources are very bursty. The deficit is that congestion may occur and therefore it is very hard to provide quality guarantees and real-time properties. A packet switched network may need some connection setup phase for establishing paths. However, since sharing is possible new paths may not be needed for each new source that enters the network.

Datagram switching is a special case where packets contain full source and destination address. The advantage is that there is no need for a setup phase at all. The switches are called routers and they do not depend on internal state to handle packets. This means that the network becomes very robust and easy to maintain. A link failure means that packets automatically can be rerouted in the network.

SONET is an example of wide area circuit switching network that allows multiplexing of many connections over point-to-point fiber links.

UNIT - IV

1. Explain the User datagram. Format.
 - ❖ draw UDP format
 - ❖ explain fields in the format.
2. Discuss the TCP segment format.
 - ❖ draw TCP segment format
 - ❖ explain the fields in the format.
3. Explain in detail the connection establishment in TCP.
 - ❖ draw the diagram
 - ❖ give explanation
4. Discuss the process of connection termination.
 - ❖ draw the diagram
 - ❖ give explanation.
5. Discuss the silly window syndrome problem and how to avoid that.
 - ❖ Concept of silly window syndrome
 - ❖ Syndrome created by sender
 - ❖ Nagles Algorithm
 - Syndrome created by Receiver
 - Clarks solution,
 - Delayed acknowledgement

UNIT – V

1. Write note on HTTP & WWW

HTTP - Request Messages
Response message

- ❖ Explain

WWW – Hypertext & Hypermedia
Categories of Web documents

- ❖ Explain

2. Write note on SMTP and FTP

SMTP – Addressing System
User Agent
MIME
Mail Transfer Agent

- ❖ Explain

FTP – FTP diagram
Control Connection

Data Connection

Communication over Data Connection

3.Explain the DES algorithm to encrypt and decrypt the message.

- ❖ Give the diagram
- ❖ Explain .

4.Explain RSA algorithm in Public key cryptography.

- ❖ Concept of Public key cryptography
- ❖ Diagram
- ❖ Explanation
- ❖ Choosing public and private keys

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