2 Marks and 16 Marks

Unit – I
Data Communication
PART A
1. Define the term Computer Network.
A Computer network is a number of computers interconnected by one or more transmission paths. The transmission path often is the telephone line, due to its convenience and universal preserve.
2. Define Data Communication.
Data communication is the exchange of data (in the form of 0s and 1s) between two devices via some form of transmission medium (such as a wire cable).
3. What is the fundamental purpose behind data communication?
The purpose of data communication is to exchange information between two agents.
4. List out the types of data communication.
Data communication is considered
Local – if the communicating device are in the same building.
Remote – if the device are farther apart.
5. Define the terms data and information.
Data : is a representation of facts, concepts and instructions presented in a formalized manner suitable for communication, interpretation or processing by human beings or by automatic means.
Information : is currently assigned to data by means by the conventions applied to those data.
6. What are the fundamental characteristics on which the effectiveness of data communication depends on?
The effectiveness of a data communication system depends on three characteristics.
1. Delivery: The system must deliver data to the correct destination.
2. Accuracy: The system must deliver data accurately.
3. Timeliness: The system must deliver data in a timely manner.
7. Give the components of data communication.
1. Message – the message is the information to be communicated.
2. Sender – the sender is the device that sends the data message.
3. Receiver – the receiver is the device that receives the message.
4. Medium – the transmission medium is the physical path by which a message travels from sender to receiver.
5. Protocol – A protocol is a set of rules that govern data communication.
8. Define Network.
A network is a set of devices (nodes) connected by media links. A node can be a computer, printer, or any other devices capable of sending and / or receiving data generated by other nodes on the network.
9. What are the advantage of distributed processing?
1. Security / Encapsulation
2. Distributed database

3. Faster problem solving
4. Security through redundancy
5. Collaborative processing.

10. What are the three criteria necessary for an effective and efficient network?
1. Performance
2. Reliability
3. Security.

11. Name the factors that affect the performance of a network.
- Performance of a network depends on a number of factors,
1. Number of users
2. Type of transmission medium
3. Capabilities of the connected hardware
4. Efficiency of software.

12. Name the factors that affect the reliability of a network.
1. Frequency of failure.
2. Recovery time of a network after a failure.
3. Catastrophe.

13. Name the factors that affect the security of a network.
Network security issues include protecting data from unauthorized access and viruses.

14. Define PROTOCOL.
A protocol is a set of rules (conventions) that govern all aspects of data communication.

15. Give the key elements of protocol.
   * Syntax : refers to the structure or format of the data, meaning the order in which they are presented.
   * Semantics : refers to the meaning of each section of bits.
   * Timing : refers to two characteristics.
1. when data should be sent and
2. how fast they can be sent.

16. Define Standard.
A standard provides a model for development that makes it possible for a product to work regardless of the individual manufacturer.

17. Why are standard needed?
   * Standards are essential in creating and maintaining an open and competitive market for equipment manufactures and in guaranteeing national and international interoperability of data and telecommunications technology and processes.
   * Standards are necessary to ensure that products from different manufactures can work together as expected.

18. Define De facto and De jure standards.
De facto standards:
De facto (by fact) standards are often established originally by manufactures seeking to define the functionality of a new product or technology.
De jure standards:
De jure (by law) standards have been legislated by an officially recognized body.

19. Define line configuration and give its types.
-              Line configuration refers to the way two or more communication devices attach to a link.

- There are two possible line configurations:
i. Point to point and
ii. Multipoint.

20. Define topology and mention the types of topologies.

Topology defines the physical or logical arrangement of links in a network

Types of topology :
- Mesh
- Star
- Tree
- Bus
- Ring

21. The Lucky Ducky corporation has a fully connected mesh network consisting of eight devices. Calculate the total number of cable links needed and the number of ports for each device.

Solution:

The formula for the number of links for a fully connected mesh is $n(n - 1) / 2$, where n is the number of devices.

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

$\qquad = 8(8 - 1) / 2 = 28$.

Number of ports per device $= n - 1$

$\qquad = 8 - 1 = 7$.

22. Define Hub.

In a star topology, each device has a dedicated point to point link only to a central controller usually called a hub.

23. Give an advantage for each type of network topology.

1. Mesh topology:
   * Use of dedicated links guarantees that each connection can carry its own data load, thus eliminating traffic problems.
   * Robust and privacy / security.
2. Star topology:
   * Less expensive than mesh.
   * Needs only one link and one input and output port to connect it any number of others.
   * Robustness.
3. Tree topology:
   * same as those of a star.
4. Bus topology:
   * Ease of installation.
   * Uses less cabling than mesh, star or tree topologies.
5. Ring topology:
   * A ring is relatively easy to install and reconfigure.
   * Each device is linked only to its immediate neighbors.
   * Fault isolation is simplified.

24. Define transmission mode and its types.

Transmission mode defines the direction of signal flow between two linked devices.

Transmission modes are of three types.

- Simplex
- Half duplex
- Full duplex.

25. What is LAN?

Local Area Network (LAN) is a network that uses technology designed to span a small geographical area. For e.g. an Ethernet is a LAN technology suitable for use in a single building.

26. What is WAN?

Wide Area Network (WAN) is a network that uses technology designed to span a large geographical area. For e.g. a satellite network is a WAN because a satellite can relay communication across an entire continent. WANs have higher propagation delay than LANs.

27. What is MAN?

   * A Metropolitan Area Network (MAN) is a network that uses technology designed to extend over an entire city.

   * For e.g. a company can use a MAN to connect the LANs in all its offices throughout a city.

28. Define Peer to peer processes.

The processes on each machine that communicate at a given layer are called peer to peer processes.

29. What is half duplex mode?

A transmission mode in which each station can both transmit and receive, but not at the same time.

30. What is full duplex mode?

A transmission mode in which both stations can transmit and receive simultaneously.

31. What is internet?

   * When two or more networks are connected they become an internetwork or internet.

   * The most notable internet is called the Internet.

32. What is Internet ?

The Internet is a communication system that has brought a wealth of information to out fingertips and organized it for our use.

Internet – Worldwide network.

33. List the layers of OSI model.

- Physical
- Data Link
- Network
- Transport
- Session
- Presentation
- Application.

34. Define OSI model.

The open system Interconnection model is a layered framework for the design of network system that allows for communication across all types of computer systems.

35. Which OSI layers are the network support layers?

- Physical
- Data link

- Network layers.

36. Which OSI layers are the user support layers?
- Session
- Presentation
- Application.

37. What are the responsibilities of physical layer, data link layer, network layer, transport layer, session layer, presentation layer, application layer.

(i)   Physical layer – Responsible for transmitting individual bits from one node to the next.

(ii)   Data link layer – Responsible for transmitting frames from one node to the next.

(iii)   Network layer – Responsible for the delivery of packets from the original source to the final destination.

(iv)   Transport layer – Responsible for delivery of a message from one process to another.

(v)   Session layer – To establish, manage and terminate sessions.

(vi)   Presentation layer – Responsible to translate, encrypt and compress data.

(vii)   Application layer – Responsible for providing services to the user. To allow access to network resources.

38. What is the purpose of dialog controller?

The session layer is the network dialog controller. It establishes, maintains and synchronizes the interaction between communicating systems.

39. Name some services provided by the application layer.

Specific services provided by the application layer include the following.
- Network virtual terminal.
- File transfer, access and management (FTAM).
- Mail services.
- Directory services.

40. Define Network Virtual Terminal.

Network Virtual Terminal – OSI remote login protocol. It is an imaginary terminal with a set of standard characteristics that every host understands.

41. Define the term transmission medium.

The transmission medium is the physical path between transmitter and receiver in a data transmission system. The characteristics and quality of data transmission are determined both the nature of signal and nature of the medium.

42. What are the types of transmission media?

Transmission media are divided into two categories. They are as follows:

(i)   Guided transmission media

(ii)   Unguided transmission media

    1. How do guided media differ from unguided media?

    1. A guided media is contained within physical boundaries, while an unguided medium is boundless.

    1. What are the three major classes of guided media?

Categories of guided media.

    1.

        1. Twisted – pair cable.

Coaxial cable.

Fiber – optic cable.
   1. What is a coaxial cable?
A type of cable used for computer network as well as cable television. The name arises from the structure in which a metal shield surrounds a center wire. The shield protects the signal on the inner wire from electrical interference.
   1. A light beam travels to a less dense medium. What happens to the beam in each of the following cases:
        1. The incident angle is less than the critical angle.
        2. The incident angle is equal to the critical angle.
        3. The incident angle is greater than the critical angle.
   1. The incident angle is less than the critical angle.
the ray refracts and moves closer to the surface.
   1. The incident angle is equal to the critical angle.
the light bends along the interface.
   1. The incident angle is greater than the critical angle.
the ray reflects and travels again in the denser substance.
   1. What is reflection?
When the angle of incident becomes greater than the critical angel, a new phenomenon occurs called reflection.
   1. Discuss the modes for propagation light along optical channels.
There are two modes for propagating light along optical channels.
Single mode and multimode.
Multimode can be implemented in two forms: step index or graded index.
   1. What is the purpose of cladding in an optical fiber? Discuss its density relative to the core.
A glass or plastic is surrounded by a cladding of less dense glass or plastic.
The difference in density of the two materials must be such that a beam of light moving through the core is reflected off the cladding instead of being refracted into it.
50. Name the advantage of optical fiber over twisted pair and coaxial cable.
Higher bandwidth.
Less signal attenuation.
Immunity to electromagnetic interference.
Resistance to corrosive materials.
More immune to tapping.
Light weight.
   1. What is the disadvantage of optical fiber as a transmission medium?
Installation / Maintenance.
Unidirectional.
Cost – More expensive than those of other guided media.
   1. What implementation of EIA – 232 is available?
DB – 25 implementation.
DB – 9 implementation.
   1. What does the term modem stands for ?
Modem stands for modulator / demodulator.
   1. What is the function of a modulator?
   2. What is the function of a demodulator?

A modulator converts a digital signal into an analog signal using ASK, FSK, PSK or QAM.

A de modulator converts an analog signal into a digital signal.

1. What is an Intelligent modems?

Intelligent modems contain software to support a number of additional functions such as automatic answering and dialing.

1. What are the factor that affect the data rate of a link?

The data rate of a link depends on the type of encoding used and the bandwidth of the medium.

1. Define Line coding.

Line coding is the process of converting binary data, a sequence of bits, to a digital signal.

1. For n devices in a network, what is the number of cable links necessary for mesh, ring, bus and star networks.

Number of links for mesh topology : $n(n-1)/2$.

Number of links for ring topology : $n-1$.

Number of links for bus topology : one backbone and n drop lines.

Number of links for star topology : n.

60. Write the design issues of datalink layer?

1) Services provided to network layer.
2) Framing
3) Error control
4) Flow control

61. What is datalink?

When a datalink control protocol is used the transmission medium between systems is referred to as a datalink.

62. What is the main function of datalink layer?

The datalink layer transforms the physical layer, a raw transmission facility to a reliable link and is responsible for node to node delivery.

63. What is a datalink protocol?

Datalink protocol is a layer of control present in each communicating device that provides functions such as flow control, error detection and error control.

64. What is meant by flow control?

Flow control is a set of procedures used to restrict the amount of data that the sender can send before waiting for an acknowledgement.

65. How is error controlled in datalink controlled protocol?

In a datalink control protocol, error control is activated by retransmission of damaged frame that have not been acknowledged by other side which requests a retransmission.

66. Discuss the concept of redundancy in error detection.

Error detection uses the concept of redundancy, which means adding extra bits for detecting errors at the destination.

67. What are the three types of redundancy checks used in data communications?

- Vertical Redundancy Check (VRC)
- Longitudinal Redundancy Check (LRC)
- Cyclic Redundancy Check (CRC)

68. How can the parity bit detect a damaged data unit?

In parity check, (a redundant bit) a parity bit is added to every data unit so that the total number of 1s is even for even parity checking function (or odd for odd parity).

69. How can we use the Hamming code to correct a burst error?

By rearranging the order of bit transmission of the data units, the Hamming code can correct burst errors.

70. Briefly discuss Stop and Wait method of flow control?

In Stop and Wait of flow control, the sender sends one frame and waits for an acknowledgement before sending the next frame.

71. In the Hamming code for a data unit of m bits how do you compute the number of redundant bits 'r' needed?

In the Hamming code, for a data unit of m bits, use the formula $2r > = m + r + 1$ to determine r, the number of redundant bits needed.

72. What are three popular ARQ mechanisms?

- Stop and wait ARQ,
- Go – Back – N ARQ and
- Selective Report ARQ.

73. How does ARQ correct an error?

Anytime an error is detected in an exchange, a negative acknowledgment (NAK) is returned and the specified frames are retransmitted.

75. What is the purpose of the timer at the sender site in systems using ARQ?

The sender starts a timer when it sends a frame. If an acknowledgment is not received within an allotted time period, the sender assumes that the frame was lost or damaged and resends it.

76. What is damaged frame?

A damaged frame is recognizable frame that does arrive, but some of the bits are in error (have been altered during transmission)

77. What is HDLC?

HDLC is a bit oriented datalink protocol designed to support both half-duplex and full duplex communication over point to point and multiport link.

78. Give data transfer modes of HDLC?

1. NRM – Normal Response Mode
2. ARM – Asynchronous Response Mode
3. ABM - Asynchronous Balanced Mode

79. How many types of frames HDLC uses?

1. U-Frames
2. I-Frames
3. S-Frame

80. State phases involved in the operation of HDLC?

1. Initialization
2. Data transfer
3. Disconnect

81. Define piggybacking?

The inclusion of an acknowledgment to a previously received packet in an outgoing data packet is known as piggybacking.

82. What is the meaning of ACK frame?

ACK frame is an indication that a station has received something from another.

60. Part – B

1. Describe the functions of the layers in the OSI reference model.

2. Explain the features of the various unguided transmission media in terms of frequency band, modulation scheme used, noise immunity, bandwidth and data rate.

3. Explain the various topologies.

4. Describe the categories of network.

5. Explain in detail the modem standards and its transmission rates.

6. With reference to transmission media, describe the relative merits of optical fibers and copper.

7. Explain the principles involved in the transmission of data through optical fibers.

8. Explain the structure of fiber cables with neat diagram.

9. List and discuss the components in an optical transmission system.

10. A network has n devices. Determine the number of cable links required for a mesh, ring, bus and star topology.

Unit 2

Data Link Layer

PART - A

1. Write the design issues of datalink layer?

1) Services provided to network layer.

2) Framing

3) Error control

4) Flow control

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23. What is CSMA?

Carrier Sense Multiple Access is a protocol used to sense whether a medium is busy before attempting to transmit.

24. Explain CSMA/CD

Carrier Sense Multiple Access with collision detection is a protocol used to sense whether a medium is busy before transmission but is has the ability to detect whether a transmission has collided with another

25. What is collision detection?

It is the ability of a station to determine when a collision has occurred.

26. State different categories of CSMA/CD?

1. 10 BASE 5
2. 10 BASE 2
3. 10 BROAD 36
4. 1 BASE 5

27. State advantage of Ethernet?

1. Inexpensive
2. Easy to install
3. Supports various wiring technologies.

28. What is the meaning of 10BASE2?

802.3 Ethernet is thin co axial cable. The 10 specifies a Bandwidth of 10 Mbps, the Base specifies that its a baseband transmission, and the 2 indicates a maximum segment length for this cable type of 200 meters.

29. What is fast Ethernet?

It is the high speed version of Ethernet that supports data
    transfer rates of 100 Mbps.

30. State different cable standards for Fast Ethernet cabling?

1. 100 BASET4
2. 100 BASETX
3. 100 BASEFX

31. What is bit stuffing and why it is needed in HDLC?

Bit stuffing is the process of adding one extra 0 whenever there are five consecutive 1s in the data so that the receiver does not mistake the data for a flag. Bit stuffing is needed to handle data transparency.

32. What is the use of p/f bit in the HDLC frame?

P/F bit is subfield in HDLC frame. The P/F field is a single bit with a dual purpose, when it is set it can mean poll or final. It means poll when the frame is sent by a primary station to secondary station and it mean final when the frame is sent by a secondary to a primary station.

33. What is the length of 802.3 MAC address.

2 or 6 octets

34. What is the error detecting capability of parity check?

Parity check can detect an error but it cannot specify which bit is in error.

35. What is the size of Ethernet address?

2 or 6 octets

36. What is a bridge?

Bridge is a hardware networking device used to connect two LANs. A bridge operates at data link layer of the OSI reference model.

37. What is a repeater?

Repeater is a hardware device used to strengthen signals being transmitted on a networks.

38. Define router?

A network layer device that connects networks with different physical media and translates between network architectures.

39. State the functions of bridge?

1. Frame filtering and forwarding
2. Learning the address
3. Routing

40. List any two functions which a bridge cannot perform?

- Bridge cannot determine most efficient path.
- Traffic management function.

41. What is hub?

Networks require a central location to bring media segment together. These central locations are called hubs.

42. State important types of hubs.

1. Passive hub
2. Active hub
3. Intelligent hub

43. Mention the function of hub.

   1. Facilitate adding/deleting or moving work stations
   2. Extend the length of network
   3. It provides centralize management services
   4. Provides multiple interfaces.

44. What is the main function of gateway.

A gateway is a protocol converter

45. A gateway operates at which layer.

Gateway operates at all seven layers of OSI model.

46. Which factors a gateway handles?

Data rate, data size, data format

47. What is meant by active hub?

A central hub in a network that retransmits the data it receives.

48. What is the function of ACK timer?

ACK timer is used in flow control protocols to determine when to send a separate acknowledgment in the absence of outgoing frame.

49. Which type of routing can respond to the changes in network.

Adaptive routing

50. The insertion of an extra bit to avoid a long run of same bit is called as ....

Bit stuffing

51. What are the types of bridges?

1. Transparent bridge
2. Source Routing bridge

Transparent bridge - Transparent bridge keep a suitable of addresses in memory to determine where to send data

Source Routing bridge - Source Routing bridge requires the entire routing table to be included in the transmission and do not route packet intelligently.

52. What is SIFS?

Short Inter Frame Spacing is used to allow the parties in
    a single dialog the chance to go first.

53. What are transreceivers?

Transreceivers are combination of transmitter and receiver. Transreceivers are also called as medium attachment unit (MAU)

54. What is the function of NIC?

NIC is used to allow the computer to communicate on the network. It supports transmitting, receiving and controlling traffic with other computers on network.

55. Mention different random access techniques?

1. ALOHA
2. CSMA
3. CSMA/CD

56. What is Bluetooth? Which frequency band is used for bandwidth?

- Bluetooth is a low cost, low power, short range wireless communication technology
- 2.4GHz to 2.484 GHz
1. Passive hub
2. Active hub
   1. Intelligent hub

57. List the two types of data frames in FDDI

- Synchronous (S frame)
- Asynchronous (A frame)

58. What is the purpose of the NAV?

The network allocation vector (NAV) is a timer for collision avoidance.

59. Name the four types of S frames.

- Receive ready(RR)
- Receive not ready (RNR)
- Reject (REI)
- Selective reject (SREJ)

60. What are the four SONET layers?

SONET defines four layers. The photonic layer is the lowest and performs physical layer activities. The section, line and path layers correspond to the OSI model's data link layer.

61. What is a virtual tributary?

A virtual tributary is a parital payload that can be inserted into an STS-1 and combined with other partial payloads to fill out the frame.

62. What is the access method used by wireless LANs?

The wireless LAN access method is CSMA/CA (Carrier
    Sense Multiple Access with Collision Avoidance)

PART B:

1. With reference to sliding window protocol explain selective repeat and go back –N.   (6)
2. Explain the datalink layer in Internet and HDLC.   (16)
3. Explain the CSMA/CD algorthims of Ethernet.   (8)

4. Explain in details about the access method and frame format used in Ethernet and token ring.   (12)

5. 1.   A block of 32 bits has to be transmitted. Discuss how the thirty two bit block is transmitted to the receiver using Longitudinal Redundancy Check.   (6)

   2.   Consider a 32 bit block of data 11100111 11011101 00111001 10101001 that has to be transmitted. IF Longitudinal Redundancy Check is used what is the transmitted bit stream.   (4)

   3.   In the Hamming code for a data unit of m bits how do you compute the number of redundant bits 'r' needed.   (3)

   4.   What kinds of errors can vertical Redundancy check determine? What kinds of errors it cannot determine?
                 (3)

6. i.   List the three main functions preformed by the data link layer of the ISO OSI model.   (3)

   ii.   Explain the working of carrier sense multiple access protocol.   (3)

   iii. How does a Token Ring LAN operates? Discuss.   (6)

   iv.   List and briefly discuss the two different basic transmission technologies that can be used to set up wireless LAN's.   (4)

7. Explain Hamming Code.

8. Explain in details SONET and SONET Frame.

9. Explain the frame format, operation and ring maintenance feature of IEEE 802.5 MAC protocol.

10. i.   Explain the datalink layer in the Internet.

    ii. If the frame is 1101011011 and generator is 10011 what would be the transmitted frame?

11. i.   What is the remainder obtained by dividing $x7+x5+1$ by the generator polynomial $x3+1$.

    ii. A bit stream 10011101 is transmitted using the standard CRC method. The generator polynomial is $x3+1$ show the actual bit string transmitted. Suppose the third bit from left is inverted during transmission show that this error is detected at receiver's end.

    iii. A bit string 0111101111101111110, needs to be transmitted at the datalink layer. What is the string actually transmitted after bit stuffing.

12. Briefly define key requirements for wireless LANs.

13. Describe the FDDI frame format and explain.

14. Discuss the MAC layer functions of IEEE 802.11.

15. Explain in details the types of bridges.

UNIT III

PART - A

1. What is mean by internetworks?

When two or more networks are connected, they become internetwork or internet.

2. What are the methods of packet switching?

Virtual Circuit approach.

Datagram approach

3. What is an Internet Protocol (IP)?

The protocol that defines both the format of packets used on a TCP/IP internet and the mechanisms for routing a packet to its destination.

4. What is an IP address?

An IP address is a 32 - bit address that uniquely and universally define the connection of a host or a router to the Internet.

The sender must know the IP address of the destination computer before sending a packet.

5. What are the categories of IP addresses?

IP addresses were divided into five categories as follows.

Class A

Class B

Class C

Class D

Class E

6. Discuss the class field in IP address.

If the address is given in binary notation, the first few bits can tell us the class of the address.

Class A - 0

Class B - 10

Class C - 110

Class D - 1110

Class E - 1111

When the address is given in dotted decimal notation, then look at the first byte to determine the class of the address..

Class A - 0 to 127

Class B – 128 to 191

Class C – 192 to 223

Class D – 224 to 239

Class E – 240 to 255

7. Explain Multicasting.

A form of addressing in which a set of computer is assigned one address, a copy of any datagram sent to the address is delivered to each of the computers in the set.

8. Define the term broad casting.

A form of delivery in which one copy of a packet is delivered to each computer on a network.

9. What is a hostid and netid?

Netid – The portion of the IP address that identifies the network called the netid.

Hostid – The portion of the IP address that identifies the host or router on the network is called the hostid.

10. How does a netid differ from a network address?

A network address has both netid and hostid with 0's for the hostid.

11. What is the purpose of subnetting?

When we divide a network into several subnets, we have three levels of hierarchy

The netid is the first level, defines the site.

The subnetid is the 2nd level, defines the physical subnetwork. The hostid is the 3rd level defines the connection of the host to the subnetwork.

12. Define Masking.

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

13. What is the difference between boundary level masking and non-boundary level masking.

Boundary level Masking:

If the masking is at the boundary level, the mask numbers are either 255 or 0, finding the subnetwork address is very easy.

Non Boundary level Masking:

If the masking is not at the boundary level, the mask numbers are not just 255 or 0, finding the subnetwork address involves using the bitwise AND operators.

14. What is the function of router?

Routers relay packets among multiple interconnected networks. They route packets from one network to any number of potential destination networks on an internet.

15. How does a router differ from a bridge?

Routers provide links between two separate but same type LANs and are most active at the network layer. Whereas bridges utilize addressing protocols and can affect the flow control of a single LAN; most active at the data link layer.

16. What is the class of each of the following addresses?

a. 10011101   10001111   11111100   11001111 – Class B
b. 11011101   10001111   11111100   11001111 – Class C
c. 01111011   10001111   11111100   11001111 – Class A
d. 11101011   10001111   11111100   11001111 – Class D
e. 11110101   10001111   11111100   11001111 – Class E

7. Find the class of each addresses.

a. 4.23.145.90 – Class A
b. 227.34.78.7 – Class D
c. 246.7.3.8 – Class E
d. 29.6.8.4 – Class A
e. 198.76.9.23 – Class C

18. In routing what does the term SHORTEST mean?

The term Shortest mean the combination of many factors including shortest, cheapest , fastest most reliable and so on.

19. Why is adaptive routing superior to non adaptive routing?

Adaptive routing is superior to non adaptive routing because adaptive routing may select a new route for each packet in response to change in condition and topology of the networks.

20. What is the router's role in controlling the packet lifetime?

As packet is generated, each packet is market with a lifetime, usually the number of hops that are allowed before a packet is considered lost and, accordingly destroyed. As each

router encounters the packet subtracts 1 from the total before passing it on. When the lifetime total reaches 0, the packet is destroyed.

21. What are the most popular routing algorithms?

a. Distance Vector routing
b. Link State routing

22. What are the three main elements of distance vector algorithms.

a. Knowledge about the entire autonomous system.
b. Routing only to neighbours
c. Information sharing at regular intervals

23. What is Supernetting?

Supernetting combines several networks into one lager one.

24. Define flooding?

Flooding means that a router sends its information to all of its neighbours and all of its output ports.

25. What are the services offered by network layer?

a. Logical addressing
b. Routing

26. Distinguish between adaptive and non adaptive routing algorithms.

Non adaptive Routing:
    Once a pathway to a destination has been selected the
    router sends all packets for that destination along that
    one route.
    The routing decisions are not based on the condition or
    topology of the networks.

Adaptive Routing:

Router may select a new route for each packet.(even packets belonging to the same transmission)

The routing decisions are based on the condition or topology of the networks.

27. Identify the class and default subnet mask of the IP address 217.65.10.7.

It belongs to class C.

Default subnet mask – 255.255.255.192

28. What are the fields present in IP address?

Netid and Hostid.

Netid – portion of the ip address that identifies the network.

Hostid – portion of the ip address that identifies the host or router on the networks.

29. What are the three main elements of Link state routing?

1. Knowledge about the neighborhood.
2. Sharing with every other network.
3. Information sharing when there is a change.

30. What algorithm does link state routing use to calculate the routing tables.

Dijkstra algorithm is used to calculate the routing table.

31. What are the advantages of flooding?

- Simple
- Needs no network information or routing tables
- Robust for failure prone networks.
- Shortest path is always found.

32. What is flow control?

How to keep a fast sender from swamping a slow receiver with data is called flow control.

33. Differentiate virtual circuit and datagram's.

VC is connection oriented and datagram is connectionless.

34. What is adaptive routing algorithm?

Adaptive routing algorithms change their routing decisions to reflect changes in the topology and usually the traffic as well. Distance vector and link state are examples of this.

35. What is the time to live field in IP header?

Time to live field is counter used to limit packet lifetimes counts in second and default value is 255 sec.

36. What are the main disadvantages of distance vector routing?

Split horizon

Count to infinity problem

37. Identify the class and default subnet mask of the IP address 217.65.10.7

IP address 217.65.10.7 belongs to class C address and default subnet mask is 255.255.255.0.

38. What is meant by virtual path?

Virtual path is a set of connections between two switches.

39. What is address resolution?

Address resolution is a process of obtaining the physical address of a computer based on its IP address, in order to be able to finally actually transmit the frame or datagrams over the network to which the node belongs.

40. Why is it that in a broadcast network, the network layer is often thin or even non existent?

Network layer is responsible for host to host delivery and for routing the packets through the routers or switches. In broadcast there is no need of addressing the packets, routing and address verification.

41. What are the benefits of subnetting a network?

1. Reduced network traffic
2. Optimized network performance
3. Simplified network management
4. Facilities spanning large geographical distance.

42. What is meant by routing algorithm?

The algorithm that manages routing tables and makes the routing decisions is called routing algorithm.

43. What are the desirable properties of a routing algorithms?

1. Correctness
2. Simplicity
3. Robustness
4. Stability
5. Fairness
6. Optimality

44. What are the types of routing algorithms?

1. Non adaptive routing algorithm

2. Adaptive routing algorithm

45. What are the metrics used by routing protocols?

Path length, reliability, delay, bandwidth, load and communication cost.

PART B

1. Explain the network layer in the Internet and IP addressing
2. Write a note on various internetworking devices
3. Compare Bridges and routers
4. Explain shortest path algorithm with a suitable illustration
5. 1. Explain the distance vector routing algorithm.

2. Mention the limitations of distance vector routing

algorithm.

3. Explain the building and distribution of link state packets in link state routing

algorithm.

4. Mention the limitations of link state routing algorithm.

6. Explain link state routing and discuss its advantages over distance vector routing.
7. Explain in details packet switching.
8. Explain in details Datagram approach.
9. Explain in details IP addressing methods.
10. i.   State which layers of the ISO OSI model does the
       following interconnecting devices operate.
a. Repeaters
b. Bridges
c. Routers
d. Gateways
    ii.   State the major difference between Distance Vector
      Routing and Link state Routing. Discuss how these
       routing techniques work.
11. i.   What is subnetting? Discuss. Also state which
       classes of IP address can be subnetted.
    ii.   What is subnet masking? Discuss
    iii.   How can we prove that we have 2,147,483,648
     addresses in class A?
    iv.   What is the subnetwork address if the destination
     address is 200.45.34.56 and the subnet mask is
     255.255.240.0
12. i.   In classful addressing how is an IP address in class
      A, Class B and Class C divided? Discuss
    ii.   Given the address 23.56.7.91 and the default class
      A mask, find the beginning address (network
     address)
    iii.   Given the address 201.180.56.5 and the default class
      C mask, find the beginning address (network
     address).
13. For the network shown in figure with the given link cost, use Djkstra's algorithm to
determine the shortest path from A to all other nodes. Show all your working and show
your result as a spanning tree(s) routed at A.

UNIT 4
PART A
1. What are the services provided by transport layer protocol?
a. End to End delivery
b. Addressing
c. Reliable delivery
d. Flow control
e. Multiplexing
2. What is the difference between network service and transport service?
Network services is generally unreliable whereas transport service is reliable. The network service is only used by the transport entities and transport service must be convenient and easy to use.
3. List some of the Quality of service parameters of transport layer
a. Error and loss levels
b. Desired average and maximum delay
c. Throughput
d. Priority level
e. Resilence.
4. What are the functions of transport layers?
The transport layer is responsible for reliable data delivery. Functions of transport layer
i.   Transport layer breaks messages into packets
ii.   It performs error recovery if the lower layers are not adequately error free.
iii.   Function of flow control if not done adequately at the network layer.
iv.   Function of multiplexing and demultiplexing sessions together.
v.   This layer can be responsible for setting up and releasing connections across the network.
5. What is transport entity?
The main goal of the transport layer is to provide efficient, reliable and cost effective service to its users, normally processes in the application layer. The hardware and software within the transport layer that does the work is called the transport entity.
6. What is segmentation?
When the size of the data unit received from the upper layer is too long for the network layer datagrams or datalink frame to handle, the transport protocol divides it in to smaller, usuable blocks. The dividing process is called segmentation.
7. What is concatenation?
When the size of the data units belonging to a single session 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 is the purpose of sequence control?
a. If a longer data unit has been segmented the numbers indicate the order of reassembly.
b. If several shorter units have been concatenated the numbers indicate the end of each subunit and allow them to be separated accurately at the destination.
9. How transport layer performs Duplication control?
Sequence number allow the receiver to identity and discard duplicate segments.
10. Define Multiplexing.

Many to one relationship

The process of accepting messages from different processes, differentiated by their assigned port number. After adding the header, the transport layer passes the packet to the network layer.

11. What are the two ways of multiplexing done at the transport layer?

Multiplexing occurs at the transport layer in 2 ways

i.   Upward Multiplexing:

The multiple transport layer connection uses the same network connections.

ii.   Downward Multiplexing

The transport layer connection uses the multiple network connections.

12. What are the service primitives in simple transport protocol?

The parameters of the service primitive and library procedures are follow.

i.   LISTEN

ii.   CONNECT

iii.   SEND

iv.   RECEIVE

v.   DISCONNECT

13. What is the function of transmission timer?

The main function is to retransmit acknowledged segment.

14. What is meant by well known port? What is the numbers?

Well known port means they are reserved for use by well known application protocols such as HTTP and FTP. The port number ranging from 0 to 1023 are well known port numbers.

15. What are the three steps involved in establishing a connection?

Connection establishment involves the following:

i.   Host A sends a packet to announce its wish for connection and includes its initialization information about traffic from A to B.

ii.   Host B sends a packet to acknowledge (confirm) the request of A.

iii.   Host B sends a packet that includes its initialization information about traffic from B to A.

iv.   Host A sends a packet to acknowledge (confirm) the request of B.

16. What are the steps involved while terminating a connection?

4 actions are needed to close the connections in both directions.

i.   Host A sends a packet announcing its wish for connection termination.

ii.   Host B sends a segment acknowledging the request of A. After this, the connection is closed in one direction, but not in the other.

iii.   When host B has finished sending its own data, it sends a segment to indicate that it wants to close the connection.

iv.   Host A acknowledge (confirm) the request of B.

17. When is upward multiplexing used?

Upward multiplexing is used when cost is the main criteria to be considered.

18. What is Transport Control Protocol (TCP)?

The TCP/IP protocol that provides application programs with access to a connection oriented communication service. TCP offers reliable flow controlled delivery. More important TCP accommodates changing conditions in the Internet by adapting its retransmission scheme.

19. Define the term (i) Host (ii) IP

a. Host : An end user's computer connection to a network. In an internet each computer is classified as a host or a router.

b. IP: Internet Protocol that defines both the format of packet used on a TCP/IP internet and the mechanism for routing a packet to its destination.

20. What is UDP?

User Datagram Protocol is the TCP/IP protocol that provides application program with connectionless communication service.

21. What are the four major aspects of reliable delivery at the transport layer?

At the transport layer, reliable delivery has 4 aspects;

i.   Error control
ii.   Sequence control
iii.   Loss control
iv.   Duplication control

22. What is RTT?

RTT is an acronym for Round Trip Time; it is a measure of the time it takes for a packet to travel from a computer, across a network to another computer and back.

23. How is RTT used in networking?

Transport protocols like TCP which expects an acknowledgement to arrive after data has been successfully received, keep an estimate of the current RTT on each connection. They use the RTT estimate to determine how long to wait for an acknowledgment before retransmitting.

24. How is RTT computed?

The sending side records the clock when it transmits a packet, and then examines the clock again when an acknowledgment arrives. By subtracting the two values, it obtains a single estimate of the round trip time. It then combines that single estimate with previous estimates to get an average.

25. Do TCP,UDP or both compute RTT?

TCP does; UDP does not

26. Explain the purpose of these timers in TCP:

a. retransmission timer
b. persist timer
c. keep alive timer
d. time waited timer

(a) retransmission timer – The retransmission timer is to control a lost or discarded segment and resend a duplicate packet after the time expires.

(b) After the sending window has been closed (with zero credit) a persist timer is used by the source to periodically probe the destination host to see if the window has actually been changed. The purpose is to prevent

deadlock situations where a credit to open the window has been lost.

(c) The keep alive timer is an optional feature in some TCP implementations. It is used to prevent a long idle connection between two TCP's

(d) Time waited timer is used during connection termination.

27. What is an silly window syndrome?

When either the sending application program creates data slowly or the receiving application program consumes data slowly or both. This problem is called the silly window syndrome.

28. List the flag used in TCP header?

TCP header contains six flags.

They are URG, ACK, PSH, RST, SYN and FIN.

29. What is the purpose of urgent pointer in the TCP header?

In certain circumstances, it may be necessary for a TCP sender to notify the receiver of urgent data that should be processed by the receiving application as soon as possible. This 16 bit field tells the receiver when the last byte of urgent data in the segment ends.

30. What is the segment?

The unit of data transfer between two devices using TCP is a segment.

31. What is a port?

Applications running on different hosts communicate with TCP with the help of a concept called as ports. A port is a 16 bit unique number allocated to a particular application.

32. What is Socket?

The communication structure needed for socket programming is called socket.

A port identifies a single application on a single computer.

Socket = IP address + Port number

33. How TCP differ from the sliding window protocols.

TCP differs from the sliding window protocols in the following ways:

1. When using TCP, applications treat the data sent and received as an arbitrary byte stream. The sending
-   TCP module divides the byte stream into a set of packets called segments, and sends individual segments within an IP datagram.
-   TCP decides where segment boundaries start and end.
2. The TCP sliding window operates at the byte level rather than the packet (or segment) level. The left and right window edges are byte pointers.
3. Segment boundaries may change at any time. TCP is free to retransmit two adjacent segments each containing 200 bytes of data as a single segment of 400 byte.
4. The size of the send and receive window change dynamically.

34. Explain how the TCP provides the reliability?

A number of mechanisms provide the reliability.

1. Checksum
2. Duplicate data detection
3. Retransmission
4. Sequencing
5. Timers

35. What is a datagram socket?

A structure designed to be used with connectionless protocols such as UDP.

36. "TCP software is implemented as a finite state machines." Discuss.

To keep track of all the different events happening during connection establishment , connection termination and data transfer.

37. What is stream socket?

A structure designed to be used with a connection oriented protocol such as TCP

38. Give the strategies TCP uses to avoid congestion.
1. Slow start and additive increase
2. Multiplicative decrease

39. What is the purpose of choke packet.
It is packet sent by router to the source to inform it of congestion.

40. Give the structure of UDP header

41. State any 2 socket primitives for TCP and state their function.
1. Listen
a. int listen (int sd , int backlog)
2. Close
a. int close (int sd)

42. Give some examples of application where UDP is preferred over TCP.
1. In multicasting
2. Route update protocol in RIP

43. What is congestion?
When load on network is greater than its capcity, there is congestion of data packets.
Congestion occurs because routers and switches have queues or buffers.

44. What is meant by slow start in TCP?
At the beginning of a connection, TCP sets the congestion window size to the maximum segment size.
For each segment that is acknowledged, TCP increases the size of the congestion window by one maximum segment size until it reaches a threshold of one half of the allowable window size.
This is called Slow Start it is used with additive increase.

45. What are the types of congestion control algorithms?
Congestion control algorithms are divided into 2 types. They are as follows:
Open loop algorithms
Closed loop algorithms

46. Define the term Jitter.
Jitter is the variation in delay for packets belonging to the same flow.

47. What are the scheduling techniques designed to improve the quality of services?
1. FIFO queuing
2. Priority queuing
3. Weighted fair queuing

48. Define Traffic Shaping.
It is a mechanism to control the amount and rate of the traffic sent to the network. Two techniques can shape traffic.
i.   Leaky bucket
ii.   Token bucket

49. Define Resource Reservation.
A flow of data needs resources such as a buffer, bandwidth, CPU time and so on. The quality of service is improved if these resource are reserved beforehand.

50. "DNS can use the services of UDP or TCP using port 53". Discuss when UDP is used and when TCP is used.
UDP is used when the size of the response message is less than 512 bytes. TCP is used when the size of the response message is greater than 512 bytes.

PART B
1. Explain a congestion control algorithm.
2. Explain the duties of Transport layer.
3. Explain the TCP transmission policy, Congestion control.
4. Explain the following issues of transport protocol
a. Establishing a connection
b. Terminating a connection
5. Explain the TCP header and working of the TCP protocol.
6. Explain the various fields of TCP header with the help of a neat diagram.
7. Explain the various steps that are followed in releasing a TCP connection.
8. Explain the three way handshake protocol to establish the transport level connection.
9. Discuss about congestion control in frame relay.
10. Discuss the various issues of transport layer in details.
11. i.   List and discuss the various primitives for a simple
         transport services
      ii.   "DNS can use the service of UDP or TCP using
         port 53" Discuss when UDP is used and when TCP
         is used.
      iii.   Highlight the features of UDP and briefly discuss
         the same.
12. i.   Discuss connection establishment and connection
         release in TCP
      ii.   Discuss how TCP provides reliability using error
         control.
      iii.   Discuss the strategies TCP uses to avoid congestion.
UNIT 5
PART A
1. What is the Domain Name System responsible for?
The Domain NameSystem converts domain names (of the form
www.charulathapublication.com) into IP numbers.
2. Discuss the three main divisions of the DNS.
Generic domains
Country domains
Inverse domains
3. What role does the DNS resolver play in the DNS system?
A DNS resolver is responsible for moving requests of the local DNS server on behalf of
clients.
4. How does a DNS Resolver bootstrap the domain name lookup process?
A DNS resolver must know the IP address of at least one DNS server. IT uses this
address to start the DNS lookup process.
5. Define SMTP.
The protocol that supports email on the Internet is called Simple Mail Transfer Protocol.
SMTP is par tof the TCP/IP protocol suite.
6. Define the term domain.
A part of the computer naming hierarchy used in the Internet. For example commercial
organizations have names registered under the com domain.

7. What are the two parts of addressing system in SMTP?

The addressing system used by SMTP consists of two parts:

A local part and a domain name separated by an @ sign

Local Part @ Domain Name

8. Discuss MIME.

Multipurpose Internet Mail Extension is an extension of SMTP that allows the transfer of multimedia and other non ASCII messages.

9. What are the services provided by user agent?

Composing Messages

Reading Messages

Replying to Messages

Forwarding Message

Handling mail boxes

10. What are the four properties of HTTP?

a. Global uniform resource identifier

b. Request response exchange

c. Statelessness

d. Resource meta data

11. Describe why HTTP is designed as a stateless protocol?

Maintaining state across request response connections significantly increases the initial interactions in a connection since the identity of each party needs to be established and any saved state must be retrieved. HTTP is therefore stateless to ensure that the Internet is scalable since state is not contained in the HTTP request/response pairs by default.

12. What are the four groups of HTTP header?

The four groups of HTTP header are:

a. General header

b. Entity header

c. Request header and

d. Response header.

13. Define the terms (i) Browser (ii) Hypertext Mark Up language.

a. Browser: A computer program that accesses and displays information from the world wide web. A browser contains multiple application programs and uses an objects name to determine which application should be used to access the objects.

b. Hypertext Markup Language: The source form used for documents on the world wide web. HTML embeds commands that determine formatting along with the text to be displayed.

Ex: To move to a new line or indent text

14. What is a hypertext?

A set of documents in which a given document can contain text as well as embedded reference to other documents.

15. What are categories of web documents?

Static documents – The contents are fixed and stored in a server.

Dynamic documents – created by a server only at a browser request.

Active documnets – It is a copy of a program retrieved by the client and run at the client side.

16. What do you mean by URL?

Uniform Resource Locator is a standard for specifying any kind of information on the Internet.

URL is a syntantic form used to identify a page of information on the world wide web.

A typical URL is http://www.abdc.com/products.html

17. What are basic functions of email system?

Basic functions of emails are:

a. Composition
b. Transfer
c. Reporting
d. Displaying
e. Disposition

18. What is an Electronic Mail?

Email is a popular application in which a user or computer sends a memo to one or more recipients.

19. What is WWW?

It is an internet application that allows users to view web pages and move from one web page to another.

www is the hypermedia system used on the internet in which a page of information can contain text, images, audio or video clips and reference to other pages.

20. What do you mean by hypermedia?

A set of documents in which a given document can contain text, graphics, video and audio clips as well as embedded references to other documents world wide web pages are hypermedia documents.

21. What is the web browser?

Web browser is a software program that interprets and displays the contents of HTML web pages.

22. What is a post office protocol?

An e-mail protocol that allows retrieval of e-mail messages from an e-mail server using remote connection.

23. What do you mean by active web pages?

When a client send a HTTP request for an active web page, the web server sends back an HTTP response that contains an HTML page as usual. HTML page also contains a small program that executes on the client computer inside the web browser.

24. What are the transmission modes of FTP?

Transmission modes of FTP are:

i.   Stream mode: Default mode and data is delivered from FTP to TCP as a continuous stream of data.

ii.   Block mode: Data is delivered from FTP to TCP in terms of blocks. Each data block follows the three byte header.

iii.   Compressed mode: File is compressed before transmitting if size is big. Run length encoding method is used for compression.

25. Compare the HTTP and FTP

    FTP:

    FTP transfers the file from client to server and server to client.

    It uses two different port connection. (i.e., port 20 and

port 21)

Uses TCP protocol

HTTP:

HTTP transfer the file from server to client (ie web page)

HTTP use only one port connection (ie port 80)

It also use TCP protocol.

26. What is mailing list?

Mailing list contains the address of destination users.

27. What is the application layer protocol world wide web?

World wide web is a repository of information of spread all over the world and linked together.

28. What is the use of Mail transfer agent?

Mail transfer agent (MTA) transfers the email across the Internet.

29. What are the two main categories of DNS messages?

DNS has two types of messages : Query and response.

30. Why was there a need for DNS?

In DNS, when there is a change, such as adding a new host, removing a host or changing an IP address, the change must be made to the DNS master file. The dynamic domain name system (DDNS) has been devised to respond to this need.

31. What are the two types of user Agents?

a.   Command driven and

b.   GUI based.

32. What is the purpose of FTP?

To copy a file from one host to another on the Internet.

33. What does CGI stand for and what is its function?

CGI stands for Common Gateway Interface. CGI is a technology that creates and handles dynamic documents.

34. What is a homepage?

A unit of hypertext or hypermedia available on the web is called a page. The main page for an organization or an individual is known as a homepage.

35. Define cryptography.

Cryptography is the science and art of transforming messages to make them secure and immune to attack.

36. What is Ciphertext?

The encrypted message is called Ciphertext.

37. Define Passive and Active attack.

Passive: Passive attack are in the nature of eavesdropping on or monitoring of transmissions.

Active: It involves some modification of the data stream or the creation of a false stream.

38. What are the two categories of cryptography methods? What is the main difference between the categories?

Two categories are

i.   Secret (symmetric) key cryptography and

ii.   Public key (asymmetric) key cryptography.

-     In symmetric key cryptography, the same key is used by the sender (for encryption) and the receiver (for decryption). The key is shared.

- In public key cryptography, the public key that is used for encryption is different from the private key that is used for decryption.

39. State which layer of the TCP/IP reference model the following protocols are present.

a. TCP – Transport layer

b. SMTP – Application layer

40. What is filter for email users?

Filters are rules that are checked when e-mail comes in or when user agent is started. Each rule specifies a condition and an action.

41. Mention the aspects of security.

a. Confidentiality

b. Integrity

c. Availability

d. Authentication

42. What are the advantages of public key encryption/decryption?

a. It removes the restriction of a shared symmetric key between two entities.

b. The number of keys needed is reduced tremendously

43. What are the parts of a browser?

Each browser consists of three parts.

i.   A controller

ii.   Client programs and

iii.   Interpreters.

PART B:

1. Explain DNS with reference to its components and working.   (16)

2. Explain the message transfer using simple mail transfer protocol.   (8)

3. Explain the final delivery of email to the end user using pop3.   (8)

4. Write short notes on email services of the application layer.   (8)

5. Explain in details the SMTP.   (8)

6. Explain in details WWW.   (8)

7. Explain the architecture and services of e-mailing system.
                                        (16)

8. Explain substitution and transposition ciphers with an example for each.
                    (5)

9. Explain the RSA public key encryption algorithms with an example.
                    (8)

10. What are the two categories of encryption/decryption methods? What is the main difference between the categories.
                                        (8)

11. Explain active and passive attacks.   (8)

12. Explain DES encryption algorithm. How is it different from triple DES?
                        (8)

13. i.   With a relevant example discuss how the domain
      space is divided.   (6)
    ii.   Distinguish between a fully qualified domain name and a partially qualified domain name. Give relevant
      example.   (6)

    iii.   List the various risks faced by messages that are transmitted over the internet. (4)

14. i.   Discuss how simple mail transfer protocol (SMTP) works? Can multimedia messages be transmitted using SMTP? Discuss. (10)

    ii.   Is common gateway interface a languages. Discuss. (6)

Unit – I

Data CommunicationPART A

1. Define the term Computer Network.

A Computer network is a number of computers interconnected by one or more transmission paths. The transmission path often is the telephone line, due to its convenience and universal preserve.

2. Define Data Communication.

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

3. What is the fundamental purpose behind data communication?

The purpose of data communication is to exchange information between two agents.

4. List out the types of data communication.

Data communication is considered

Local – if the communicating device are in the same building.

Remote – if the device are farther apart.

5. Define the terms data and information.

Data : is a representation of facts, concepts and instructions presented in a formalized manner suitable for communication, interpretation or processing by human beings or by automatic means.

Information : is currently assigned to data by means by the conventions applied to those data.

6. What are the fundamental characteristics on which the effectiveness of data communication depends on?

The effectiveness of a data communication system depends on three characteristics.

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

7. Give the components of data communication.

1. Message – the message is the information to be communicated.
2. Sender – the sender is the device that sends the data message.
3. Receiver – the receiver is the device that receives the message.
4. Medium – the transmission medium is the physical path by which a message travels from sender to receiver.
5. Protocol – A protocol is a set of rules that govern data communication.

8. Define Network.

A network is a set of devices (nodes) connected by media links. A node can be a computer, printer, or any other devices capable of sending and / or receiving data generated by other nodes on the network.

9. What are the advantage of distributed processing?

1. Security / Encapsulation

2. Distributed database
3. Faster problem solving
4. Security through redundancy
5. Collaborative processing.
10. What are the three criteria necessary for an effective and efficient network?
1. Performance
2. Reliability
3. Security.
11. Name the factors that affect the performance of a network.
- Performance of a network depends on a number of factors,
1. Number of users
2. Type of transmission medium
3. Capabilities of the connected hardware
4. Efficiency of software.
12. Name the factors that affect the reliability of a network.
1. Frequency of failure.
2. Recovery time of a network after a failure.
3. Catastrophe.
13. Name the factors that affect the security of a network.
Network security issues include protecting data from unauthorized access and viruses.
14. Define PROTOCOL.
A protocol is a set of rules (conventions) that govern all aspects of data communication.
15. Give the key elements of protocol.
   * Syntax : refers to the structure or format of the data, meaning the order in which they
are presented.   * Semantics : refers to the meaning of each section of bits.   * Timing :
refers to two characteristics.
1. when data should be sent and
2. how fast they can be sent.
16. Define Standard.
A standard provides a model for development that makes it possible for a product to work
regardless of the individual manufacturer.
17. Why are standard needed?
   * Standards are essential in creating and maintaining an open and competitive market
for equipment manufactures and in guaranteeing national and international
interoperability of data and telecommunications technology and processes.   * Standards
are necessary to ensure that products from different manufactures can work together as
expected.
18. Define De facto and De jure standards.
De facto standards:
De facto (by fact) standards are often established originally by manufactures seeking to
define the functionality of a new product or technology.
De jure standards:
De jure (by law) standards have been legislated by an officially recognized body.
19. Define line configuration and give its types.
-               Line configuration refers to the way two or more
communication devices attach to a link.

- There are two possible line configurations:
i. Point to point and
ii. Multipoint.

20. Define topology and mention the types of topologies.

Topology defines the physical or logical arrangement of links in a network

Types of topology :
- Mesh
- Star
- Tree
- Bus
- Ring

21. The Lucky Ducky corporation has a fully connected mesh network consisting of eight devices. Calculate the total number of cable links needed and the number of ports for each device.

Solution:

The formula for the number of links for a fully connected mesh is $n(n - 1) / 2$, where n is the number of devices.

Number of links = $n(n - 1) / 2$
$$= 8(8 - 1) / 2 = 28.$$
Number of ports per device = $n - 1$
$$= 8 - 1 = 7.$$

22. Define Hub.

In a star topology, each device has a dedicated point to point link only to a central controller usually called a hub.

23. Give an advantage for each type of network topology.

1. Mesh topology:
   * Use of dedicated links guarantees that each connection can carry its own data load, thus eliminating traffic problems.   * Robust and privacy / security.
2. Star topology:
   * Less expensive than mesh.   * Needs only one link and one input and output port to connect it any number of others.   * Robustness.
3. Tree topology:
   * same as those of a star.
4. Bus topology:
   * Ease of installation.   * Uses less cabling than mesh, star or tree topologies.
5. Ring topology:
   * A ring is relatively easy to install and reconfigure.   * Each device is linked only to its immediate neighbors.   * Fault isolation is simplified.

24. Define transmission mode and its types.

Transmission mode defines the direction of signal flow between two linked devices. Transmission modes are of three types.
   - Simplex
   - Half duplex
   - Full duplex.

25. What is LAN?

Local Area Network (LAN) is a network that uses technology designed to span a small

geographical area. For e.g. an Ethernet is a LAN technology suitable for use in a single building.

26. What is WAN?

Wide Area Network (WAN) is a network that uses technology designed to span a large geographical area. For e.g. a satellite network is a WAN because a satellite can relay communication across an entire continent. WANs have higher propagation delay than LANs.

27. What is MAN?

   * A Metropolitan Area Network (MAN) is a network that uses technology designed to extend over an entire city.   * For e.g. a company can use a MAN to connect the LANs in all its offices throughout a city.

28. Define Peer to peer processes.

The processes on each machine that communicate at a given layer are called peer to peer processes.

29. What is half duplex mode?

A transmission mode in which each station can both transmit and receive, but not at the same time.

30. What is full duplex mode?

A transmission mode in which both stations can transmit and receive simultaneously.

31. What is internet?

   * When two or more networks are connected they become an internetwork or internet.
 * The most notable internet is called the Internet.

32. What is Internet ?

The Internet is a communication system that has brought a wealth of information to out fingertips and organized it for our use.

Internet – Worldwide network.

33. List the layers of OSI model.

- Physical
- Data Link
- Network
- Transport
- Session
- Presentation
- Application.

34. Define OSI model.

The open system Interconnection model is a layered framework for the design of network system that allows for communication across all types of computer systems.

35. Which OSI layers are the network support layers?

- Physical
- Data link
- Network layers.

36. Which OSI layers are the user support layers?

- Session
- Presentation
- Application.

37. What are the responsibilities of physical layer, data link layer, network layer,

transport layer, session layer, presentation layer, application layer.

(i) Physical layer – Responsible for transmitting individual bits from one node to the next.

(ii) Data link layer – Responsible for transmitting frames from one node to the next.

(iii) Network layer – Responsible for the delivery of packets from the original source to the final destination.

(iv) Transport layer – Responsible for delivery of a message from one process to another.

(v) Session layer – To establish, manage and terminate sessions.

(vi) Presentation layer – Responsible to translate, encrypt and compress data.

(vii) Application layer – Responsible for providing services to the user. To allow access to network resources.

38. What is the purpose of dialog controller?

The session layer is the network dialog controller. It establishes, maintains and synchronizes the interaction between communicating systems.

39. Name some services provided by the application layer.

Specific services provided by the application layer include the following.

- Network virtual terminal.
- File transfer, access and management (FTAM).
- Mail services.
- Directory services.

40. Define Network Virtual Terminal.

Network Virtual Terminal – OSI remote login protocol. It is an imaginary terminal with a set of standard characteristics that every host understands.

41. Define the term transmission medium.

The transmission medium is the physical path between transmitter and receiver in a data transmission system. The characteristics and quality of data transmission are determined both the nature of signal and nature of the medium.

42. What are the types of transmission media?

Transmission media are divided into two categories. They are as follows:

(i) Guided transmission media

(ii) Unguided transmission media

  1. How do guided media differ from unguided media?

  1. A guided media is contained within physical boundaries, while an unguided medium is boundless.

  1. What are the three major classes of guided media?

Categories of guided media.

  1.   1. Twisted – pair cable.

Coaxial cable.

Fiber – optic cable.

  1. What is a coaxial cable?

A type of cable used for computer network as well as cable television. The name arises from the structure in which a metal shield surrounds a center wire. The shield protects the signal on the inner wire from electrical interference.

  1. A light beam travels to a less dense medium. What happens to the beam in each of the following cases: 1. The incident angle is less than the critical angle.   2. The

incident angle is equal to the critical angle.   3. The incident angle is greater than the critical angle.

   1. The incident angle is less than the critical angle.
the ray refracts and moves closer to the surface.

   1. The incident angle is equal to the critical angle.
the light bends along the interface.

   1. The incident angle is greater than the critical angle.
the ray reflects and travels again in the denser substance.

   1. What is reflection?
When the angle of incident becomes greater than the critical angel, a new phenomenon occurs called reflection.

   1. Discuss the modes for propagation light along optical channels.
There are two modes for propagating light along optical channels.
Single mode and multimode.
Multimode can be implemented in two forms: step index or graded index.

   1. What is the purpose of cladding in an optical fiber? Discuss its density relative to the core.
A glass or plastic is surrounded by a cladding of less dense glass or plastic.
The difference in density of the two materials must be such that a beam of light moving through the core is reflected off the cladding instead of being refracted into it.

50. Name the advantage of optical fiber over twisted pair and coaxial cable.
Higher bandwidth.
Less signal attenuation.
Immunity to electromagnetic interference.
Resistance to corrosive materials.
More immune to tapping.
Light weight.

   1. What is the disadvantage of optical fiber as a transmission medium?
Installation / Maintenance.
Unidirectional.
Cost – More expensive than those of other guided media.

   1. What implementation of EIA – 232 is available?
DB – 25 implementation.
DB – 9 implementation.

   1. What does the term modem stands for ?
Modem stands for modulator / demodulator.

   1. What is the function of a modulator?   2. What is the function of a demodulator?
A modulator converts a digital signal into an analog signal using ASK, FSK, PSK or QAM.
A de modulator converts an analog signal into a digital signal.

   1. What is an Intelligent modems?
Intelligent modems contain software to support a number of additional functions such as automatic answering and dialing.

   1. What are the factor that affect the data rate of a link?
The data rate of a link depends on the type of encoding used and the bandwidth of the medium.

1. Define Line coding.

Line coding is the process of converting binary data, a sequence of bits, to a digital signal.

1. For n devices in a network, what is the number of cable links necessary for mesh, ring, bus and star networks.

Number of links for mesh topology : n (n – 1) / 2.

Number of links for ring topology : n – 1.

Number of links for bus topology : one backbone and n drop lines.

Number of links for star topology : n.

60. Write the design issues of datalink layer?

1) Services provided to network layer.
2) Framing
3) Error control
4) Flow control

61. What is datalink?

When a datalink control protocol is used the transmission medium between systems is referred to as a datalink.

62. What is the main function of datalink layer?

The datalink layer transforms the physical layer, a raw transmission facility to a reliable link and is responsible for node to node delivery.

63. What is a datalink protocol?

Datalink protocol is a layer of control present in each communicating device that provides functions such as flow control, error detection and error control.

64. What is meant by flow control?

Flow control is a set of procedures used to restrict the amount of data that the sender can send before waiting for an acknowledgement.

65. How is error controlled in datalink controlled protocol?

In a datalink control protocol, error control is activated by retransmission of damaged frame that have not been acknowledged by other side which requests a retransmission.

66. Discuss the concept of redundancy in error detection.

Error detection uses the concept of redundancy, which   means adding extra bits for detecting errors at the   destination.

67. What are the three types of redundancy checks used in data communications?

-   Vertical Redundancy Check (VRC)
-   Longitudinal Redundancy Check (LRC)
-   Cyclic Redundancy Check (CRC)

68. How can the parity bit detect a damaged data unit?

In parity check, (a redundant bit) a parity bit is added to every data unit so that the total number of 1s is even for even parity checking function (or odd for odd parity).

69. How can we use the Hamming code to correct a burst error?

By rearranging the order of bit transmission of the data units, the Hamming code can correct burst errors.

70. Briefly discuss Stop and Wait method of flow control?

In Stop and Wait of flow control, the sender sends one frame and waits for an acknowledgement before sending the next frame.

71. In the Hamming code for a data unit of m bits how do you compute the number of

redundant bits 'r' needed?

In the Hamming code, for a data unit of m bits, use the formula $2r \geq m + r + 1$ to determine r, the number of redundant bits needed.

72. What are three popular ARQ mechanisms?

-   Stop and wait ARQ,
-   Go – Back – N ARQ and
-   Selective Report ARQ.

73. How does ARQ correct an error?

Anytime an error is detected in an exchange, a negative acknowledgment (NAK) is returned and the specified frames are retransmitted.

75. What is the purpose of the timer at the sender site in systems using ARQ?

The sender starts a timer when it sends a frame. If an acknowledgment is not received within an allotted time period, the sender assumes that the frame was lost or damaged and resends it.

76. What is damaged frame?

A damaged frame is recognizable frame that does arrive, but some of the bits are in error (have been altered during transmission)

77. What is HDLC?

HDLC is a bit oriented datalink protocol designed to support both half-duplex and full duplex communication over point to point and multiport link.

78. Give data transfer modes of HDLC?

1. NRM – Normal Response Mode
2. ARM – Asynchronous Response Mode
3. ABM - Asynchronous Balanced Mode

79. How many types of frames HDLC uses?

1. U-Frames
2. I-Frames
3. S-Frame

80. State phases involved in the operation of HDLC?

1. Initialization
2. Data transfer
3. Disconnect

81. Define piggybacking?

The inclusion of an acknowledgment to a previously received packet in an outgoing data packet is known as piggybacking.

82. What is the meaning of ACK frame?

ACK frame is an indication that a station has received something from another.

60. Part – B

   1. Describe the functions of the layers in the OSI reference model.   2. Explain the features of the various unguided transmission media in terms of frequency band,

modulation scheme used, noise immunity, bandwidth and data rate.   3. Explain the various topologies.   4. Describe the categories of network.   5. Explain in detail the modem standards and its transmission rates.   6. With reference to transmission media, describe the relative merits of optical fibers and copper.   7. Explain the principles involved in the transmission of data through optical fibers.   8. Explain the structure of fiber cables with neat diagram.   9. List and discuss the components in an optical transmission system. 10. A network has n devices. Determine the number of cable links required for a mesh, ring, bus and star topology.

Unit 2
Data Link Layer

PART - A

1. Write the design issues of datalink layer?
1) Services provided to network layer.
2) Framing
3) Error control
4) Flow control
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23. What is CSMA?

Carrier Sense Multiple Access is a protocol used to sense whether a medium is busy before attempting to transmit.

24. Explain CSMA/CD

Carrier Sense Multiple Access with collision detection is a protocol used to sense

whether a medium is busy before transmission but is has the ability to detect whether a transmission has collided with another

25. What is collision detection?

It is the ability of a station to determine when a collision has occurred.

26. State different categories of CSMA/CD?

1. 10 BASE 5
2. 10 BASE 2
3. 10 BROAD 36
4. 1 BASE 5

27. State advantage of Ethernet?

1. Inexpensive
2. Easy to install
3. Supports various wiring technologies.

28. What is the meaning of 10BASE2?

802.3 Ethernet is thin co axial cable. The 10 specifies a Bandwidth of 10 Mbps, the Base specifies that its a baseband transmission, and the 2 indicates a maximum segment length for this cable type of 200 meters.

29. What is fast Ethernet?

It is the high speed version of Ethernet that supports data transfer rates of 100 Mbps.

30. State different cable standards for Fast Ethernet cabling?

1. 100 BASET4
2. 100 BASETX
3. 100 BASEFX

31. What is bit stuffing and why it is needed in HDLC?

Bit stuffing is the process of adding one extra 0 whenever there are five consecutive 1s in the data so that the receiver does not mistake the data for a flag. Bit stuffing is needed to handle data transparency.

32. What is the use of p/f bit in the HDLC frame?

P/F bit is subfield in HDLC frame. The P/F field is a single bit with a dual purpose, when it is set it can mean poll or final. It means poll when the frame is sent by a primary station to secondary station and it mean final when the frame is sent by a secondary to a primary station.

33. What is the length of 802.3 MAC address.

2 or 6 octets

34. What is the error detecting capability of parity check?

Parity check can detect an error but it cannot specify which bit is in error.

35. What is the size of Ethernet address?

2 or 6 octets

36. What is a bridge?

Bridge is a hardware networking device used to connect two LANs. A bridge operates at data link layer of the OSI reference model.

37. What is a repeater?

Repeater is a hardware device used to strengthen signals being transmitted on a networks.

38. Define router?

A network layer device that connects networks with different physical media and translates between network architectures.

39. State the functions of bridge?
1. Frame filtering and forwarding
2. Learning the address
3. Routing

40. List any two functions which a bridge cannot perform?
- Bridge cannot determine most efficient path.
- Traffic management function.

41. What is hub?
Networks require a central location to bring media segment together. These central locations are called hubs.

42. State important types of hubs.
1. Passive hub
2. Active hub
3. Intelligent hub

43. Mention the function of hub.
   1. Facilitate adding/deleting or moving work stations
   2. Extend the length of network
   3. It provides centralize management services
   4. Provides multiple interfaces.

44. What is the main function of gateway.
A gateway is a protocol converter

45. A gateway operates at which layer.
Gateway operates at all seven layers of OSI model.

46. Which factors a gateway handles?
Data rate, data size, data format

47. What is meant by active hub?
A central hub in a network that retransmits the data it receives.

48. What is the function of ACK timer?
ACK timer is used in flow control protocols to determine when to send a separate acknowledgment in the absence of outgoing frame.

49. Which type of routing can respond to the changes in network.
Adaptive routing

50. The insertion of an extra bit to avoid a long run of same bit is called as ....
Bit stuffing

51. What are the types of bridges?
1. Transparent bridge
2. Source Routing bridge
Transparent bridge - Transparent bridge keep a suitable of addresses in memory to determine where to send data
Source Routing bridge - Source Routing bridge requires the entire routing table to be included in the transmission and do not route packet intelligently.

52. What is SIFS?
Short Inter Frame Spacing is used to allow the parties in   a single dialog the chance to go first.

53. What are transreceivers?
Transreceivers are combination of transmitter and receiver. Transreceivers are also called

as medium attachment unit (MAU)

54. What is the function of NIC?

NIC is used to allow the computer to communicate on the network. It supports transmitting, receiving and controlling traffic with other computers on network.

55. Mention different random access techniques?

1. ALOHA
2. CSMA
3. CSMA/CD

56. What is Bluetooth? Which frequency band is used for bandwidth?

- Bluetooth is a low cost, low power, short range wireless communication technology
- 2.4GHz to 2.484 GHz
1. Passive hub
2. Active hub
  1. Intelligent hub

57. List the two types of data frames in FDDI

- Synchronous (S frame)
- Asynchronous (A frame)

58. What is the purpose of the NAV?

The network allocation vector (NAV) is a timer for collision avoidance.

59. Name the four types of S frames.

- Receive ready(RR)
- Receive not ready (RNR)
- Reject (REI)
- Selective reject (SREJ)

60. What are the four SONET layers?

SONET defines four layers. The photonic layer is the lowest and performs physical layer activities. The section, line and path layers correspond to the OSI model's data link layer.

61. What is a virtual tributary?

A virtual tributary is a parital payload that can be inserted into an STS-1 and combined with other partial payloads to fill out the frame.

62. What is the access method used by wireless LANs?

The wireless LAN access method is CSMA/CA (Carrier   Sense Multiple Access with Collision Avoidance)

PART B:

1. With reference to sliding window protocol explain selective repeat and go back –N. (6)
2. Explain the datalink layer in Internet and HDLC.   (16)
3. Explain the CSMA/CD algorthims of Ethernet.   (8)
4. Explain in details about the access method and frame format used in Ethernet and token ring.   (12)
5. 1. A block of 32 bits has to be transmitted. Discuss   how the thirty two bit block is transmitted to the   receiver using Longitudinal Redundancy Check.   (6)
   2. Consider a 32 bit block of data 11100111 11011101   00111001 10101001 that

has to be transmitted. IF   Longitudinal Redundancy Check is used what is the
 transmitted bit stream.   (4)
    3.   In the Hamming code for a data unit of m bits how   do you compute the
number of redundant bits 'r'   needed.   (3)
    4.   What kinds of errors can vertical Redundancy check   determine? What kinds of
errors it cannot determine?   (3)
6. i.   List the three main functions preformed by the data   link layer of the ISO OSI
model.   (3)
    ii.   Explain the working of carrier sense multiple access   protocol.
          (3)
    iii.   How does a Token Ring LAN operates? Discuss.   (6)
    iv.   List and briefly discuss the two different basic   transmission technologies that
can be used to set up   wireless LAN's.   (4)
7. Explain Hamming Code.
8. Explain in details SONET and SONET Frame.
9. Explain the frame format, operation and ring maintenance feature of IEEE 802.5
MAC protocol.
10. i.   Explain the datalink layer in the Internet.
    ii.   If the frame is 1101011011 and generator is 10011   what would be the
transmitted frame?
11. i.   What is the remainder obtained by dividing x7+x5+1   by the generator
polynomial x3+1.
    ii.   A bit stream 10011101 is transmitted using the   standard CRC method. The
generator polynomial is   x3+1 show the actual bit string transmitted. Suppose   the
third bit from left is inverted during transmission   show that this error is detected at
receiver's end.
    iii.   A bit string 0111101111101111110, needs to be   transmitted at the datalink
layer. What is the string   actually transmitted after bit stuffing.
12. Briefly define key requirements for wireless LANs.
13. Describe the FDDI frame format and explain.
14. Discuss the MAC layer functions of IEEE 802.11.
15. Explain in details the types of bridges.

UNIT III

PART - A

1.   What is mean by internetworks?
When two or more networks are connected, they become internetwork or internet.
2.   What are the methods of packet switching?
Virtual Circuit approach.
Datagram approach
3.   What is an Internet Protocol (IP)?
The protocol that defines both the format of packets used on a TCP/IP internet and the
mechanisms for routing a packet to its destination.
4.   What is an IP address?

An IP address is a 32 - bit address that uniquely and universally define the connection of a host or a router to the Internet.

The sender must know the IP address of the destination computer before sending a packet.

5. What are the categories of IP addresses?

IP addresses were divided into five categories as follows.

Class A

Class B

Class C

Class D

Class E

6. Discuss the class field in IP address.

If the address is given in binary notation, the first few bits can tell us the class of the address.

Class A - 0

Class B - 10

Class C - 110

Class D - 1110

Class E - 1111

When the address is given in dotted decimal notation, then look at the first byte to determine the class of the address..

Class A - 0 to 127

Class B – 128 to 191

Class C – 192 to 223

Class D – 224 to 239

Class E – 240 to 255

7. Explain Multicasting.

A form of addressing in which a set of computer is assigned one address, a copy of any datagram sent to the address is delivered to each of the computers in the set.

8. Define the term broad casting.

A form of delivery in which one copy of a packet is delivered to each computer on a network.

9. What is a hostid and netid?

Netid – The portion of the IP address that identifies the network called the netid.

Hostid – The portion of the IP address that identifies the host or router on the network is called the hostid.

10. How does a netid differ from a network address?

A network address has both netid and hostid with 0's for the hostid.

11. What is the purpose of subnetting?

When we divide a network into several subnets, we have three levels of hierarchy

The netid is the first level, defines the site.

The subnetid is the 2nd level, defines the physical subnetwork. The hostid is the 3rd level defines the connection of the host to the subnetwork.

12. Define Masking.

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

13. What is the difference between boundary level masking and non-boundary level

masking.

Boundary level Masking:

If the masking is at the boundary level, the mask numbers are either 255 or 0, finding the subnetwork address is very easy.

Non Boundary level Masking:

If the masking is not at the boundary level, the mask numbers are not just 255 or 0, finding the subnetwork address involves using the bitwise AND operators.

14. What is the function of router?

Routers relay packets among multiple interconnected networks. They route packets from one network to any number of potential destination networks on an internet.

15. How does a router differ from a bridge?

Routers provide links between two separate but same type LANs and are most active at the network layer. Whereas bridges utilize addressing protocols and can affect the flow control of a single LAN; most active at the data link layer.

16. What is the class of each of the following addresses?

a. 10011101   10001111   11111100   11001111 – Class B
b. 11011101   10001111   11111100   11001111 – Class C
c. 01111011   10001111   11111100   11001111 – Class A
d. 11101011   10001111   11111100   11001111 – Class D
e. 11110101   10001111   11111100   11001111 – Class E

7. Find the class of each addresses.

a. 4.23.145.90 – Class A
b. 227.34.78.7 – Class D
c. 246.7.3.8 – Class E
d. 29.6.8.4 – Class A
e. 198.76.9.23 – Class C

18. In routing what does the term SHORTEST mean?

The term Shortest mean the combination of many factors including shortest, cheapest , fastest most reliable and so on.

19. Why is adaptive routing superior to non adaptive routing?

Adaptive routing is superior to non adaptive routing because adaptive routing may select a new route for each packet in response to change in condition and topology of the networks.

20. What is the router's role in controlling the packet lifetime?

As packet is generated, each packet is market with a lifetime, usually the number of hops that are allowed before a packet is considered lost and, accordingly destroyed. As each router encounters the packet subtracts 1 from the total before passing it on. When the lifetime total reaches 0, the packet is destroyed.

21. What are the most popular routing algorithms?

a. Distance Vector routing
b. Link State routing

22. What are the three main elements of distance vector algorithms.

a. Knowledge about the entire autonomous system.
b. Routing only to neighbours
c. Information sharing at regular intervals

23. What is Supernetting?

Supernetting combines several networks into one lager one.

24. Define flooding?

Flooding means that a router sends its information to all of its neighbours and all of its output ports.

25. What are the services offered by network layer?

a. Logical addressing
b. Routing

26. Distinguish between adaptive and non adaptive routing algorithms.

Non adaptive Routing:

Once a pathway to a destination has been selected the router sends all packets for that destination along that one route.

The routing decisions are not based on the condition or topology of the networks.

Adaptive Routing:

Router may select a new route for each packet.(even packets belonging to the same transmission)

The routing decisions are based on the condition or topology of the networks.

27. Identify the class and default subnet mask of the IP address 217.65.10.7.

It belongs to class C.

Default subnet mask – 255.255.255.192

28. What are the fields present in IP address?

Netid and Hostid.

Netid – portion of the ip address that identifies the network.

Hostid – portion of the ip address that identifies the host or router on the networks.

29. What are the three main elements of Link state routing?

1. Knowledge about the neighborhood.
2. Sharing with every other network.
3. Information sharing when there is a change.

30. What algorithm does link state routing use to calculate the routing tables.

Dijkstra algorithm is used to calculate the routing table.

31. What are the advantages of flooding?

- Simple
- Needs no network information or routing tables
- Robust for failure prone networks.
- Shortest path is always found.

32. What is flow control?

How to keep a fast sender from swamping a slow receiver with data is called flow control.

33. Differentiate virtual circuit and datagram's.

VC is connection oriented and datagram is connectionless.

34. What is adaptive routing algorithm?

Adaptive routing algorithms change their routing decisions to reflect changes in the topology and usually the traffic as well. Distance vector and link state are examples of this.

35. What is the time to live field in IP header?

Time to live field is counter used to limit packet lifetimes counts in second and default

value is 255 sec.

36. What are the main disadvantages of distance vector routing?

Split horizon

Count to infinity problem

37. Identify the class and default subnet mask of the IP address 217.65.10.7

IP address 217.65.10.7 belongs to class C address and default subnet mask is 255.255.255.0.

38. What is meant by virtual path?

Virtual path is a set of connections between two switches.

39. What is address resolution?

Address resolution is a process of obtaining the physical address of a computer based on its IP address, in order to be able to finally actually transmit the frame or datagrams over the network to which the node belongs.

40. Why is it that in a broadcast network, the network layer is often thin or even non existent?

Network layer is responsible for host to host delivery and for routing the packets through the routers or switches. In broadcast there is no need of addressing the packets, routing and address verification.

41. What are the benefits of subnetting a network?

1. Reduced network traffic
2. Optimized network performance
3. Simplified network management
4. Facilities spanning large geographical distance.

42. What is meant by routing algorithm?

The algorithm that manages routing tables and makes the routing decisions is called routing algorithm.

43. What are the desirable properties of a routing algorithms?

1. Correctness
2. Simplicity
3. Robustness
4. Stability
5. Fairness
6. Optimality

44. What are the types of routing algorithms?

1. Non adaptive routing algorithm
2. Adaptive routing algorithm

45. What are the metrics used by routing protocols?

Path length, reliability, delay, bandwidth, load and communication cost.

PART B

1. Explain the network layer in the Internet and IP addressing
2. Write a note on various internetworking devices
3. Compare Bridges and routers
4. Explain shortest path algorithm with a suitable illustration

5. 1. Explain the distance vector routing algorithm.
2. Mention the limitations of distance vector routingalgorithm.
3. Explain the building and distribution of link state packets in link state routing algorithm.
4. Mention the limitations of link state routing algorithm.
6. Explain link state routing and discuss its advantages over distance vector routing.
7. Explain in details packet switching.
8. Explain in details Datagram approach.
9. Explain in details IP addressing methods.
10. i.   State which layers of the ISO OSI model does the   following interconnecting devices operate.
a.   Repeaters
b.   Bridges
c.   Routers
d.   Gateways
    ii.   State the major difference between Distance Vector   Routing and Link state Routing. Discuss how these   routing techniques work.
11. i.   What is subnetting? Discuss. Also state which   classes of IP address can be subnetted.
    ii.   What is subnet masking? Discuss
    iii.   How can we prove that we have 2,147,483,648   addresses in class A?
    iv.   What is the subnetwork address if the destination   address is 200.45.34.56 and the subnet mask is   255.255.240.0
12. i.   In classful addressing how is an IP address in class   A, Class B and Class C divided? Discuss
    ii.   Given the address 23.56.7.91 and the default class   A mask, find the beginning address (network   address)
    iii.   Given the address 201.180.56.5 and the default class   C mask, find the beginning address (network   address).
13. For the network shown in figure with the given link cost, use Djkstra's algorithm to determine the shortest path from A to all other nodes. Show all your working and show your result as a spanning tree(s) routed at A.

UNIT 4

PART A

1.   What are the services provided by transport layer protocol?
a.   End to End delivery
b.   Addressing
c.   Reliable delivery
d.   Flow control
e.   Multiplexing
2.   What is the difference between network service and transport service?
Network services is generally unreliable whereas transport service is reliable. The network service is only used by the transport entities and transport service must be

convenient and easy to use.

3. List some of the Quality of service parameters of transport layer

a. Error and loss levels

b. Desired average and maximum delay

c. Throughput

d. Priority level

e. Resilence.

4. What are the functions of transport layers?

The transport layer is responsible for reliable data delivery. Functions of transport layer

i.   Transport layer breaks messages into packets

ii.   It performs error recovery if the lower layers are not adequately error free.

iii.   Function of flow control if not done adequately at the network layer.

iv.   Function of multiplexing and demultiplexing sessions together.

v.   This layer can be responsible for setting up and releasing connections across the network.

5. What is transport entity?

The main goal of the transport layer is to provide efficient, reliable and cost effective service to its users, normally processes in the application layer. The hardware and software within the transport layer that does the work is called the transport entity.

6. What is segmentation?

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

7. What is concatenation?

When the size of the data units belonging to a single session 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 is the purpose of sequence control?

a. If a longer data unit has been segmented the numbers indicate the order of reassembly.

b. If several shorter units have been concatenated the numbers indicate the end of each subunit and allow them to be separated accurately at the destination.

9. How transport layer performs Duplication control?

Sequence number allow the receiver to identity and discard duplicate segments.

10. Define Multiplexing.

Many to one relationship

The process of accepting messages from different processes, differentiated by their assigned port number. After adding the header, the transport layer passes the packet to the network layer.

11. What are the two ways of multiplexing done at the transport layer?

Multiplexing occurs at the transport layer in 2 ways

i.   Upward Multiplexing:

The multiple transport layer connection uses the same network connections.

ii.   Downward Multiplexing

The transport layer connection uses the multiple network connections.

12. What are the service primitives in simple transport protocol?

The parameters of the service primitive and library procedures are follow.

i.   LISTEN

ii.   CONNECT

iii.   SEND

iv.   RECEIVE

v.   DISCONNECT

13. What is the function of transmission timer?

The main function is to retransmit acknowledged segment.

14. What is meant by well known port? What is the numbers?

Well known port means they are reserved for use by well known application protocols such as HTTP and FTP. The port number ranging from 0 to 1023 are well known port numbers.

15. What are the three steps involved in establishing a connection?

Connection establishment involves the following:

i.   Host A sends a packet to announce its wish for connection and includes its initialization information about traffic from A to B.

ii.   Host B sends a packet to acknowledge (confirm) the request of A.

iii.   Host B sends a packet that includes its initialization information about traffic from B to A.

iv.   Host A sends a packet to acknowledge (confirm) the request of B.

16. What are the steps involved while terminating a connection?

4 actions are needed to close the connections in both directions.

i.   Host A sends a packet announcing its wish for connection termination.

ii.   Host B sends a segment acknowledging the request of A. After this, the connection is closed in one direction, but not in the other.

iii.   When host B has finished sending its own data, it sends a segment to indicate that it wants to close the connection.

iv.   Host A acknowledge (confirm) the request of B.

17. When is upward multiplexing used?

Upward multiplexing is used when cost is the main criteria to be considered.

18. What is Transport Control Protocol (TCP)?

The TCP/IP protocol that provides application programs with access to a connection oriented communication service. TCP offers reliable flow controlled delivery. More important TCP accommodates changing conditions in the Internet by adapting its retransmission scheme.

19. Define the term (i) Host (ii) IP

a. Host : An end user's computer connection to a network. In an internet each computer is classified as a host or a router.

b. IP: Internet Protocol that defines both the format of packet used on a TCP/IP internet and the mechanism for routing a packet to its destination.

20. What is UDP?

User Datagram Protocol is the TCP/IP protocol that provides application program with connectionless communication service.

21. What are the four major aspects of reliable delivery at the transport layer?

At the transport layer, reliable delivery has 4 aspects;

i.   Error control

ii.   Sequence control
iii.   Loss control
iv.   Duplication control

22. What is RTT?

RTT is an acronym for Round Trip Time; it is a measure of the time it takes for a packet to travel from a computer, across a network to another computer and back.

23. How is RTT used in networking?

Transport protocols like TCP which expects an acknowledgement to arrive after data has been successfully received, keep an estimate of the current RTT on each connection. They use the RTT estimate to determine how long to wait for an acknowledgment before retransmitting.

24. How is RTT computed?

The sending side records the clock when it transmits a packet, and then examines the clock again when an acknowledgment arrives. By subtracting the two values, it obtains a single estimate of the round trip time. It then combines that single estimate with previous estimates to get an average.

25. Do TCP,UDP or both compute RTT?

TCP does; UDP does not

26. Explain the purpose of these timers in TCP:

a.   retransmission timer
b.   persist timer
c.   keep alive timer
d.   time waited timer

(a) retransmission timer – The retransmission timer is to control a lost or discarded segment and resend a duplicate packet after the time expires.

(b) After the sending window has been closed (with zero credit) a persist timer is used by the source to periodically probe the destination host to see if the window has actually been changed. The purpose is to preventdeadlock situations where a credit to open the window has been lost.

(c) The keep alive timer is an optional feature in some TCP implementations. It is used to prevent a long idle connection between two TCP's

(d) Time waited timer is used during connection termination.

27. What is an silly window syndrome?

When either the sending application program creates data slowly or the receiving application program consumes data slowly or both. This problem is called the silly window syndrome.

28. List the flag used in TCP header?

TCP header contains six flags.
They are URG, ACK, PSH, RST, SYN and FIN.

29. What is the purpose of urgent pointer in the TCP header?

In certain circumstances, it may be necessary for a TCP sender to notify the receiver of urgent data that should be processed by the receiving application as soon as possible. This 16 bit field tells the receiver when the last byte of urgent data in the segment ends.

30. What is the segment?

The unit of data transfer between two devices using TCP is a segment.

31. What is a port?

Applications running on different hosts communicate with TCP with the help of a concept called as ports. A port is a 16 bit unique number allocated to a particular application.

32. What is Socket?

The communication structure needed for socket programming is called socket.

A port identifies a single application on a single computer.

Socket = IP address + Port number

33. How TCP differ from the sliding window protocols.

TCP differs from the sliding window protocols in the following ways:

1. When using TCP, applications treat the data sent and received as an arbitrary byte stream. The sending

-   TCP module divides the byte stream into a set of packets called segments, and sends individual segments within an IP datagram.

-   TCP decides where segment boundaries start and end.

2. The TCP sliding window operates at the byte level rather than the packet (or segment) level. The left and right window edges are byte pointers.

3. Segment boundaries may change at any time. TCP is free to retransmit two adjacent segments each containing 200 bytes of data as a single segment of 400 byte.

4. The size of the send and receive window change dynamically.

34. Explain how the TCP provides the reliability?

A number of mechanisms provide the reliability.

1. Checksum

2. Duplicate data detection

3. Retransmission

4. Sequencing

5. Timers

35. What is a datagram socket?

A structure designed to be used with connectionless protocols such as UDP.

36. "TCP software is implemented as a finite state machines." Discuss.

To keep track of all the different events happening during connection establishment , connection termination and data transfer.

37. What is stream socket?

A structure designed to be used with a connection oriented protocol such as TCP

38. Give the strategies TCP uses to avoid congestion.

1. Slow start and additive increase

2. Multiplicative decrease

39. What is the purpose of choke packet.

It is packet sent by router to the source to inform it of congestion.

40. Give the structure of UDP header

41. State any 2 socket primitives for TCP and state their function.

1. Listen

a. int listen (int sd , int backlog)

2. Close

a. int close (int sd)

42. Give some examples of application where UDP is preferred over TCP.

1. In multicasting
2. Route update protocol in RIP

43. What is congestion?

When load on network is greater than its capcity, there is congestion of data packets.
Congestion occurs because routers and switches have queues or buffers.

44. What is meant by slow start in TCP?

At the beginning of a connection, TCP sets the congestion window size to the maximum segment size.

For each segment that is acknowledged, TCP increases the size of the congestion window by one maximum segment size until it reaches a threshold of one half of the allowable window size.

This is called Slow Start it is used with additive increase.

45. What are the types of congestion control algorithms?

Congestion control algorithms are divided into 2 types. They are as follows:

Open loop algorithms
Closed loop algorithms

46. Define the term Jitter.

Jitter is the variation in delay for packets belonging to the same flow.

47. What are the scheduling techniques designed to improve the quality of services?

1. FIFO queuing
2. Priority queuing
3. Weighted fair queuing

48. Define Traffic Shaping.

It is a mechanism to control the amount and rate of the traffic sent to the network. Two techniques can shape traffic.

i.   Leaky bucket
ii.   Token bucket

49. Define Resource Reservation.

A flow of data needs resources such as a buffer, bandwidth, CPU time and so on. The quality of service is improved if these resource are reserved beforehand.

50. "DNS can use the services of UDP or TCP using port 53". Discuss when UDP is used and when TCP is used.

UDP is used when the size of the response message is less than 512 bytes. TCP is used when the size of the response message is greater than 512 bytes.

PART B

1. Explain a congestion control algorithm.
2. Explain the duties of Transport layer.
3. Explain the TCP transmission policy, Congestion control.
4. Explain the following issues of transport protocol
a. Establishing a connection
b. Terminating a connection
5. Explain the TCP header and working of the TCP protocol.

6. Explain the various fields of TCP header with the help of a neat diagram.
7. Explain the various steps that are followed in releasing a TCP connection.
8. Explain the three way handshake protocol to establish the transport level connection.
9. Discuss about congestion control in frame relay.
10. Discuss the various issues of transport layer in details.
11. i.   List and discuss the various primitives for a simple   transport services
    ii.   "DNS can use the service of UDP or TCP using   port 53" Discuss when UDP is used and when TCP   is used.
    iii.   Highlight the features of UDP and briefly discuss   the same.
12. i.   Discuss connection establishment and connection   release in TCP
    ii.   Discuss how TCP provides reliability using error   control.
    iii.   Discuss the strategies TCP uses to avoid congestion.

UNIT 5

PART A

1. What is the Domain Name System responsible for?
The Domain NameSystem converts domain names (of the form www.charulathapublication.com) into IP numbers.
2. Discuss the three main divisions of the DNS.
Generic domains
Country domains
Inverse domains
3. What role does the DNS resolver play in the DNS system?
A DNS resolver is responsible for moving requests of the local DNS server on behalf of clients.
4. How does a DNS Resolver bootstrap the domain name lookup process?
A DNS resolver must know the IP address of at least one DNS server. IT uses this address to start the DNS lookup process.
5. Define SMTP.
The protocol that supports email on the Internet is called Simple Mail Transfer Protocol. SMTP is par tof the TCP/IP protocol suite.
6. Define the term domain.
A part of the computer naming hierarchy used in the Internet. For example commercial organizations have names registered under the com domain.
7. What are the two parts of addressing system in SMTP?
The addressing system used by SMTP consists of two parts:
A local part and a domain name separated by an @ sign
Local Part @ Domain Name
8. Discuss MIME.
Multipurpose Internet Mail Extension is an extension of SMTP that allows the transfer of multimedia and other non ASCII messages.
9. What are the services provided by user agent?
Composing Messages
Reading Messages

Replying to Messages

Forwarding Message

Handling mail boxes

10. What are the four properties of HTTP?

a. Global uniform resource identifier

b. Request response exchange

c. Statelessness

d. Resource meta data

11. Describe why HTTP is designed as a stateless protocol?

Maintaining state across request response connections significantly increases the initial interactions in a connection since the identity of each party needs to be established and any saved state must be retrieved. HTTP is therefore stateless to ensure that the Internet is scalable since state is not contained in the HTTP request/response pairs by default.

12. What are the four groups of HTTP header?

The four groups of HTTP header are:

a. General header

b. Entity header

c. Request header and

d. Response header.

13. Define the terms (i) Browser (ii) Hypertext Mark Up language.

a. Browser: A computer program that accesses and displays information from the world wide web. A browser contains multiple application programs and uses an objects name to determine which application should be used to access the objects.

b. Hypertext Markup Language: The source form used for documents on the world wide web. HTML embeds commands that determine formatting along with the text to be displayed.

Ex: To move to a new line or indent text

14. What is a hypertext?

A set of documents in which a given document can contain text as well as embedded reference to other documents.

15. What are categories of web documents?

Static documents – The contents are fixed and stored in a server.

Dynamic documents – created by a server only at a browser request.

Active documnets – It is a copy of a program retrieved by the client and run at the client side.

16. What do you mean by URL?

Uniform Resource Locator is a standard for specifying any kind of information on the Internet.

URL is a syntantic form used to identify a page of information on the world wide web.

A typical URL is http://www.abdc.com/products.html

17. What are basic functions of email system?

Basic functions of emails are:

a. Composition

b. Transfer

c. Reporting

d. Displaying

e. Disposition

18. What is an Electronic Mail?

Email is a popular application in which a user or computer sends a memo to one or more recipients.

19. What is WWW?

It is an internet application that allows users to view web pages and move from one web page to another.

www is the hypermedia system used on the internet in which a page of information can contain text, images, audio or video clips and reference to other pages.

20. What do you mean by hypermedia?

A set of documents in which a given document can contain text, graphics, video and audio clips as well as embedded references to other documents world wide web pages are hypermedia documents.

21. What is the web browser?

Web browser is a software program that interprets and displays the contents of HTML web pages.

22. What is a post office protocol?

An e-mail protocol that allows retrieval of e-mail messages from an e-mail server using remote connection.

23. What do you mean by active web pages?

When a client send a HTTP request for an active web page, the web server sends back an HTTP response that contains an HTML page as usual. HTML page also contains a small program that executes on the client computer inside the web browser.

24. What are the transmission modes of FTP?

Transmission modes of FTP are:

i.   Stream mode: Default mode and data is delivered from FTP to TCP as a continuous stream of data.

ii.   Block mode: Data is delivered from FTP to TCP in terms of blocks. Each data block follows the three byte header.

iii.   Compressed mode: File is compressed before transmitting if size is big. Run length encoding method is used for compression.

25. Compare the HTTP and FTP

   FTP:

   FTP transfers the file from client to server and server to   client.

   It uses two different port connection. (i.e., port 20 and   port 21)

   Uses TCP protocol

   HTTP:

   HTTP transfer the file from server to client (ie web page)

   HTTP use only one port connection (ie port 80)

   It also use TCP protocol.

26. What is mailing list?

Mailing list contains the address of destination users.

27. What is the application layer protocol world wide web?

World wide web is a repository of information of spread all over the world and linked together.

28. What is the use of Mail transfer agent?

Mail transfer agent (MTA) transfers the email across the Internet.

29. What are the two main categories of DNS messages?

DNS has two types of messages : Query and response.

30. Why was there a need for DNS?

In DNS, when there is a change, such as adding a new host, removing a host or changing an IP address, the change must be made to the DNS master file. The dynamic domain name system (DDNS) has been devised to respond to this need.

31. What are the two types of user Agents?

a. Command driven and

b. GUI based.

32. What is the purpose of FTP?

To copy a file from one host to another on the Internet.

33. What does CGI stand for and what is its function?

CGI stands for Common Gateway Interface. CGI is a technology that creates and handles dynamic documents.

34. What is a homepage?

A unit of hypertext or hypermedia available on the web is called a page. The main page for an organization or an individual is known as a homepage.

35. Define cryptography.

Cryptography is the science and art of transforming messages to make them secure and immune to attack.

36. What is Ciphertext?

The encrypted message is called Ciphertext.

37. Define Passive and Active attack.

Passive: Passive attack are in the nature of eavesdropping on or monitoring of transmissions.

Active: It involves some modification of the data stream or the creation of a false stream.

38. What are the two categories of cryptography methods? What is the main difference between the categories?

Two categories are

i.   Secret (symmetric) key cryptography and

ii.   Public key (asymmetric) key cryptography.

-    In symmetric key cryptography, the same key is used by the sender (for encryption) and the receiver (for decryption). The key is shared.

-    In public key cryptography, the public key that is used for encryption is different from the private key that is used for decryption.

39. State which layer of the TCP/IP reference model the following protocols are present.

a. TCP – Transport layer

b. SMTP – Application layer

40. What is filter for email users?

Filters are rules that are checked when e-mail comes in or when user agent is started. Each rule specifies a condition and an action.

41. Mention the aspects of security.

a. Confidentiality

b. Integrity

c. Availability

d. Authentication

42. What are the advantages of public key encryption/decryption?

a. It removes the restriction of a shared symmetric key between two entities.

b. The number of keys needed is reduced tremendously

43. What are the parts of a browser?

Each browser consists of three parts.

i.   A controller

ii.   Client programs and

iii.   Interpreters.

PART B:

1. Explain DNS with reference to its components and working.   (16)

2. Explain the message transfer using simple mail transfer protocol.   (8)

3. Explain the final delivery of email to the end user using pop3.   (8)

4. Write short notes on email services of the application layer.   (8)

5. Explain in details the SMTP.   (8)

6. Explain in details WWW.   (8)

7. Explain the architecture and services of e-mailing system.

                    (16)

8. Explain substitution and transposition ciphers with an example for each.

                 (5)

9. Explain the RSA public key encryption algorithms with an example.

                 (8)

10. What are the two categories of encryption/decryption methods? What is the main difference between the categories.   (8)

11. Explain active and passive attacks.   (8)

12. Explain DES encryption algorithm. How is it different from triple DES?

                 (8)

13. i.   With a relevant example discuss how the domain   space is divided.

                    (6)

    ii.   Distinguish between a fully qualified domain name and a partially qualified domain name. Give relevant   example.   (6)

    iii.   List the various risks faced by messages that are transmitted over the internet.

 (4)

14. i.   Discuss how simple mail transfer protocol (SMTP)   works? Can multimedia messages be transmitted using SMTP? Discuss. (10)

    ii.   Is common gateway interface a languages. Discuss.

        (6)