

Probable Q & A on DC 01

1. What is meant by Data Communication and explain its characteristics?

Data communications are the exchange of data between two devices via some form of transmission medium such as a wire cable.

For data communications to occur, the communicating devices must be part of a communication system made up of a combination of hardware (physical equipment) and software (programs).

2. What are the components of Data communication?

These are sender (sends information), receiver (receives information), communication medium (transmission medium), the message to be communicated (Information such as audio, video, image, text etc.), and certain rules called protocols (TCP/IP) to be followed during communication.

3. Explain different Data flow directions.

- Simplex: In simplex mode, the communication is unidirectional, as on a one-way street. (Unidirectional only)
The keyboard, Television, Mouse, Radio Broadcasts, and Monitor are great examples of a Simplex transmission.
- Half-Duplex: In half-duplex mode, each station can both transmit and receive, but not at the same time. (Bidirectional but not Simultaneous)
A Walkie-talkie set is an example of Half Duplex transmission.
- Full-Duplex: In full-duplex mode, each station can both transmit and receive and at the same time too. (Bidirectional & Simultaneous)
Telephone lines, Mobile phones are commendable examples of Full-Duplex transmission.

4. What is Network and explain characteristics of Networks?

A network consists of two or more computers that are linked in order to share resources (such as printers and CDs), exchange files, or allow electronic communications.

The computers on a network may be linked through cables, telephone lines, radio waves, satellites, or infrared light beams.

5. Write about different types of connections.

There are two possible types of connections: point-to-point and multipoint.

A point-to-point connection provides a dedicated link between two devices.

The entire capacity of the link is reserved for transmission between those two devices.

6. Explain different types of Networks.

Three basic network types are local-area networks (LANs), wide-area network (WANs) and wide-area networks (WANs).

LANs connect computers and peripheral devices in a limited physical area, such as a business office, laboratory, or college campus, by means of links (wires, Ethernet cables, fibre optics, Wi-Fi) that transmit data rapidly.

A wide-area network (WAN) is the technology that connects your offices, data centers, cloud applications, and cloud storage together. It is called a wide-area

network because it spans beyond a single building or large campus to include multiple locations spread across a specific geographic area, or even the world.

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7. Write about Protocol and Standards.

A protocol defines a set of rules used by two or more parties to interact between themselves. A standard is a formalized protocol accepted by most of the parties that implement it.

Some of the examples of Standard Protocols are FTP, DNS, DHCP, SMTP, TELNET, TFTP, etc. Proprietary protocols are developed by an individual organization for their specific devices.

8. What is skip distance?

A skip distance is the distance a radio wave travels, usually including a hop in the ionosphere. A skip distance is a distance on the Earth's surface between the two points where radio waves from a transmitter, refracted downwards by different layers of the ionosphere, fall.

9. Explain optical properties of radio waves.

Property 1: Radio waves are a form of radiation known as electromagnetic waves. The wavelength of radio waves is longer than the infrared light.

Property 2: Radio waves can travel for a long distance.

Property 3: Radio waves can penetrate through materials.

10. What is Radio Modem?

Radio Modems Are used to send data across a pair of glass a radio frequency signal.

11. What is Optical Modem?

Optical Modems Are used to send data across a pair of glass fibers using light. Such modems use entirely different technology than modems that operate over dedicated wires.

12. What is Dial up Modem?

Dial up modems contain a circuitry that mimics a telephone. That is, modem can simulate lifting the handset, dialing, or hanging up the telephone. Second, telephone system is designed to carry sound, a dial up modem uses a carrier that is an audible tone. Third, although they send all data through a single voice channel, a pair of dialup modems offer full duplex communication. That is, a single telephone connection between two dial up modems usually allows data to flow in both directions.

Dial-up modems can establish point-to-point connections on the PSTN by any combination of manual or automatic dialing or answering, The quality of the circuit is not guaranteed, but all telephone companies establish objectives. The links established are almost always 2-wire because 4-wire dialing is tedious and expensive.

A four-wire line is a pair of two-wire lines, one for transmitting and one for receiving, in which the signals in the two directions are to be kept totally separate. Perfect separation can be maintained only if the four-wire configuration is sustained from

transmitter to receiver. The lines may be combined in a 4-wire/2-wire network (often called a hybrid or a hybrid transformer) at any point in the signal path. In this case impedance mismatches will cause reflections and Interference between the two signals.

13. What is cable Modem?

For internet and data communications systems to function, business cable modems are a crucial piece of infrastructure. Finding a device with the appropriate features is essential to enabling complete communication capabilities, including:

1. Getting to the ISP:

A cable modem's ability to connect to your ISP's network is its most fundamental function, given that it relies on a well-established network of physical wires that span the entire nation, and it is one of the most common types of widely used and dependable forms of ISP connectivity.

2. Utilizing and combining services:

Using cable modem-based delivery networks, voice services, internet access, and television can all be combined into a single contract. Multiple services from one source can frequently lower your provider costs and result in cost savings for your company. Each service is delivered through distinct physical cable lines when they are combined, reducing service lag and interruptions. Bundling is similar to best practices for *unified communications as a service (UCaaS)*, which frequently group together comparable infrastructure and telecoms technology under a single platform.

3. An increase in internet speed

Less than *100 Mbps* and as much as a gigabit, ISPs and cable companies provide a variety of internet download servicing speeds. Your cable modem greatly impacts the speed of the internet you can access. Your company can see slower internet speeds if there is no *DOCSIS model* with a comparable speed specification.

14. What Does AT Command Set Mean?

The AT command set is a command language with a series of short text strings, which combine together to output complete commands for different operations such as hanging up, dialing and changing connection parameters for modems. A majority of personal computer modems follow the AT command set specifications.

15. Define Network?

A network is a set of devices connected by physical media links. A network is recursively a connection of two or more nodes by a physical link or two or more networks connected by one or more nodes.

16. What is a Link?

At the lowest level, a network can consist of two or more computers directly connected by some physical medium such as coaxial cable or optical fiber. Such a physical medium is called as Link.

17. What is a node?

A network can consist of two or more computers directly connected by some physical medium such as coaxial cable or optical fiber. Such a physical medium is called as Links and the computer it connects is called as Nodes.

18. What is a gateway or Router?

A node that is connected to two or more networks is commonly called as router or Gateway. It generally forwards message from one network to another.

19. What is point-point link?

If the physical links are limited to a pair of nodes it is said to be point-point link.

20. What is Multiple Access?

If the physical links are shared by more than two nodes, it is said to be Multiple Access.

21. What are the advantages of Distributed Processing?

- a. Security/Encapsulation
- b. Distributed database
- c. Faster Problem solving
- d. Security through redundancy
- e. Collaborative Processing

22. What are the criteria necessary for an effective and efficient Network?

- a. Performance

It can be measured in many ways, including transmit time and response time.

- b. Reliability

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

- c. Security

Security issues include protecting data from unauthorized access and virus.

23. Name the factors that affect the performance of the network?

- a. Number of Users
- b. Type of transmission medium
- c. Hardware
- d. Software

24. Name the factors that affect the reliability of the network?

- a. Frequency of failure
- b. Recovery time of a network after a failure

25. Name the factors that affect the security of the network?

- a. Unauthorized Access
- b. Viruses

26. What is Protocol?

A protocol is a set of rules that govern all aspects of information communication.

27. What are the key elements of protocols?

The key elements of protocols are

- a. Syntax

It refers to the structure or format of the data, that is the order in which they are presented.

b. Semantics

It refers to the meaning of each section of bits.

c. Timing

Timing refers to two characteristics: When data should be sent and how fast they can be sent.

28. What are the key design issues of a computer Network?

- a. Connectivity
- b. Cost-effective Resource Sharing
- c. Support for common Services
- d. Performance

29. Define Bandwidth and Latency?

Network performance is measured in Bandwidth (throughput) and Latency (Delay). Bandwidth of a network is given by the number of bits that can be transmitted over the network in a certain period of time.

Latency corresponds to how long it takes a message to travel from one end of a network to the other. It is strictly measured in terms of time.

16. Define Routing?

The process of determining systematically how to forward messages toward the destination nodes based on its address is called routing.

17. What is a peer-peer process?

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

18. When a switch is said to be congested?

It is possible that a switch receives packets faster than the shared link can accommodate and stores in its memory, for an extended period of time, then the switch will eventually run out of buffer space, and some packets will have to be dropped and in this state is said to be congested state.

19. Define the terms Unicasting, Multicasting and Broadcasting?

If the message is sent from a source to a single destination node, it is called Unicasting.

If the message is sent to some subset of other nodes, it is called Multicasting.

If the message is sent to all the nodes in the network it is called Broadcasting.

20. What is Multiplexing?

Multiplexing is the set of techniques that allows the simultaneous transmission of multiple signals across a single data link.

It is mainly of 2 types.

- 1. FDM
- 2. TDM

21. Name the categories of Multiplexing?

- a. Frequency Division Multiplexing (FDM)
- b. Time Division Multiplexing (TDM)
- i. Synchronous TDM

- ii. Asynchronous TDM Or Statistical TDM.
- c. Wave Division Multiplexing (WDM)

22. What is FDM?

FDM is an analog technique that can be applied when the bandwidth of a link is greater than the combined bandwidths of the signals to be transmitted.

30. What is WDM?

WDM is conceptually the same as FDM, except that the multiplexing and demultiplexing involve light signals transmitted through fiber optics channel.

31. What is TDM?

TDM is a digital process that can be applied when the data rate capacity of the transmission medium is greater than the data rate required by the sending and receiving devices.

32. Comparison between FDM & TDM

FDM is operational on frequency slots where as TDM on time slots.

FDM is meant for analog signals, while TDM works well with both analog as well as digital signals. However, TDM is mostly used in digital communications only.

In TDM, synchronization pulse is important; whereas in FDM, Guard Band is required.

Transmission rate is high in TDM in comparison to FDM.

27. What is Synchronous TDM?

In STDM, the multiplexer allocates exactly the same time slot to each device at all times, whether or not a device has anything to transmit.

28. List the layers of OSI

- a. Physical Layer
- b. Data Link Layer
- c. Network Layer
- d. Transport Layer
- e. Session Layer
- f. Presentation Layer
- g. Application Layer

29. Which layers are network support layers?

- a. Physical Layer
- b. Data link Layer and
- c. Network Layers

30. Which layers are user support layers?

- a. Session Layer
- b. Presentation Layer and
- c. Application Layer

31. Which layer links the network support layers and user support layers?

The Transport layer links the network support layers and user support layers.

32. What are the concerns of the Physical Layer?

Physical layer coordinates the functions required to transmit a bit stream over a physical medium.

- a. Physical characteristics of interfaces and media
- b. Representation of bits
- c. Data rate
- d. Synchronization of bits
- e. Line configuration
- f. Physical topology
- g. Transmission mode

33. What are the responsibilities of Data Link Layer?

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

- a. Framing
- b. Physical Addressing
- c. Flow Control
- d. Error Control
- e. Access Control

34. What are the responsibilities of Network Layer?

The Network Layer is responsible for the source-to-destination delivery of packet possibly across multiple networks (links).

- a. Logical Addressing
- b. Routing

35. What are the responsibilities of Transport Layer?

The Transport Layer is responsible for source-to-destination delivery of the entire message.

- a. Service-point Addressing
- b. Segmentation and reassembly
- c. Connection Control
- d. Flow Control
- e. Error Control

36. What are the responsibilities of Session Layer?

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

- a. Dialog control
- b. Synchronization

37. What are the responsibilities of Presentation Layer?

The Presentation layer is concerned with the syntax and semantics of the information exchanged between two systems.

- a. Translation
- b. Encryption
- c. Compression

38. What are the responsibilities of Application Layer?

The Application Layer enables the user, whether human or software, to access the network. It provides user interfaces and support for services such as e-mail, shared database management and other types of distributed information services.

- a. Network virtual Terminal
- b. File transfer, access and Management (FTAM)
- c. Mail services
- d. Directory Services

39. What are the two classes of hardware building blocks?

Nodes and Links.

40. What are the different link types used to build a computer network?

- a. Cables
- b. Leased Lines
- c. Last-Mile Links
- d. Wireless Links

41. What are the categories of Transmission media?

- a. Guided Media
 - i. Twisted - Pair cable
 - 1. Shielded TP
 - 2. Unshielded TP
 - ii. Coaxial Cable
 - iii. Fiber-optic cable
- b. Unguided Media
 - i. Terrestrial microwave
 - ii. Satellite Communication

42. What are the types of errors?

- a. Single-Bit error
In a single-bit error, only one bit in the data unit has changed
- b. Burst Error
A Burst error means that two or more bits in the data have changed.

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49. What is Error Detection? What are its methods?

Data can be corrupted during transmission. For reliable communication errors must be deducted and Corrected.

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

The common Error Detection methods are

- a. Vertical Redundancy Check (VRC)
- b. Longitudinal Redundancy Check (VRC)
- c. Cyclic Redundancy Check (VRC)
- d. Checksum

50. What is Redundancy?

The concept of including extra information in the transmission solely for the purpose of comparison.

This technique is called redundancy which helps in error detection and correction.

51. What is VRC?

It is the most common and least expensive mechanism for Error Detection.

In VRC, a parity bit is added to every data unit so that the total number of 1s becomes even for even parity. It can detect all single-bit errors.

It can detect burst errors only if the total number of errors in each data unit is odd.

52. What is LRC?

In LRC, a block of bits is divided into rows and a redundant row of bits is added to the whole block.

It can detect burst errors. If two bits in one data unit are damaged and bits in exactly the same positions in another data unit are also damaged, the LRC checker will not detect an error.

In LRC a redundant data unit follows n data units.

53. What is CRC?

CRC, is the most powerful of the redundancy checking techniques, is based on binary division.

54. What is Checksum?

Checksum is used by the higher layer protocols (TCP/IP) for error detection.

55. List the steps involved in creating the checksum.

- a. Divide the data into sections
- b. Add the sections together using 1's complement arithmetic
- c. Take the complement of the final sum, this is the checksum.

56. What are the Data link protocols?

Data link protocols are sets of specifications used to implement the data link layer. The categories of Data Link protocols are

1. Asynchronous Protocols
2. Synchronous Protocols
 - a. Character Oriented Protocols
 - b. Bit Oriented protocols

57. Compare Error Detection and Error Correction:

The correction of errors is more difficult than the detection.

In error detection, checks only any error has occurred. In error correction, the exact number of bits that are corrupted and location in the message are known.

The number of the errors and the size of the message are important factors.

58. What is Forward Error Correction?

Forward error correction is the process in which the receiver tries to guess the message by using redundant bits.

59. Define Retransmission?

Retransmission is a technique in which the receiver detects the occurrence of an error and asks the sender to resend the message.

Resending is repeated until a message arrives that the receiver believes is error-free.

60. What are Data Words?

In block coding, we divide our message into blocks, each of k bits, called datawords. The block coding process is one-to-one.

The same data word is always encoded as the same codeword.

61. What are Code Words?

"r" redundant bits are added to each block to make the length $n = k + r$.

The resulting n-bit blocks are called code words. $2^n - 2^k$ code words that are not used.

These codewords are invalid or illegal.

62. What is a Linear Block Code?

A linear block code is a code in which the exclusive OR (addition modulo-2) of two valid code words creates another valid codeword.

63. What are Cyclic Codes?

Cyclic codes are special linear block codes with one extra property.

In a cyclic code, if a codeword is cyclically shifted (rotated), the result is another codeword.

64. Define Encoder?

A device or program that uses predefined algorithms to encode, or compress audio or video data for storage or transmission use.

A circuit that is used to convert between digital video and analog video.

65. Define Decoder?

A device or program that translates encoded data into its original format (e.g. it decodes the data).

The term is often used in reference to MPEG-2 video and sound data, which must be decoded before it is output.

66. What is Framing?

Framing in the data link layer separates a message from one source to a destination, or from other messages to other destinations, by adding a sender address and a destination address.

The destination address defines where the packet has to go and the sender address helps the recipient acknowledge the receipt.

67. What is Fixed Size Framing?

In fixed-size framing, there is no need for defining the boundaries of the frames.

The size itself can be used as a delimiter.

68. What is Flow Control?

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

69. What is Error Control ?

Error control is both error detection and error correction.

It allows the receiver to inform the sender of any frames lost or damaged in transmission and coordinates the retransmission of those frames by the sender.

In the data link layer, the term error control refers primarily to methods of error detection and retransmission.

70. What Automatic Repeat Request (ARQ)?

Error control is both error detection and error correction.

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Error control in the data link layer is often implemented simply: Any time an error is detected in an exchange, specified frames are retransmitted.

This process is called automatic repeat request (ARQ).

71. What is Stop-and-Wait Protocol?

In Stop and wait protocol, sender sends one frame, waits until it receives confirmation from the receiver (okay to go ahead), and then sends the next frame.

72. What is usage of Sequence Number in Reliable Transmission?

The protocol specifies that frames need to be numbered.

This is done by using sequence numbers.

A field is added to the data frame to hold the sequence number of that frame.

Since we want to minimize the frame size, the smallest range that provides unambiguous communication.

The sequence numbers can wrap around.

73. What is Pipelining ?

In networking and in other areas, a task is often begun before the previous task has ended.

This is known as pipelining.

74. What is Sliding Window?

The sliding window is an abstract concept that defines the range of sequence numbers that is the concern of the sender and receiver.

In other words, the sender and receiver need to deal with only part of the possible sequence numbers.

75. Difference between the communication and transmission.

Transmission is a physical movement of information and concerns issues like bit polarity, synchronisation, clock etc.

Communication means the meaningful exchange of information between two communication media.

76. What are the possible ways of data exchange?

(i) Simplex (ii) Half-duplex (iii) Full-duplex.

75. What is attenuation?

The degeneration of a signal over distance on a network cable is called Attenuation. It is usually represented in dB.

76. Difference between bit rate and baud rate.

Bit rate is the number of bits transmitted during one second whereas baud rate refers to the number of signal units per second that are required to represent those bits.

$\text{baud rate} = (\text{bit rate} / N)$

where N is no-of-bits represented by each signal shift.

77. What is Protocol Data Unit?

The data unit in the LLC level is called the protocol data unit (PDU).

The PDU contains of four fields a destination service access point (DSAP), a source service access point (SSAP), a control field and an information field.

DSAP, SSAP are addresses used by the LLC to identify the protocol stacks on the receiving and sending machines that are generating and using the data.

The control field specifies whether the PDU frame is a information frame (I - frame) or a supervisory frame (S - frame) or a unnumbered frame (U - frame).

78. What are the data units at different layers of the TCP / IP protocol suite?

The data unit created at the application layer is called a message, at the transport layer the data unit created is called either a segment or an user datagram, at the network layer the data unit created is called the datagram, at the data link layer the datagram is encapsulated in to a frame and finally transmitted as signals along the transmission media.

79. What are the important topologies for networks?

1. **BUS topology:** In this each computer is directly connected to primary network cable in a single line.

Advantages: Inexpensive, easy to install, simple to understand, easy to extend.

2. **STAR topology:** In this all computers are connected using a central hub.

Advantages: Can be inexpensive, easy to install and reconfigure and easy to trouble shoot physical problems.

3. **RING topology:** In this all computers are connected in loop.

Advantages: All computers have equal access to network media, installation can be simple, and signal does not degrade as much as in other topologies because each computer regenerates it.

80. What is difference between baseband and broadband transmission?

In a baseband transmission, the entire bandwidth of the cable is consumed by a single signal.

In broadband transmission, signals are sent on multiple frequencies, allowing multiple signals to be sent simultaneously.