

## Chapter 7 Review Questions

1. **What does a Modem stand for?**  
a combined device for modulation and demodulation, for example, between the digital data of a computer and the analog signal of a telephone line
2. **Explain the function of modem.**  
A modems main function is to convert digital to analog and vise versa
3. **Define data rate**  
Number of bits which a modem can transmit in one second
4. **Define baud rate.**  
Number of signals which a modem can transmit in one second
5. **Explain ASK modulation.**  
The amplitude of the signal changes. The receiver recognizes these modulation changes as voltage changes.
6. **Explain FSK modulation.**  
Frequency Shift Keying is represented by a change to the frequency of the original signal
7. **Explain PSK modulation.**  
Phase Shift Keying the phase of the signal is changed to represent ones and zeros. Shift in degree
8. The speed of Modem is represented by Mbps (Megabits per second)
9. **What is the speed of modems currently being produced?**  
**Dial up:** 56 kbps  
**DSL:** 10 Mbps  
**Cable:** 30 Mbps
10. **Explain 56K modem operation.**  
Designed for one-end digital connection from the server to the Public Switch Telephone Network (PSTN); the subscriber line (line that connects to the modem) remains analog.
11. **Distinguish between data rate and baud rate**  
Data rate is the number of bits transmitted per second where the baud rate is the number of signal units transmitted per second. One signal unit is able to represent one or more bits. Therefore, baud rate is always  $\leq$  data rate but never greater.
12. **Draw a constellation diagram for 32QAM using 2 amplitudes**
13. **What does DSL stand for?**

Digital Subscriber Line (DSL) is the latest modem tech, using twisted pair wires to deliver data and voice at speeds ranging from 64kbps to 50 Mbps.

14. **What does ADSL stand for?**

Asymmetrical Digital Subscriber Line (ADSL) supports voice and data simultaneously. Data rate from service provider to the user is 6 Mbps and is 786 kbps from the user to the service provider (telephone service)

15. **Explain ADSL operation.**

Uses an existing twisted-pair telephone line to access the Internet for transferring information such as multimedia. ADSL transfers data at a higher rate downstream (from company switch) to the subscriber than upstream (from sub to company). The up / down data rate is a factor of the distance between the company switch and sub.

**Down rate:** 1.5 – 8 Mbps

**Up rate:** 16kbps – 640kbps

**Transmit data:** 6 – 8 Mbps

ADSL does not affect the current telephone voice channel.

16. **What type of Modulation is used for ADSL?**

ADSL uses Discrete Multi-Tone Modulation (DMT)

17. **Explain xDSL?**

xDSL is basically just DSL but the “x” is a wildcard that can be ADSL, HDSL, SDSL, VDSL. xDSL uses digital encoding to provide more bandwidth over existing twisted lines.

18. **Why can ADSL transfer information faster than a modem?**

ADSL can transfer information faster than a modem because DSL is usually used for downloading more than uploading. It also supports voice and data simultaneously (at the same time)

19. **Is ADSL dependent on length of cable?**

Yes

20. **What type of cable is used for ADSL?**

CAT cables (CAT 5, CAT 6, CAT 7)

21. **What are the components of a cable TV system?**

**Trunk cable:** head end transmits TV signals over this to a group of subs

**Coaxial amplifier:** is to amplify the signal and works in either direction. (feeder and drop)

**Drop cable:** part of the cable system that connects the subscriber to the feeder cable

**Feeder cable:** connected to trunk cable to cover a large area.

22. **What does HFC stand for?**

Hybrid Fiber Cable (HFC) combination of fiber-optic cable and coaxial cable.

23. **What is bandwidth of a TV channel?**  
TV channels require 6Mhz of bandwidth
24. **What type of modulation is used in cable TV modems for upstream transmission?**  
64-QAM or 256-QAM modulation to transmit information from the head end to the cable modem
25. **What is the type of modulation is used in cable TV for downstream transmission?**  
From cable modem to head end Quadrature Phase Shift Keying (QPSK) modulation is used.
26. **What type of NIC is used in a computer connected to cable TV Modem?**  
10Base-T
27. **List the devices which can be connected to a cable Modem**
- Computers
  - Switch
  - Router
  - Cable Ready TV
  - VCR / DVD Players
  - Set-top converter box
28. What is baud rates of ASK with data rate 600 bits per second?  
 $600 \text{ bps} = 600 \text{ baud}$   
 $600 \text{ bps} = 0.6 \text{ kbaud}$
29. What is the data rate of a modem using frequency shift keying with the baud rate of 300 signal per second?
30. What is data rate of a QAM signal with baud rate of 1200 and each signal represented by 4 bits?
31. Calculate number of the bits represented by each signal for a PSK signal with data rate of 2400 bps and baud rate of 600
32. How many bits per signal can be represented by 32 QAM signal?
33. Calculate the baud rate of a 32 QAM signal with data rate of 25Kbps
34. **What does ISDN stand for?**  
Integrated Services Digital Network is a set of digital transmission standards which are used for end-to-end digital connectivity. ISDN supports voice and data. Integrates voice, data, video and audio over the same network. Uses digital signal which is less vulnerable to noise compared to the analog signal used by a modem.
35. **List the types of ISDN.**  
Basic Rate Interface (BRI)

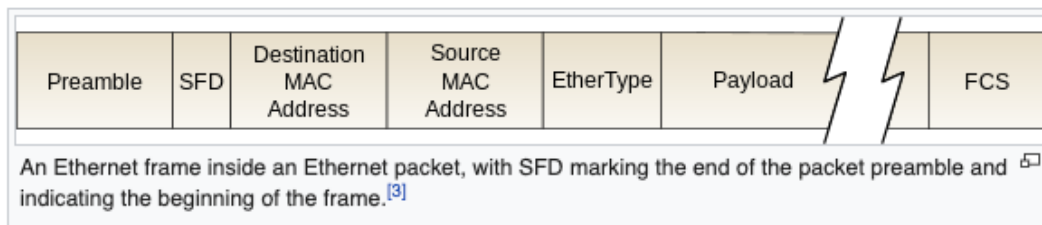
## Primary Rate Interface (PRI)

36. **How many channels does Basic Rate Interface have?**  
BRI uses TWO 64 Kbps B-channels and ONE 16 Kbps D channel. By combining two B-channels, the total data transmission rate is 128 Kbps.
37. **List the data rates of the B channel and D channel for BRI.**  
B Channel:  $2 * 64\text{Kbps} = 128\text{ Kbps}$   
D Channel:  $1 * 16\text{Kbps} = 16\text{Kbps}$   
 $2B + D = \text{total rate}$
38. **How many devices can be connected to BRI ISDN?**  
Can support up to 8 devices
39. **What is the data rate of the D channel for PRI?**  
B Channels:  $23 * 64\text{ Kbps} = 1.472\text{ Mbps}$   
D Channels:  $1 * 64\text{ Kbps} = 64\text{ Kbps}$   
 $23B + D = 1.536\text{ Mbps bandwidth}$

## Chapter 8 Review

1. **Define 10BaseT**  
10BaseT uses a UTP cable as transmission media and all stations are connected to a repeater or hub. The repeater (hub) is to accept frames from one port and retransmit the frames to all the other ports
2. **What do UTP and STP stand for?**  
**UTP:** Unshielded twisted pair, copper cable used for phone wiring and local area networks  
**STP:** Shielded Twisted pair, extra covering protects transmission line from electromagnetic interference. Used in ethernet networks and fast data rate ethernets
3. **What is 10BaseT topology?**  
**10** represents the frequency in Mhz for which the cable is made. Translates 10Mbit a second (1.2 Mbps)  
**Base** refers to Baseband, the type of communication used by ethernet. When a computer is transmitting it uses all available bandwidth.  
**T** represents “Twisted Pair”, carries signal.  
Typically, 10BaseT uses CAT cables.
4. **What is a network segment?**  
A portion of a computer network. Depends on the nature of the network and the device(s) used to interconnect end stations.

5. Show Ethernet II frame format and function of each field



Starting Delimiter (1 byte)	Destination Address (6 bytes)	Source Address (6 bytes)	Protocol Type (2 bytes)	Information field 46-1500	Frame Check Sequence (4 bytes)
-----------------------------	-------------------------------	--------------------------	-------------------------	---------------------------	--------------------------------

**Preamble:** 56 bit (7 byte) pattern of alternating 1 and 0 bits, allowing devices to sync receiving clocks, bit level sync.

**SFD (start frame delimiter):** byte level sync, mark new incoming frame, transmitted in order left to right. 8 bit (1 byte) marks end of preamble. Designed to break the bit pattern of the preamble and signal the start of the actual frame.

**DA:** Destination Address, where the packet (frame) is sent (6 bytes)

**SA:** Source Address, where the packet (frame) came from (6 bytes)

**Protocol:** the field which defines the type of communication method to send information.

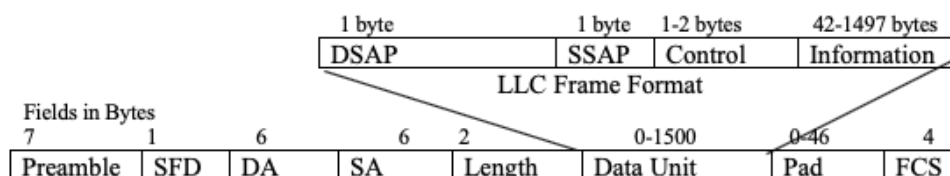
**Information Field:** contains actual information. Min size 46 bytes – Max 1500 bytes

**Frame Check Sequence (FCS):** used for error detection to determine if any info was corrupted during transmission. Uses CRC-32 for err detection.

6. Explain the function of a repeater or a hub

Accept frames from one port and retransmit to all other ports.

7. Show the IEEE 802.3 frame formats and function of each field.



**Preamble:** The preamble provides signal synchronization and consists of seven bytes of alternating 1 and 0 bits.

**Start of Frame Delimiter (SFD):** The SFD represents the start of frame and is always set to 10101011.

**Destination Address (DA):** 6 byte (48 bits) hardware address of the recipient station.

**Source Address (SA):** shows the address of the source which the frame originated.

**Length Field:** The two-byte field defines the number of bytes in the data field.

**Data Field:** The data field contains the actual information. The IEEE specifies that the minimum size of data field must be 46 bytes, and the maximum size is 1500 bytes.

**Destination Service Access Point (DSAP):** The MAC layer passes information to the LLC layer, which must then determine which protocol the incoming information belongs to, such as IP, NetWare or DecNet.

**Source Service Access Point (SSAP):** The SSAP determines which protocol is sent to the destination protocol, such as IP or DecNet.

**Control Field:** The control field determines the type of information in the information field, such as the supervisory frame, the unnumbered frame, and the information frame.

**Pad Field:** If the information in the data field is less than 46 bytes, extra information is added in the pad field to increase the size to 46 bytes.

**Frame Check Sequence (FCS):** The FCS is used for error detection to determine if any information was corrupted during transmission. IEEE uses CRC-32 for error detection.

**8. Describe the access method for Ethernet.**

Access method is a way of sharing common transmission medium (cable, wireless link) between several hosts. Ethernet is built upon the medium access called CSMA/CD (Carrier Sense Multiple Access/Collision Detection)

**9. What does CSMA/CD stand for?**

Previous

**10. What is IEEE 802.2?**

The original name for ISO/IEC standard which defines logical link control (LLC) as the upper portion of data link layer.

**11. What is a MAC Address?**

Mac Addresses (Media Access Control) or physical address. The IEEE oversees the physical addresses of NICs world-wide by assigning 22 bits of physical address to the manufacturer of network interface cards. Unique.

**12. Explain collisions in Ethernet.**

A collision is the result of two devices on the same Ethernet network attempting to transmit data at exactly the same time. The network detects the "collision" of the two transmitted packets and discards the both. Natural occurrences.

**13. What is a jam signal?**

A signal that carries a bit pattern sent by a data station to inform the other stations that they must not transmit. Indicates that a jam has occurred.

**14. Explain broadcast addresses.**

Means that the recipients of the frame is every station in the network.

**15. Describe unicast addresses.**

Recipient is an individual station.

**16. What is the size a network interface card address?**

Hardware component that connects a computer to a network (46 bits)

**17. What is the application of CRC (Cyclic Redundancy Check)?**

Error detecting code commonly used in digital networks and storage devices to detect accidental changes to raw data. Blocks of data entering these systems get a short check value.

**18. What is the maximum size of a frame for IEEE 802.3?**

Min 64 bytes – Max 1518 bytes

**19. How many bits of a network address represent the manufacturer ID?**

22 bits

**20. How do computers distinguish one another on an Ethernet network?**

Mac addresses (unique to each device)

**21. What happens when two or more computers simultaneously transmit frames on an Ethernet network?**

Collision occurs (jam signal)

**22. What is the function of the FCS field in the Ethernet frame format?**

The FCS field checks for errors while transmitting frame, uses CRC-32

**23. What is the function of the back-off algorithm in an Ethernet network?**

A collision resolution mechanism which is used in random access MAC protocols (CSMA/CD). Re-schedule re-transmissions after collisions.

**24. What is the function of the length field in an Ethernet frame?**

Defines the number of bytes in the data field.

**26a. What is function of Protocol type in Ethernet II frame format**

Defines the type of communication method to send information

**27. List the IEEE sublayers of the data link layer**

**Logical Link Control (LLC):** establish a logical connection between source and destination

**Media Access Control (MAC):** to access the network, which uses CSMA/CD

**28. What is function of the PAD field in IEEE 802.3 frame format?**

PAD field: the info in the data field is less than 46 bytes, extra info is added to the pad field to increase the size to 46 bytes.

**1. Explain the following terms:**

- a. 100BaseT4
    - Early implementation of Fast Ethernet. Requires 4 twisted pair wires
    - 100 meters
    - One transmits
    - One receives
    - 2 switch direction
  - b. 100BaseTX
    - 2 wire pairs
  - c. 100BaseFX
    - Wiring uses fiber optic cable
    - Campus backbones
    - 412 meters
2. What is the cable type of 100BaseTX?  
CAT cables
  3. What is the difference between 100BaseTX and 100BaseT4?  
T4 uses 8 wires, does not use extra 4 wires for bandwidth. TX uses 4 wires and transmits faster.
  4. What is the application of a Class I repeater?  
Class I repeater is allowed to have larger timing delays, and operates by translating line signals on an incoming port to digital form, and then retranslating them to line signals when sending them out on the other ports. This makes it possible to repeat signals between media segments that use different signaling techniques
  5. What is the application of a Class II repeater?  
Class II repeater is restricted to smaller timing delays, and immediately repeats the incoming signal to all other ports without a translation process. To achieve the smaller timing delay, Class II repeaters connect only to segment types that use the same signaling technique
  6. What is the maximum network diameter using two Class II repeaters in a 100BaseT network?
  7. Name the IEEE committee that developed the standard for Fast Ethernet.  
802.3u
  8. Identify and explain the access method for Fast Ethernet.
  9. What is the function of the convergence sublayer?  
Data Linked Layer. Wraps the data in a header and trailer that contain necessary info.
  10. What are the types of media used for Fast Ethernet?
  11. What type of signal encoding is used for 100BaseT4?  
MLT3 encoding



12. What type of signal encoding is used for 100BaseFX?  
Block encoding
13. Convert 84 Hex to 5 bit symbols and then show the corresponding MLT digital signals.
14. Show the binary value for ternary code 0-+-+0 ternary code.

## Chapter 10 Review

### 1. List LAN interconnection devices.

- Repeater
- Bridge (Transparent, Learning, Source Routing)
- Switch
- Router

### 2. What is the function of a repeater?

A device used to connect several segments of an LAN to extend the allowable length of a network. A repeater accepts traffic from its input port and retransmits the traffic at its output port.

### 3. Describe the function of a bridge?

**Definition:** Used to connect same segments of a network together (Homogenous Network) and operates in the data link layer. Bridges forward frames based on the destination addresses of the frames, as well as control data flow and detect transmission errors.

**Function:** To analyze the incoming destination address of a frame and make a forwarding decision based on the location of the station. The bridge forwards the data from one LAN to another without alteration of the frame. Bridges allow network admins to segment their networks transparently, meaning that the individual station does not need to know that there is a bridge in the network. Bridges are capable of filtering (eliminating unnecessary frames). By dividing large networks into segments and using bridges to link segments together and throughput of network will increase. Extend length of LAN.

### 4. what layer of OSI model bridge operate

Data Link Layer

### 5. Explain the operation of a transparent bridge.

Also known as the Learning Bridge requires no initial programming. It can learn the location of each device by accepting a frame from the network segment and recording the MAC address and the port number. Frame > Bridge > Retransmit Frame to all segments of network > learn which station is connected to which segment of network.

### 6. Explain the operation of source routing bridge.

The frame contains the entire route to the destination. Used for a Token Ring Network because a token ring frame has a field that specifies the routing of the frame.

**7. Explain the function of a Router.**

The main function of a router is to determine the optimal data path and transfer information using that path. Another is to convert one type of frame to another type. Example would be Token Ring Network > Ethernet Frame.

**8. Explain a static router.**

A router that can be configured manually by a network admin. The routing table is administered manually by the network admin who determines the route.

**9. what is function of a router?**

The main function of a router is to determine the optimal data path and transfer information using that path. Another is to convert one type of frame to another type. Example would be Token Ring Network > Ethernet Frame.

**10. A Router works in which layer of the OSI model?**

Network Layer

**11. Explain dynamic router.**

A router that can be configured by itself. The router sets up its own routing table and updates it automatically. The dynamic router also exchanges information with the next router on the network.

**12. What is the application of a gateway?**

To convert one protocol to another protocol.

**13. A Gateway operates in which layers of the OSI model?**

Application Layer

**14. What is the difference between a Gateway and a Router?**

Gateways regulate traffic between two dissimilar networks, while routers regulate traffic between similar networks.

**15. Explain switch operation.**

Switches are used to connect LAN segments together to increase network throughput. A switch is a device with multiple ports which accepts packets from the ports of other computing devices. When a switch receives packets, it examines the destination addr, then transmits the packets to the intended port of a host with the same destination addr. Data Link Layer

**16. What is the application of a symmetric switch?**

Provides switching between segments which have the same bandwidth. Ex: 10 Mbps to 10Mbps or 100Mbps to 100Mbps.

**17. What is application of an asymmetric switch?**

Provides switching between segments of different bandwidths. Ex: 10Mbps to 100Mbps.

**18. Explain the operation of a cut-through Switch.**

Reads the first few bytes of the packet to obtain the source and destination addr. The packets are sent to the destination segment without checking the rest of the packet for errors. The cut-through switch uses ASIC processor for processing the packet.

**19. Explain the operation of a store-and-forward Switch.**

Stores the entire packet, then checks for errors in the packet. If a packet contains errors, it is discarded, otherwise the switch forwards the packet to the specified destination. The store-and-forward switch is more suitable for an Ethernet LAN because it will filter out any corrupted packets to the other segments and therefore reduce collision.

**20. What does VLAN stand for?**

Virtual LAN or IEEE 802.1q. A configuration option on a LAN switch which allows network managers the flexibility to group or segment ports on an individual switch into logically defined LANs.

Benefits:

- Provides a way for network admins to decrease the size of broadcast domain
- Provide security options for admins
  - Prevent hosts on virtual segments from reaching another.
- Logical Segmentation of workgroups within an organization.

**21. What is the difference between a router and a L3 Switch?**

L3 switches are typically faster than routers. In a Layer 3 switch, on the other hand, whenever a routing table searches for any specific destination, a cache entry is made in a fast memory. This cache entry contains the source-destination pair and next hop address. Once this cache entry is in place, the next packet with the same source and destination pair does not have to go through the entire process of searching the routing table. Next hop information is directly picked up from the cache.

**22. What is the application of a L4 switch?**

Operates on the Transport Layer. Operates on the port number to forward a packet to the destination. An L4 switch is used for network security and for filtering packets based on application protocol.

23. Suppose a company has two working groups, A and B. Group A has 4 computers and group B has 3 computers; all connected to an eight port Ethernet switch. Both groups need to access a common file server FS1. There is an in-house requirement that group A computers should not be able to see Group B computers in the Network.

- a. Draw a diagram showing an Ethernet switch with seven computers and file server.
- b. Show the VLAN connectivity matrix for the above requirements.