

1

Mawlana Bhashani Science and Technology  
University

Name: Jamnatul Ferdoush Dhima

ID: IT- 18012

Session: 2017 - 2018

1. a) What is data encoding? Mention the types of data encoding? (1+3)

b) How you define by channel capacity (3)

c) Explain the types of transmission media (6)

2. a) What are four SONET layers?

Discuss the function of each SONET layers. (1+4)

b) Discuss about connection oriented. (4)

c) What is signal? Define the types of signal (1+4)

2

3. a) What are the significance of the twisting on twisted pair cable ? (5)

b) Describe about optical fiber. (4)

c) Explain about transmission impairment (5)

4. a) What are multiplexing and demultiplexing in transport layer ? (5)

b) What do you mean by code division multiplexing ? (5)

c) Describe about parity check (4)

5. a) How you define switching in computer networking ? (4)

b) Briefly compare between connectionless and connection oriented switching ? (6)

c) What is connection less switching ? (4)

6. a) Write some advantages of optical fiber over twisted-pair fiber (6)  
b) Describe the functionality of data link layer (5)  
c) What is optical fiber (3)

7. a) Explain the three phases of circuit switching (4)  
b) What is parity check (4)  
c) Discuss about code division multiplexing (5)

8. a) What do you mean by line coding?  
Give some properties of it? (1+5)  
b) What do you mean by error correction (4)

- c) Explain about Cyclic Redundancy Check? (4)

4

Answer to the question no 1 (a)

Q. What is data encoding? Mention the types of data encoding.

Answer: It is the process of employing numbers of patterns of voltage and current levels to show 1s and 0s of the digital signals on the transmission link. Unipolar, polar, Bipolar and Manchester are the general types of line coding.

Encoding Techniques:

- Analog data to Analog Signals: Techniques such as Frequency Modulation, Amplitude Modulation and phase Modulation of analog signals come under this category.

**XyliMelts®**

• Analog data to digital signals: Pulse Code Modulation (PCM) does the digitization process also called as digital modulation. Key factors in PCM are sampling and quantization. Better output can be obtained from Data Modulation than PCM.

• Digital Data to Analog Signals: Techniques such as Amplitude Shift Keying (ASK) frequency shift keying (FSK), Phase shift keying (PSK) etc, come under the category.

• Digital data to Digital signals: those are discussed in this section. Below are the ways to map digital data to digital signals,

Answers to the question no 1 (b)

Q. How you define by channel capacity?

Answer: Channel capacity is a maximum rate that a channel can transmit. It is measured in bits per second (bps). Channel capacity is a rough value as measuring takes into account only the whole amount of data transferred, but leaves out of account communication quality.

Bandwidth can be considered as a subset of channel capacity term. When bandwidth is measured, the maximum volume of information that can be accurately transferred per unit of time is taken into account. For example, channel capacity may be very high, but low signal quality would make bandwidth low as well.

7

### Answer to the question no 1 (c)

Q. Explain the types of transmission media.

Answer: The transmission medium can be defined as a pathway that can transmit information from a sender to a receiver.

Transmission media are located below the physical layer and are controlled by the physical layer. Transmission media are also called communication channels.

Transmission media are of two types.

- Guided Transmission Medium
- Unguided Transmission Medium

✓ Guided Transmission medium: are also called bounded media or wired media. They comprise cables or wires through which data is transmitted. They are called guided since they provide a physical conduit from

the sender device to the receiver device.

The signal travelling through these media are bounded by the physical limits of the medium.

The most popular guided media are-

- Twisted pair cable
- Coaxial cable
- Power lines
- Fiber Optics.

Unguided Transmission Medium; are also called wireless media. They transport data in the form of electromagnetic waves that do not require any cables for transmission. These media are bounded by geographical boundaries. This type of communication is commonly referred to as

9

wireless communications.

Unguided signals can travel in three ways -

- Ground propagation
- Sky propagation
- Line-of-sight propagation.

The commonly used unguided transmission are -

- Radio transmission
- Microwave transmission
- Infrared transmission
- Light transmission.

Answer to the question no 2 (a)

Q. What are four SONET layers? Discuss the functions of each SONET layers.

Answer: The SONET standard includes four functional layers; the photonic, the section, the line, and the path layer. They

correspond to both the physical and the data link layers.

### path layer:

The path layer is responsible for the movement of a signal from its optical source to its optical destination. At the optical source, the signal is changed from an electronic form into an optical form, multiplexed with other signals, and encapsulated in a frame.

line layer: The line layer is responsible for the movement of a signal across a physical line. Line layer overhead is added to the frame at this layer. STS multiplexers and add/drop multiplexers provide line layer function.

Section Layer: The section layer is responsible for the movement of a signal across a physical section. It handles framing, scrambling, and error control. Section layer overhead is added to the frame at this layer.

Photonic Layer: The photonic layer corresponds to the physical layer of the OSI model. It includes physical specifications for the optical fiber channel, the sensitivity of the receiver multiplexing functions, and so on.

Answer to the question no 2 (b)

Q. Discuss about connection oriented?

Answer: In telecommunications, connection-oriented describes a means of transmitting data in which the devices at the end points use a preliminary protocol to establish

12

an end-to-end connection before any data is sent. Connection-oriented protocol service is sometimes called a 'reliable' network service, because it guarantees that data will arrive in the proper sequence. Transmission control protocol (TCP) is a connection-oriented protocol. For connection-oriented communications, each end point must be able to transmit, so that it can communicate. The alternative to connection-oriented transmission is the connectionless approach, in which data is sent from one end point to another without prior arrangement. Connectionless protocols are usually described as stateless because the end points have no protocol-defined way to remember where they are in a "conversation" of message exchanges. Because

XyliMelts®

13

they can keep track of a conversation, connection-oriented protocols are sometimes described as stateful.

Answer to the question no 2(c)

Q. What is signal? Define the type of signal.

Answer:- A signal is a way of conveying information. Gestures, semaphores, images, sound all can be signals.

Technically - a function of time, space or another observation variable that conveys information.

We will distinguish 3 forms of signals,

- Continuous-Time/Analog signal.
- Discrete-Time signal
- Digital signal.

Answer to the question no - 3 (a)

Q. What are the significance of the twisting on twisted pair cable. ?

Answer: There are several advantages that come with twisting cables together, and possibly shielding them with a plastic cover;

- Twisting cables forms a thin and more flexible cable that is easy to string up between.

- Twisting means that more lines can be fed through the same ducts.

- An unshielded twisted pair costs a lot less per meter or foot than other types of cables.

- Crosstalk from other cables is minimized.

Answer to the question no 3(b)

Q. Describe about optical fiber?

Answer: A fiber-optic cable is made up of incredibly thin strands of glass or plastic known as optical fibers; one cable can have as few as two strands or as many as several hundred. Each strand is less than a tenth as thick as a human hair and can carry something like 25,000 telephone calls, so an entire fiber-optic cable can easily carry several million calls.

Fiber-optic cables carry information between two places using entirely optical (light-based) technology. Suppose, you wanted to send information from your computer to a friend's house down the street using fiber optics.

Answer to the question no - 2 (c)

Q. Explain about transmission impairment; ?

Answer: In the data communication system, analog and digital signals go through the transmission medium. Transmission media are not ideal. There are some imperfections in transmission media. So, the signals sent through the transmission medium are also not perfect. This imperfection cause signal impairment. It means that, signals are transmitted at the beginning of the medium are not the same as the signals that are received at the end of the medium that is what is sent is not what is received. These impairments tend to deteriorate the quality of analog and digital signals.

Answer to the question no 9 (a)

Q. What are multiplexing and demultiplexing in transport layer?

Answer: Multiplexing and demultiplexing in transport layer means extending the host-to-host delivery service provided by the network layer to a process-to-process delivery service for application running on the hosts. A multiplexing-demultiplexing service is needed for all computer networks.

At the destination host, the transport layer receives segments from the network layer just below. The transport layer has the responsibility of delivering the data in these segments to the appropriate application process running in the host.

Answer to the question no 4 (b)

Q. What do you mean by code division multiplexing?

Answer: Code division Multiplexing (CDM) is a network technique in which multiple data signals are combined for simultaneous transmission over a common frequency band. When CDM is used to allow multiple users to share a single communications channel, the technology is called code division multiple access (CDMA). CDMA uses spread spectrum, a technology that was developed in World War II to prevent enemies from intercepting and jamming transmissions. In spread spectrum, a data signal is sent over a range of frequencies in an assigned frequency spectrum.

19

Answer to the question no 4(c)

Q. Describe about parity check?

Answer - A parity check is the process that ensures accurate data transmission between nodes during communication. A parity bit is appended to the original data bits to create an even or odd bit number. The number of bits with value one. The source then transmits this data via a link, and bits are checked and verified at the destination. Data is considered accurate if the number of bits (even or odd) matches the number transmitted from the source.

Answer to the question no 5(a)

Q. How you define switching in computer networking?

Answer - Switching is process to forward packets coming in from one port to a port leading towards the destination. When data comes on a port it is called ingress, and when data leaves

a port or goes out it is called egress. A communication system may include number of switches and nodes. At broad level, switching can be divided into two major categories,

• Connectionless: The data is forwarded on behalf of forwarding tables. No previous handshaking is required and acknowledgements are optional.

• Connection Oriented: Before switching data to be forwarded to destination, there is ~~no~~ a need to pre-establish circuit along the path between both endpoints. Data is then forwarded on that circuit. After the transfer is completed, circuits can be kept for future use or can be turned down immediately.

21

Answer to the question no 5(b)

Q. Briefly compare between connectionless and connection oriented switching.

Answers

Connection Oriented	Connectionless
Connection-oriented service is related to the telephone system.	Connectionless service is related to the postal system.
This service is preferred by long and steady communication.	This service is preferred by bursty communication.
This service is necessary feasible	It is not compulsory not feasible
Congestion is not possible	Congestion is possible
Connection-oriented service gives the guarantee of reliability	Connection less service does not give the guarantee of reliability.

Answer to the question no 5(c)

Q. What is connectionless switching?

Answer: Unlike the case with connection-oriented services, the network has no state information to determine whether a packet is part of a stream of other packets. In particular, the network has no knowledge of the amount of traffic that will be sent by the user. Consequently, the network cannot set aside resources that would be needed to achieve a specific quality of service. Because of this limited information, only a restricted range of service quality can be offered. Typical QoS parameters include a bound on the maximum packet size and service priority: a higher priority packet is transmitted before a lower priority.

23

Answer to the question no 6 (a)

Q. Write some advantages of optical fiber over twisted pair fiber.

Answer: 1. Greater Bandwidth: Copper cables were originally designed for voice transmission and have a limited bandwidth. Fiber optic cables provide more bandwidth for carrying more data.

2. Faster speeds: Fiber optic cables have a core that carries light to transmit data. This allows fiber optic cables to carry signals at speeds that are only about 31 percent slower than the speed of light - faster than cat5 or cat6 copper cables.

3. Longer Distance: Fiber optic cables can carry signals much farther than the typical 328-foot limitation for copper cables.

4. Better Reliability: Fiber is immune to temperature changes, severe weather and moisture, all of which can hamper the

connectivity of copper cables, plus fiber doesn't carry electric current, so it's not bothered by electromagnetic interference (EMI) that can interrupt data transmission. It also does not present a fire hazard like old or worn copper cables can.

5. Thinner and sturdier: Compared to copper cables, fiber optic cables are thinner and lighter in weight. Fiber can withstand more pull pressure than copper and is less prone to damage and breakage.

6. More flexibility for the future.

7. Lower total cost of ownership: Although some fiber optic cables may have a higher initial cost than copper, the durability and reliability of fiber can make the total cost of ownership.

**XyliMelts®**

Answer to the question no 6 (b)

Q. Describe the functionality of data link layer.

Answer: Data link layer does many tasks on behalf of upper layer. These are:

- **Framing:** Data-link layer takes packets from Network layer and encapsulate them into frames. Then, it sends each frame bit-by-bit on the hardware. At receiver end, data link layer picks up signals from hardware and assembles them into frames.

- **Addressing:** Data-link layer provides layer-2 hardware addressing mechanism. Hardware address is assumed to be unique on the link. It is encoded into hardware at the time of manufacturing.

- **Synchronization:** When data frames are sent on the link, both machine must be synchronized in order to transfer to take place.

26

- Error Control: Sometimes signals may have encountered problem in transition and the bits are flipped. These errors are detected and attempted to recover actual data bits. It also provides error reporting mechanism to the sender.
- Flow Control: stations on same link may have different speed or capacity. Data link layer ensures flow control that enables both machine to exchange data on same speed.
- Multi Access: When host on the shared link tries to transfer the data, it has a high probability of collision. Data-link layer provides mechanism such as CSMA/CD to equip capability of accessing a shared media among multiple systems.

Answer to the question no 6 (c)

Q. What is optical fiber?

Answer: A fiber-optic cable is made up of inc. redibly thin strands of glass or plastic kn. own as optical fiber; one cable can have as few as two strands or as many as several hundred. Each strand is less than a tenth as thick as a human hair and can carry something like 25,000 telephone calls, so an entire fiber optic cable can easily carry several million calls.

Answer to the question no 7 (a)

Q. Explain the three phases of circuit switching?

Answer: phases of circuit switch connection

- Circuit Establishment: In this phase, a dedicated circuit is established from the source to the destination through a number of inter.

mediate switching centers. The sender and receiver transmits communication signal to request and acknowledge establishment of circuit.

- Data transfer: Once the circuit has been established from the source to the destination, the dedication connection remains as long as the end parties communicate.
- Circuit Destination: When data transfer is complete, the connection is relinquished. The disconnection is initiated by any one of the users. Disconnection involves removal of all intermediate links from the sender to the receiver.

29

Answer to the question no 7(b)

Q. What is parity check?

Answer: A parity check is the process that ensures accurate data transmission between nodes during communication. A parity bit is appended to the original data bits to create an even or odd bit number; the number of bits with value one. The source then transmits this data via a link and bits are checked and verified at the destination. Data is considered accurate if the number of bits matches the number transmitted from the source.

Answer to the question no 7(c)

Q. Discuss about code division multiplexing?

Answer: Code division multiplexing (CDM) is a networking technique in which multiple data signals are combined for simultaneous transmission over a common frequency band.

When CDM is used to allow multiple users to share a single communications channel, the technology is called code division multiple access (CDMA).

CDMA uses spread spectrum, a technology that was developed in World War II.

### Answers to the question no 8 (a)

Q. What do you mean by line coding? Give some properties of it?

Answer: A line code is the code used for data transmission of a digital signal over a transmission line. This process of coding is chosen so as to avoid overlap and distortion of signal such as inter-symbol interference.

Properties of line coding -

- As the coding is done to make more bits transmit on a single signal, the bandwidth

Used is much reduced.

- For a given bandwidth, the power is efficiently used.
- The probability of error is much reduced.
- Error detection is done and the bipolar too has a correction capability.
- Power density is much favorable.
- The timing content is adequate.
- Long strings of 1s and 0s is avoided to maintain transparency.

Answer to the question no 8(b)

Q. What do you mean by error correction?

Answer: In the digital world, error correction can be done in two ways.

- Backward Error correction: When the receiver detects an error in the data received, it requests back the sender to retransmit the data unit.

• Forward Error Correction: When the receiver detects some error in the data received, it executes error-correcting code, which helps it to autorecover and to correct some kinds of error.

The first one, Backward Error correction, is simple and can only be efficiently used where retransmitting is not expensive. For example, fiber optics. But in case of wireless transmission retransmitting may cost too much. In the latter case, Forward Error Correction is used.

To correct the errors in data frame, the receiver must know exactly which bit in the frame.

### Answer to the question no 8(c)

Q. Explain about Cyclic Redundancy Check?

Answer:- CRC is a different approach to detect if the received frame contains valid data. This technique involves binary division of the data bits being sent. The divisor is generated using polynomials. The sender performs a division operation on the bits being sent and calculates the remainder. Before sending the actual bits the sender adds the remainder at the end of the actual bits. Actual data bits plus the remainder is called a code word. The sender transmits data bits as code words.