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1. (a) What is Multiplexing and explain different types of multiplexing? 4  
(b) Write about Wavelength-division multiplexing? 5  
(c) Write about time Division multiplexing and Frequency division multiplexing? 5
2. (a) What is transmission medium? What are the different types of transmission medium? 5  
(b) Write about Guided medium? 4  
(c) Write about circuit switched Network? 5
3. (a) What is Switching and what are the different types of Switching Techniques? 5  
(b) Write about Un-guided medium? 4  
(c) Write about Datagram Network and virtual circuit Network? 5
4. (a) What is framing and explain different framing algorithms? 5  
(b) Write about Flow control and Error Control 5  
(c) Write about Simplest Protocol 4

5. (a) Write about Piggybacking ?

(b) Explain about HDLC Configurations, Transfer Modes and different types of frames ? 5

(c) Explain about Control Fields of HDLC frames ? 5

6. (a) Write about Selective Repeat ARQ protocol ? 5

(b) Write about Go-Back-N ARQ protocol ? 4

(c) Write about Stop and wait with ARQ protocol ? 5

7. (a) Different Data Flow Directions ? 4

(b) What are the different spread spectrum techniques ? 5

(c) Explain Different Digital to Analog Conversion Techniques. 5

8. (a) Different methods for Digital signal transmission 5

(b) Write about Transmission Impairments 5

(c) Different Criteria for the performance of Networks. 4



(3)

Ans to the question no: 1(a)

\* What is Multiplexing and Explain different types of Multiplexing?

Ans:

Multiplexing:

Multiplexing is the set of techniques that allows the simultaneous transmission of multiple signals across a single data link. Whenever the bandwidth of a medium linking two devices is greater than the bandwidth needs of the devices, the link can be shared.

The three basic multiplexing techniques are

1. Frequency-division multiplexing
2. Wavelength-division multiplexing
3. Time-division multiplexing.

Ans to the question no: 1(b)

\* Write about Wavelength-division multiplexing.

Ans:

Wavelength division multiplexing (WDM) is designed to use the high data rate capability of fiber-optic cable. The optical fiber data rate is higher than the data rate of metallic transmission cable. Using a fiber-optic cable for one single line wastes the available bandwidth. Multiplexing allows us to combine several lines into one.

WDM is conceptually the same as FDM, except that the multiplexing and demultiplexing involve optical signals transmitted through fiber-optic channels.

Ans to the question no: 1(c)

\* Write about Time Division Multiplexing and Frequency Division Multiplexing.

Ans:



### Time Division Multiplexing :

Time Division Multiplexing (TDM) is a digital process that allows several connections to share the high bandwidth of a line. Instead of sharing a portion of the bandwidth as in FDM, time is shared. Each connection occupies a portion of time in the link.

### Frequency Division Multiplexing :

Frequency Division Multiplexing (FDM) is an analog technique that can be applied when the bandwidth of a link (in hertz) is greater than the combined bandwidths of the signals to be transmitted.

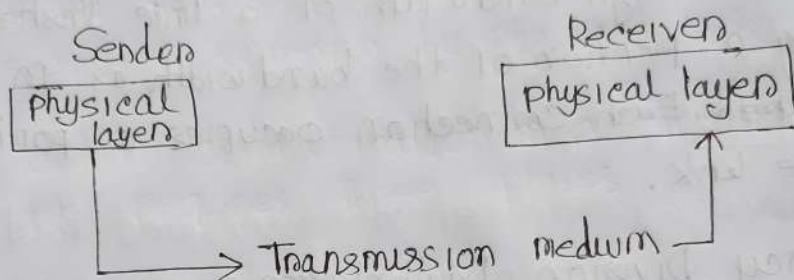
Ans to the question no: 2(a)

\* What is transmission medium? What are the different types of transmission medium?

Ans:

Transmission media are actually located below

the physical layer and are directly controlled by the physical layer. The following figure shows the position of transmission media in relation to the physical layer.



In telecommunications, transmission media can be divided into two broad categories:

- \* Guided
- \* Unguided

Guided media include twisted-pair cable, coaxial cable. Unguided medium is free space.

Ans to the question no: 2(b)

\* Write about Guided medium

Ans:



Guided media, which are those that provide a channel from one device to another, include twisted-pair cable, coaxial cable and fiber-optic cable.

### Twisted - Pair Cable :

A twisted pair consists of two conductors, each with its own plastic insulation, twisted together.

### Performance :

One way to measure the performance of twisted-pair cable is to compare attenuation versus frequency and distance.

### Applications :

Twisted-pair cable are used in telephone lines to provide voice and data channels.

### Coaxial cable :

Coaxial cable carries signals of higher frequency ranges than those in twisted pair cable.

Ans to the question no: 2(c)

\* Write about Circuit switched Network

Ans:

A circuit-switched network consists of a set of switches connected by physical links.

The actual communication in a circuit switched network requires three phases

- \* connection setup
- \* data transfer
- \* connection teardown

### 1. Setup Phase :

Before the two parties can communicate, a dedicated circuit needs to be established.

### 2. Data Transfer Phase :

After the establishment of the dedicated circuit the two parties can transfer data.

### 3. Teardown Phase :

When one of the parties needs to disconnect a signal is sent to each switch to release the resources.



Ans to the question no: 3(a)

\* What is switching and what are the different types of switching

Ans:

A network is a set of connected devices. Whenever we have multiple devices, we have the problem of how to connect them to make one-to-one communication possible.

There are three methods of switching have been important:

- \* Circuit switching
- \* Packet switching
- \* Message switching

Ans to the question no: 3(b)

\* write about Un-guided medium

Ans:

Unguided media transport electromagnetic waves without using a physical conductor. This type of communication is often referred to as wireless communication.

### 1. Ground propagation mode :

In ground propagation, radio waves travel through the lowest portion of the atmosphere, hugging the earth.

### 2. Sky propagation mode :

In sky propagation, higher-frequency radio waves radiate upward into the ionosphere where they are reflected back to earth.

### 3. Line-of-sight propagation mode :

In line-of-sight propagation, very high frequency signals are transmitted in straight lines directly from antenna to antenna.

Ans to the question no : 3(c)

\* Write about Datagram Network and Virtual circuit network.

Ans :



### Datagram Network :

In data communications, we need to send messages from one end system to another. If the message is going to pass through a packet-switched network, it needs to be divided into packets of fixed or variable size.

### Virtual circuit Network :

A virtual-circuit network is a cross between a circuit switched network and a datagram network. It has some characteristics of both. As - in a circuit-switched network, there are setup and teardown phases in addition to the data transfer phase.

Ans to the question no : 4(a)

Q. What is framing and explain different framing algorithms?

Ans :

The data link layer, on the other hand, needs to pack bits into frames, so that each frame is distinguishable from another. 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.

Frames can be of fixed or variable size

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.



### Variable-Size Framing :

In variable-size framing, we need to define the end of the frame and the beginning of the next.

### Ans to the question no : 4(b)

A Write about Flow control and Error Control.

Ans :

Flow control :

Flow control coordinates the amount of data that can be sent before receiving an acknowledgement and is one of the most important duties of the data link layer.

Any receiving device has a limited speed at which it can process incoming data and a limited amount of memory in which to store incoming data.

### 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.

### Ans to the question no: 4(c)

\* Write about simplest protocol

Ans:

Simplest protocol is one that has no flow or error control and it is a unidirectional protocol in which data frames are traveling in only one direction - from the sender to receiver. We assume that the receiver can immediately handle any frame it receives with a processing time that is small enough to be negligible.



Design :

There is no need for flow control in this scheme. The data link layer at the sender site gets data from its network layer, makes a frame out of the data and sends it.

Ans to the question no : 5(a)

\* Write about piggybacking protocol

Ans :

In some protocols data frames flow in only one direction although control information such as ACK and NAK frames can travel in the other direction. In real life, data frames are normally flowing in both directions, from node A to node B and node B to node A. This means that the control information also needs to flow in both directions.

A technique called piggybacking is used to improve the efficiency of the bidirectional protocols.

Ans' to the question no: 5(b)

\* Explain about HDLC configurations, Transfer Modes and different types of frames.

Ans:

High-Level Data Link Control (HDLC) is a bit oriented protocol for configuration over point to point and multipoint links. It implements the ARQ mechanisms.

Configuration and Transfer Modes:

HDLC provides two common transfer modes that can be used in different configurations.



- \* Normal Response Mode
- \* Asynchronous Balanced Mode.

### Frames:

To provide the flexibility necessary to support all the options possible in the modes and configurations, HDLC defines three types of frames:

- \* Information frames (I-frames)
- \* Supervisory frames (S-frames)
- \* Unnumbered frames (U-frames)

### Ans to the question no: 5(c)

\* Explain about Control Fields of HDLC Frames

### Ans:

The control field determines the type of frame and defines its functionality

So let us discuss the format of this field in greater detail. The format is specific for the type of frame as shown in.

### Control Field for I-Frames :

I-Frames are designed to carry user data from the network layer.

### Control Field for S-Frames :

Supervisory frames are used for flow and error control whenever piggybacking is either impossible or inappropriate.

### Control field for U-Frames :

Unnumbered frames are used to exchange session management and control information between connected devices.



Ans to the question no: 6(a)

\* Write about ~~Stop and wait~~ <sup>Selective Repeat</sup> with ARQ protocol.

Ans:

Go-Back-N ARQ simplifies the process at the receiver site. The receiver keeps track of only one variable and there is no need to buffer out-of-order frames; they are simply discarded. However, this protocol is very inefficient for a noisy link.

In a noisy link a frame has a higher probability of damage, which means the re-sending of multiple frames. This re-sending uses up the bandwidth and slows down the transmission.

Ans to the question no: 6(b)

\* Write about Go-Back-N ARQ protocol

To improve the efficiency of transmission multiple frames must be in transition, while waiting for acknowledgement. In Go-Back-N Automatic Repeat Request, we can send several frames before receiving acknowledgements. We keep a copy of these frames until the acknowledgements arrive.

### Sequence Numbers :

Frames from a sending station are numbered sequentially. If the header of the frame allows  $m$  bits for the sequence number, the sequence numbers range from 0 to  $2^m - 1$ , if  $m$  is 4, the only sequence numbers are 0 through 15 inclusive.



Ans to the question no: 6(c)

If write about stop and wait with ARQ protocol.

Ans:

If data frames arrive at the receiver's site faster than they can be processed the frames must be stored until their use. Normally, the receiver does not have enough storage space, especially if it is receiving data from many sources. This may result in either the discarding of frames or denial of service. To prevent the receiver from becoming overwhelmed with frames we somehow need to tell the sender to slow down. In stop and wait protocol, the sender sends one frame, stops until it receives confirmation

from the receiver and then sends the next frames.

Ans to the question no: 7(a)

A Different Data Flow Directions :

Ans:

Communication between any two devices can be simplex, half-duplex or full-duplex.

Simplex :

In simplex mode, the communication is unidirectional, as on a one-way street.

Half-Duplex :

In half-duplex mode, each station can both transmit and receive, but not at the same time.



### Full-Duplex :-

In Full-duplex mode (also called duplex) both stations can transmit and receive simultaneously.

### Ans to the question no : 7(b)

\* What are the different spread spectrum techniques ?

Ans :-

Spread-Spectrum techniques are methods by which a signal generated with a particular bandwidth is deliberately spread in the frequency domain, resulting in a signal with a wider bandwidth.

There are two techniques to spread the bandwidth :

- \* Frequency Hopping Spread Spectrum
- \* Direct Sequence Spread Spectrum

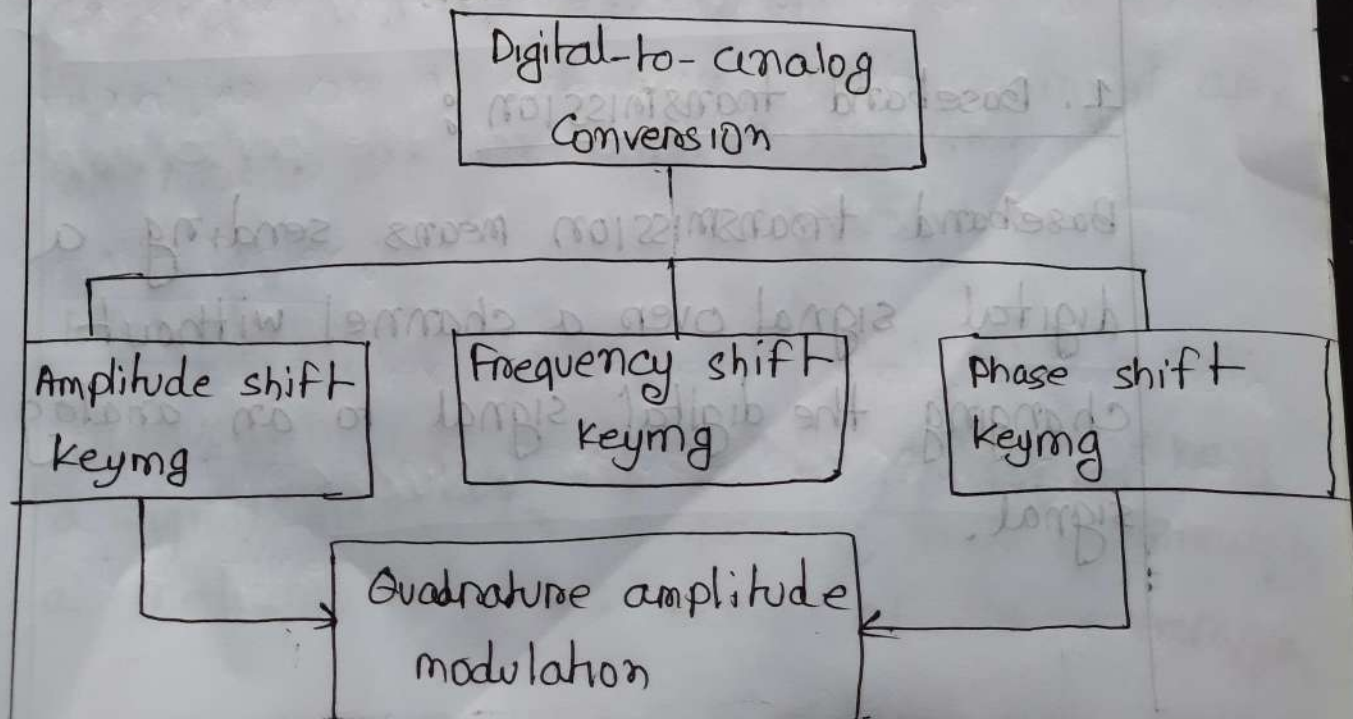
Ans to the question no: 7(c)

\* Explain Different Digital to Analog Conversion Techniques.

Ans :

Digital-to-analog conversion is the process of changing one of the characteristics of an analog signal based on the information in digital data.

A sine wave is defined by three characteristics : amplitude, Frequency and phase





Ans to the question no : 8(a)

Different methods for Digital signal transmission.

Ans:

A digital signal periodic or non-periodic is a composite analog signal with frequencies between zero and infinity.

We can transmit a digital signal by using one of two different approaches

- \* Baseband transmission
- \* Broadband transmission

1. Baseband transmission :

Baseband transmission means sending a digital signal over a channel without changing the digital signal to an analog signal.

## 2. Broad band Transmission :

Broadband transmission or modulation means changing the digital signal to an analog for transmission

Ans to the question no: 8(b)

\* Write about transmission Impairments.

Ans:

Signals travel through transmission media, which are not perfect. The imperfection causes signal impairment.

The three different causes of impairment are attenuation, distortion and noise.

Attenuation :

Attenuation means a loss of energy. When a signal, simple or composite, travels through a medium, it loses some of its energy



in overcoming the resistance of the medium.

Noise :

Noise is another cause of impairment. Several types of noise, such as thermal noise, induced noise, crosstalk.

Distortion :

Distortion means that the signal changes its form or shape.

Ans to the question no: 8(c)

\* Different Criteria For the performance of Networks

Ans :

Performance of the Network :

One important issue in networking is the performance of the network. The different factors which effects performance of the Network are as follows:

1. Bandwidth
2. Throughput
3. Latency (Delay)
4. Propagation Time
5. Transmission time
6. Jitter