

# MODULE WISE QUESTIONS & ANSWERS 2015-2016

## DATA COMMUNICATION & COMPUTER NETWORK

BRANCH: EEE+ETC+CSE

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### MODULE I

#### Short Questions

1. Define data communication. What are the components of a data communication system?

**Answer:**

Data communications refers to the exchange of data between two devices via some form of transmission medium such as a wire cable. A data communications system has five components:

- **Message:** The message is the information (data) to be communicated. Popular forms of information include text, numbers, pictures, audio, and video.
- **Sender:** The sender is the device that sends the data message. It can be a computer, workstation, telephone handset, video camera, and so on.
- **Receiver:** The receiver is the device that receives the message. It can be a computer, workstation, telephone handset, television, and so on.
- **Transmission medium:** The transmission medium is the physical path by which a message travels from sender to receiver. Some examples of transmission media include twisted-pair wire, coaxial cable, fiber-optic cable, and radio waves.
- **Protocol:** A protocol is a set of rules that govern data communications. It represents an agreement between the communicating devices. Without a protocol, two devices may be connected but not communicating, just as a person speaking French cannot be understood by a person who speaks only Japanese.

2. Define computer network.

**Answer:**

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

3. List the parameters which decide the efficiency of a data communication system.

**Answer:**

The effectiveness of a data communications system depends on four fundamental characteristics: delivery, accuracy, timeliness, and jitter.

- **Delivery:** The system must deliver data to the correct destination. Data must be received by the intended device or user and only by that device or user.
- **Accuracy:** The system must deliver the data accurately. Data that have been altered in transmission and left uncorrected are unusable.
- **Timeliness:** The system must deliver data in a timely manner. Data delivered late are useless. In the case of video and audio, timely delivery means delivering data as they are produced, in the same order that they are produced, and without significant delay. This kind of delivery is called real-time transmission.
- **Jitter:** Jitter refers to the variation in the packet arrival time. It is the uneven delay in the delivery of audio or video packets. For example, let us assume that video packets are sent every 30ms. If some of the packets arrive with 30ms delay and others with 40ms delay, an uneven quality in the video is the result.

**4. Differentiate between point to point and multipoint line configuration.**

**Answer:**

**Point-to-Point line configuration:** 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.

**Multipoint line configuration:** A multipoint (also called multi drop) connection is one in which more than two specific devices share a single link. In a multipoint environment, the capacity of the channel is shared, either spatially or temporally.

**5. Define topology. List various types topologies.**

**Answer:**

The term physical topology refers to the way in which a network is laid out physically.

Various types of topologies are:

Mesh, Star, Ring, Bus & Hybrid topology.

**6. Differentiate between bit rate and baud rate.**

**Answer:**

<b>Bit rate</b>	<b>Baud rate</b>
<ul style="list-style-type: none"> <li>▪ It is defined as no of bits sent per second</li> <li>▪ It is used to measure data rate.</li> <li>▪ It is expressed in terms of bps.</li> </ul>	<ul style="list-style-type: none"> <li>▪ It is defined as no of signal elements sent per second.</li> <li>▪ It is used measure signal rate.</li> <li>▪ It is expressed in terms of Baud.</li> </ul>

**7. Define transmission impairment.**

**Answer:**

Transmission impairment is said to occur if the signal at the beginning of the medium is not the same as the signal at the end of the medium.

**8. Define bandwidth. How it is calculated?**

**Answer:**

Range of frequencies contained in a signal is termed as bandwidth. Mathematically it is the difference between highest and lowest frequency i.e.  $\text{bandwidth} = f_H - f_L$ .

**9. List all layers present in OSI stack from bottom to top.**

**Answer:**

Layers present in OSI stack are:

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

**10. List the functions of presentation layer.**

**Answer:**

Presentation layer is responsible for:

- Data Translation
- Compression & Decompression
- Encryption & Decryption

**11. Which layer is responsible for host to host delivery of packets?**

**Answer:**

Network Layer

**12. Differentiate between UTP and STP.**

**13. Define Nyquist formula.**

**14. Define Shannon's formula.**

**15. Define SNR and  $\text{SNR}_{\text{dB}}$ .**

**16. Define line coding.**

**17. Define NRZ-L and NRZ-I.**

**Answer:**

In NRZ-L line coding scheme level of the signal determines the value of the bit. Whereas in NRZ-I line coding scheme, the change in the level of the signal determines the value of the bit.

**18. Define multiplexing.**

**Answer:**

Multiplexing (or muxing) is a way of sending multiple signals or streams of information over a communications link at the same time in the form of a single, complex signal; the receiver recovers the separate signals, a process called demultiplexing (or demuxing).

**19. Define modulation.**

**Answer:**

**Modulation** is the process of varying one or more properties of a periodic waveform, called the carrier signal, with a modulating signal that typically contains information to be transmitted.

**20. Define LAN, MAN and WAN.**

**Answer:**

A **LAN** (local area network) is a group of computers and network devices connected together, usually within the same building. By definition, the connections must be high speed and relatively inexpensive (e.g., token ring or Ethernet). Most Indiana University Bloomington departments are on LANs. A LAN connection is a high-speed connection to a LAN. On the IUB campus, most connections are either Ethernet (10 Mbps) or Fast Ethernet (100 Mbps), and a few locations have Gigabit Ethernet (1000 Mbps) connections.

A **MAN** (metropolitan area network) is a larger network that usually spans several buildings in the same city or town. The IUB network is an example of a MAN.

A **WAN** (wide area network), in comparison to a MAN, is not restricted to a geographical location, although it might be confined within the bounds of a state or country. A WAN connects several LANs, and may be limited to an enterprise (a corporation or an organization) or accessible to the public. The technology is high speed and relatively expensive. The Internet is an example of a worldwide public WAN.

**Long Questions (Refer Lecture Notes for Answer)**

1. Differentiate between simplex, half duplex and full duplex mode of data transmission. In which case the channel bandwidth is utilized efficiently?
2. Define transmission impairment. Discuss its various causes in details.
3. Differentiate between circuit switching & packet switching.
4. Define transmission media. Explain guided and unguided media in details.
5. Define line coding. Explain various line coding schemes.
6. Define open system. Explain 7-layer OSI stack explaining functions of each layer in details.

**7. Define multiplexing. Explain FDM, WDM and TDM in details.**

**Answer:**

Whenever the bandwidth of a medium linking two devices is greater than the bandwidth needs of the devices, then the link can be shared. Multiplexing is the set of techniques that allows the simultaneous transmission of multiple signals across a single data link. Advantages (purpose) of Multiplexing: Efficient utilization of bandwidth. Refer Lecture notes for details.

**8. Define modulation. Explain various analog modulation techniques.**

**Answer:**

Modulation is nothing but, a carrier signal that varies in accordance with the message signal. Modulation technique is used to change the signal characteristics.

**Analog Modulation Techniques:** In analog modulation, analog signal (sinusoidal signal) is used as a carrier signal that modulates the message signal or data signal. The general function Sinusoidal wave's is shown in the figure below, in which, three parameters can be altered to get modulation – they are amplitude, frequency and phase; so, the types of analog modulation are:

1. Amplitude Modulation (AM)
2. Frequency Modulation (FM)
3. Phase Modulation (PM)

**Amplitude Modulation (AM)**

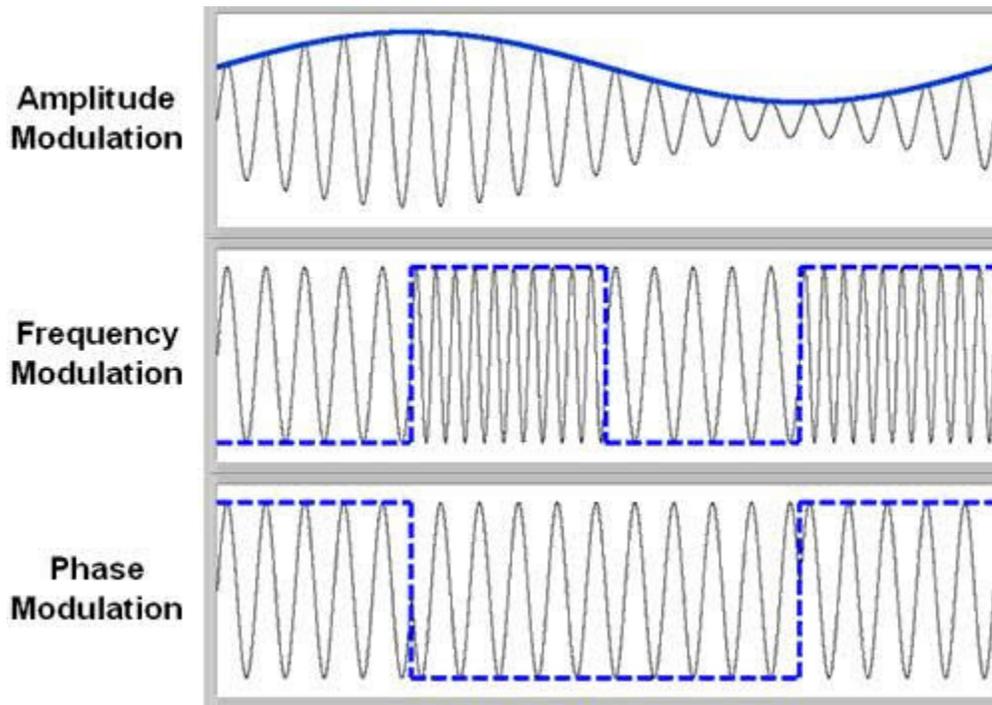
Amplitude modulation was developed in the beginning of the 20th century. It was the earliest modulation technique used to transmit voice by radio. This type of modulation technique is used in electronic communication. In this modulation, the amplitude of the carrier signal varies in accordance with the message signal, and other factors like phase and frequency remain constant.

The modulated signal is shown in the below figure, and its spectrum consists of the lower frequency band, upper frequency band and carrier frequency components. This type of modulation requires more power and greater bandwidth; filtering is very difficult. Amplitude modulation is used in computer modems, VHF aircraft radio, and in portable two-way radio.

**Frequency Modulation (FM)**

In this type of modulation, the frequency of the carrier signal varies in accordance with the message signal, and other parameters like amplitude and phase remain constant. Frequency modulation is used in different applications like radar, radio and telemetry, seismic prospecting and monitoring newborns for seizures via EEG, etc.

This type of modulation is commonly used for broadcasting music and speech, magnetic tape recording systems, two way radio systems and video transmission systems. When noise occurs naturally in radio systems, frequency modulation with sufficient bandwidth provides an advantage in cancelling the noise.



### Phase Modulation (PM)

In this type of modulation, the phase of the carrier signal varies in accordance with the message signal. When the phase of the signal is changed, then it affects the frequency. So, for this reason, this modulation is also comes under the frequency modulation.

Generally, phase modulation is used for transmitting waves. It is an essential part of many digital transmission coding schemes that underlie a wide range of technologies like GSM, WiFi, and satellite television. This type of modulation is used for signal generation in al synthesizers, such as the Yamaha DX7 to implement FM synthesis. Therefore, Analog modulation includes AM, FM and PM and these are more sensitive to noise. If noise enters into a system, it persists and gets carried up to the end receiver. So, this drawback can be overcome by the digital modulation technique.

9. Define topology. Explain different types of topologies with neat diagram.
10. Differentiate between Manchester & differential Manchester line coding scheme.

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