BCA 3RD SEMSESTER

DCA2104-BASIC OF DATA COMMUNICATIONS

(set:- I)

1.) **Question:- Describe various trends in data communications and network technology. Explain Communication model in brief.**

Answer :- To discuss computer networking, it is necessary to use terms that have special meaning. Even other computer professionals may not be familiar with all the terms in the networking alphabet soup. As is always the case, English and computer-speak are not equivalent (or even necessarily compatible) languages. Although descriptions and examples should make the meaning of the networking jargon more apparent, sometimes terms are ambiguous. A common frame of reference is necessary for understanding data communications terminology.

- **Application Layer**

  The Application Layer is the level of the protocol hierarchy where user-accessed network processes reside. In this context, a TCP/IP application is any network process that occurs above the Transport Layer. **Presentation Layer**

  For cooperating applications to exchange data, they must agree on how data is represented. In OSI, this layer provides standard data presentation routines. This function is frequently handled within the applications in TCP/IP, though increasingly TCP/IP protocols such as XDR and MIME perform this function.

- **Session Layer**

  As with the Presentation Layer, the Session Layer is not identifiable as a separate layer in the TCP/IP protocol hierarchy. The OSI Session Layer manages the sessions (connection) between cooperating applications. In TCP/IP, this function largely occurs in the Transport Layer, and the term *session* is not used. For TCP/IP, the terms *socket* and *port* are used to describe the path over which cooperating applications communicate.

- **Transport Layer**

  Much of our discussion of TCP/IP is directed to the protocols that occur in the Transport Layer. The Transport Layer in the OSI reference model guarantees that the receiver gets the data exactly as it was sent. In TCP/IP this function is performed by the Transmission Control Protocol (TCP). However, not all applications require reliable delivery service. TCP/IP offers a second Transport Layer service, User Datagram Protocol (UDP), that does not perform end-to-end reliability checks.[2]

- **Network Layer**

  The Network Layer manages connections across the network and isolates the upper layer protocols from the details of the underlying network. The Internet Protocol (IP), which isolates the upper layers from the underlying network and handles the addressing and delivery of data, is usually described as TCP/IP's Network Layer.

⇨ **Data Link Layer**

The reliable delivery of data across the underlying physical network is handled by the Data Link Layer. TCP/IP rarely creates protocols in the Data Link Layer. Most RFCs that relate to the Data Link Layer discuss how IP can make use of existing data link protocols.

⇨ **Physical Layer**

The Physical Layer defines the characteristics of the hardware needed to carry the data transmission signal. Features such as voltage levels and the number and location of interface pins are defined in this layer. Examples of standards at the Physical Layer are interface connectors such as RS232C and V.35 and standards for local area network wiring such as IEEE 802.3. TCP/IP does not define physical standards—it makes use of existing standards.

2.) Question:- List some differences between baseband and broadband transmission with some examples.

Answer:-

BASEBAND

Baseband refers to a communications channel in which information is carried in digital form and which uses the transmission medium as a single-channel device. This means a single channel is used to communicate with devices on a network, which allows computers to transmit and receive data on a single cable. Only one station can transmit at a time, and all stations must transmit and receive the same types of signals. The communication is bi-directional meaning the same channel is used to transmit and receive signals. Every device on a baseband system shares the same channel. When one node transmits data on a baseband channel, all other nodes on the network have to wait for the transmission to end before , transmitted data . The only problem with baseband LANs is their limited capacity over a limited distance which is no more than a couple of miles.

BROADBAND

Broadband transmission is a digital electrical transmission in which signals are modulated as radiofrequency analog waves that use different frequency ranges. Unlike baseband, broadband technology does not encode information as digital pulses. It generates an analog carrier frequency, which carries multiple digital signals or multiple channels. Each channel occupies a different frequency band out of the total bandwidth allocated (frequency-division multiplexing). Consequently, each channel can contain different modulation and encoding schemes and operate at different transmission rates. Through FDM, multiple independent channels can carry

analog or digital information, depending on the interfaces. This is essentially the way cable television operates. The cable TV connection can carry at least 25 times as much data as a typical baseband system can carry. Broadband systems are generally more expensive to install and maintain because of the additional hardware involved. However, they span much longer distances than baseband.

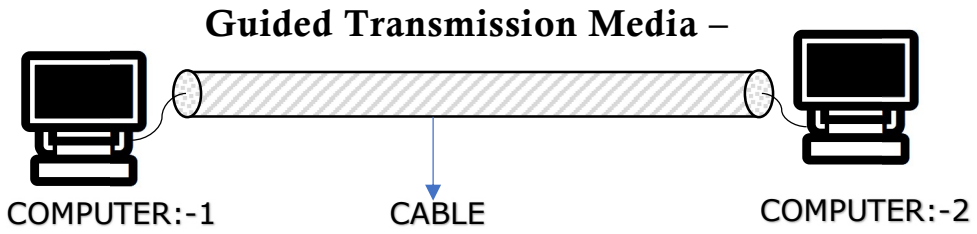
-: BASEBAND :-	DIFFERENT	-: BASEBAND :-
➔ It refers to a communications channel in which information is carried in digital form .		➔ The signals are modulated as radiofrequency analog waves that use different frequency ranges.
➔ Communication is bi-directional which means the same channel is used to transmit and receive signals .		➔ Communication is unidirectional meaning two different channels are needed in order to send and receive signals.
➔ Every device on baseband system shares the same channel .		➔ Multiple independent channel can carry analog or digital information through FDM.
➔ Baseband LANs are inexpensive and easier to install and maintain .		➔ Broadband system are generally more expensive because of the additional hard-ware involved.
➔ Baseband LANs have a limited distance reach which is no more than a couple miles .		➔ Broadband LANs span much longer distance than baseband (up to tens of kilo-meters.)

3.) Question:- Differentiate between guided and unguided transmission with some examples?

Answer:-

⇨ **Guided Transmission Media –**

The role of the physical layer is to transfer bits from one computer to another through the channel. Different physical media can be used for the actual transfer. Each of them has its place in terms of throughput, time, cost, and ease of installation and maintenance. Operators are grouped roughly in managed environments, such as copper and fiber optic cables, and in unmanaged environments, such as global wireless networks, satellites, and live lasers. And guided media is too much safe for unguided.
Example:-

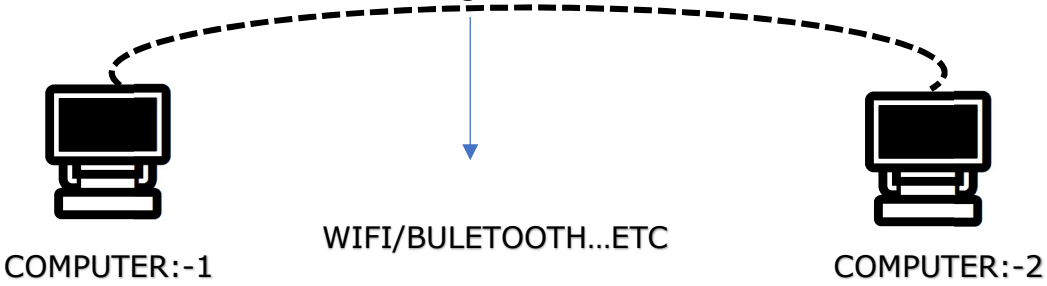


⇨ **Unguided Transmission Media -**

The **unguided transmission media** is able to not used use the physical medium to transmit information from one computer to another. Unlike the guided transmission media, the unguided transmission media utilize air as a transmission media instead of wire or cable so it is also termed as **wireless transmission media**

The wired or guided transmission media are good at their service then why do we need the unguided or wireless transmission media? Well, it was not possible to install the fiber, wire, cable in a hilly areas, jungles, swamps, etc. In these circumstances, wireless or unguided transmission media performs better.

The unguided media uses an **antenna** for transmitting and receiving **electromagnetic wave**. Now before going into the classification of unguided transmission media let us talk about the antenna and electromagnetic wave.



(set:- II)

4.) Question:- Explain different error detecting codes? Explain different Bluetooth layers.

Answer:- Error-detecting codes are a sequence of numbers generated by specific procedures for detecting errors in data that has been transmitted over computer networks.

When bits are transmitted over the computer network, they are subject to getting corrupted due to interference and network problems. The corrupted bits lead to spurious data being received by the receiver and are called errors.

Error – find codes ensures messages are encoded before they are sent over noisy channels. The encoding is done in a manner so that the decoder at the receiving end can detect whether there are errors in the incoming signal with high a probability of success.

Features of Error Detecting Codes

- Error detecting codes are adopted when backward error correction techniques are used for reliable data transmission. In this method, the receiver sends a feedback message to the sender to inform whether an

error-free message has been received or not. If there are errors, then the sender retransmits the message.

- Error-detecting codes are usually block codes, where the message is divided into fixed-sized blocks of bits, to which redundant bits are added for error detection.
- Error detection involves checking whether any error has occurred or not. The number of error bits and the type of error do not matter.

➔ Different Bluetooth layers

Bluetooth is, with the infrared, one of the major wireless technologies developed to achieve WPAN. Bluetooth is a wireless LAN technology used to connect devices of different functions such as telephones, computers (laptop or desktop), notebooks, cameras, printers, and so a on. Bluetooth is an example of a personal area network.

• Bluetooth project was started by SIG (Special Interest Group) formed by four companies IBM, Intel, Nokia or Toshiba for interconnecting computing and communicating devices using short-range, lower-power, inexpensive wireless radios.

• The project was named Bluetooth after the name of Viking king – Harald Blast and who unified Denmark and Norway in the 10^{th} century.

• Nowadays, Bluetooth technology is used for several computers and noncomputer application:

1. It is used for providing communication between peripheral devices like wireless mouse or keyboard with the computer.
2. It is used by modern healthcare devices to send signals to monitors.
3. It is used by modern communication* devices like mobile phones* , PDAs, palmtops….etc to transfer data rapidly.
4. It is used for dial-up networking. Thus allowing a notebook computer to call via a mobile phone.
5. It is used for cordless telephoning to connect a handset and its local base station.
6. It also allows hands-free voice communication with a headset.
7. It also enables a mobile computer to connect to a fixed LAN.
8. It can also be used for file transfer operations from one mobile phone to another.
9. Bluetooth uses Omni-directional radio waves that can through walls or other non-metal barriers.

Bluetooth devices have a built-in short-range radio transmitter. The rate provided is 1Mbps and uses 2.4 GHz bandwidth.

5.) Question:- Write short on synchronous and asynchronous transmission.

Answer:-

⇨ Synchronous Transmission

Synchronous data transmission is a type of data transfer that carries a frequent stream of data in the form of signals along with timing signals generated by an electric clock that ensures the synchronization of the sender and receiver. synchronous transmission allows data to be transmitted in fixed intervals in the form of frames or blocks.

⇨ **Asynchronous Transmission**

Asynchronous transmission is a type of data transmission which works on start and stop bits. In Asynchronous transmission, each character contains its start and stop bit and irregular interval of time between them.

-: Synchronous :-	DIFFERENT	Asynchronous
➔ **In Synchronous transmission a common clock is shared by the transmitter and receiver to achieve Synchronous while data transmission .**		➔ In Asynchronous transmission each character contains its own start and stop bits.
➔ **In Synchronous transmission data sent in farms or block.**		➔ In Asynchronous transmission data is sent in the form of bytes or characters.
➔ Synchronous transmission is faster, as a common clock is shared by the sender and receiver.		➔ Asynchronous transmission is slower as each character has its own start and stop bit.
➔ Synchronous transmission is costlier.		➔ Asynchronous transmission is cheaper.
➔ It is easy to design.		➔ It is complex.
➔ In synchronous transmission there is no gap between the data as they share a common clock.		➔ In asynchronous transmission there is a gap between the data due to the start and stop bit feature.

6.) Question:- Differentiate between frequency hopping spread spectrum and direct sequence spread spectrum

Answer:- **FHSS vs DSSS**

Spread spectrum is a group of techniques that utilizes a much larger bandwidth in transmitting information than would otherwise occupy a fraction of the bandwidth used. This is done to achieve a certain effect. FHSS and DSSS, which stand for Frequency Hopping Spread Spectrum and Direct Sequence Spread Spectrum, are two spread spectrum techniques. The main difference is in how they spread the data into the wider bandwidth. FHSS utilizes frequency hopping while DSSS utilizes pseudo noise to modify the phase of the signal.

Frequency hopping is achieved by dividing the large bandwidth into smaller channels that would fit the data. The signal would then be sent pseudo-randomly into a different channel. Because only one of the channels is in use at any given time, you are wasting bandwidth equivalent to the data bandwidth multiplied by the number of channels minus one. DSSS spreads the information across the band in a very different manner. It does so by introducing pseudo-random noise into the signal to change its phase at any given time. This results in an output that closely resembles static noise and would appear as just that to others. But with a process called “de-spreading,” the original signal can be extracted from the noise as long as the pseudo-random sequence is known.

For the receiver to decode the transmitted information, it must be synchronized with the transmitter. For FHSS it is relatively easy as the transmitter simply waits on one of the channels and waits for a decodable transmission. Once it finds that out, it can then follow the sequence being used to follow the transmitter which jumps across the different

channels. With DSSS, it is not as simple. A timing search algorithm needs to be employed for the receiver to correctly establish synchronization.
A side effect of “de-spreading” is its ability to establish relative timing between the receiver and transmitter. With multiple transmitters that are in known locations, the relative timing can be used to establish the relative distances of the receiver from each transmitter. This is the working principle behind positioning systems like GPS. Since the receiver can calculate how far it is from each transmitting satellite, it is then able to triangulate its location. This ability is not present in FHSS.