Q1 (a)

Analog Transmission

An analog wave form (or signal) is characterized by being continuously variable along amplitude and frequency. In the case of telephony, for instance, when you speak into a handset, there are changes in the air pressure around your mouth. Those changes in air pressure fall onto the handset, where they are amplified and then converted into current, or voltage fluctuations. Those fluctuations in current are an analog of the actual voice pattern

Digital Transmission

Digital transmission is quite different from analog transmission. For one thing, the signal is much simpler. Rather than being a continuously variable wave form, it is a series of discrete pulses, representing one bits and zero bits. Each computer uses a coding scheme that defines what combinations of ones and zeros constitute all the characters in a character set (that is, lowercase letters, uppercase letters, punctuation marks, digits, keyboard control functions).

Noise:

Noise refers to any energy interference that affects the quality of a wireless signal. Furthermore, this disruptive energy can either be natural or man-made. Much like trying to have a conversation in a busy restaurant full of people, noise can make it difficult for wireless communication to be sent and received effectively. Thus, it is important for wireless network engineers to understand how noise is caused and the ways to mitigate it.

Media:

Media refers to the cables linking workstations together. There are many different types of transmission media, the most popular being twisted-pair wire (normal electrical wire), coaxial cable (the type of cable used for cable television), and fiber opticcable (cables made out of glass).

Encoding:

Encoding is the process of using various patterns of voltage or current levels to represent 1s and 0s of the digital signals on the transmission link.

Synchronous Transmission

In synchronous transmission, data moves in a completely paired approach, in the form of chunks or frames. Synchronisation between the source and target is required so that the source knows where the new byte begins, since there are no spaces included between the data.

Asynchronous Transmission

In asynchronous transmission, data moves in a half-paired approach, 1 byte or 1 character at a time. It sends the data in a constant current of bytes. The size of a character transmitted is 8 bits, with a parity bit added both at the beginning and at the end, making it a total of 10 bits. It doesn't need a clock for integration—rather, it utilises the parity bits to tell the receiver how to translate the data.

Q1 (b)

Bridging:

A network bridge is a computer networking device that creates a single aggregate network from multiple communication networks or network segments. This function is called network bridging.[1] Bridging is distinct from routing. Routing allows multiple networks to communicate independently and yet remain separate, whereas bridging connects two separate networks as if they were a single network.

MAC Layer Protocols:

There are three mac layer protocols:

1. Stop & wait protocol

Stop and **Wait Protocol**. It is the simplest flow control method. In this, the sender will send one frame at a time to the receiver.

2. GBN

Go-Back-N ARQ is a specific instance of the automatic repeat request protocol, in which the sending process continues to send a number of frames specified by a window size even without receiving an acknowledgement packet from the receiver.

3. Selective Repeat

Selective Repeat ARQ/Selective Reject ARQ is a specific instance of the automatic repeat request protocol used to manage sequence numbers and retransmissions in reliable communications.

Q2 (a)

Multiplexing:

In telecommunications and computer networks, **multiplexing** (sometimes contracted to **muxing**) is a method by which multiple analog or digital signals are combined into one signal over a shared medium. The aim is to share a scarce resource. The multiplexed signal is transmitted over a communication channel such as a cable.

The multiplexing divides the capacity of the communication channel into several logical channels, one for each message signal or data stream to be transferred. A reverse process, known as demultiplexing, extracts the original channels on the receiver end.

Q2 (b)

Switched Networks:

A network in which a temporary connection is established from one point to another for either the duration of the session (circuit switching) or for the transmission of one or more packets of data (packet switching). See packet switching and circuit switching.

IP Networks:

The **Internet Protocol** (**IP**) is the principal communications protocol in the Internet protocol suite for relaying datagrams across network boundaries. Its routing function enables internetworking, and essentially establishes the Internet.

Q3 (a)

Internetworking:

Internetworking is the process or technique of connecting different **networks** by using intermediary devices such as routers or gateway devices. **Internetworking** ensures data communication among **networks** owned and operated by different entities using a common data communication and the **Internet** Routing Protocol.

Routing:

Routing is the process of selecting a path for traffic in a network or between or across multiple networks. Broadly, **routing** is performed in many types of networks, including circuit-switched networks, such as the public switched telephone network (PSTN), and computer networks, such as the Internet.

Q3 (b)

Application Layer protocol:-

1. TELNET:

Telnet stands for the **TEL**ecomunications **NET**work. It helps in terminal emulation. It allows Telnet client to access the resources of the Telnet server. It is used for managing the files on the internet. It is used for initial set up of devices like switches. The telnet command is a command that uses the Telnet protocol to communicate with a remote device or system. Port number of telnet is 23.

2. FTP:

FTP stands for file transfer protocol. It is the protocol that actually lets us transfer files.It can facilitate this between any two machines using it. But FTP is not just a protocol but it is also a program.FTP promotes sharing of files via remote computers with reliable and efficient data transfer. Port number for FTP is 20 for data and 21 for control.

3. TFTP:

The Trivial File Transfer Protocol (TFTP) is the stripped-down, stock version of FTP, but it's the protocol of choice if you know exactly what you want and where to find it. It's a technology for transferring files between network devices and is a simplified version of FTP

4. NFS:

It stands for network file system.It allows remote hosts to mount file systems over a network and interact with those file systems as though they are mounted locally. This enables system administrators to consolidate resources onto centralized servers on the network.

5. SMTP:

It stands for Simple Mail Transfer Protocol. It is a part of the TCP/IP protocol. Using a process called "store and forward," SMTP moves your email on and across networks. It works closely with something called the Mail Transfer Agent (MTA) to send your communication to the right computer and email inbox. Port number for SMTP is 25.

6. LPD:

It stands for Line Printer Daemon.It is designed for printer sharing.It is the part that receives and processes the request. A "daemon" is a server or agent.

7. X window:

It defines a protocol for the writing of graphical user interface–based client/server applications. The idea is to allow a program, called a client, to run on one computer. It is primarily used in networks of interconnected mainframes.

8. SNMP:

It stands for Simple Network Management Protocol. It gathers data by polling the devices on
the network from a management station at fixed or random intervals, requiring
them to disclose certain information. It is a way that servers can share information about their current state, and also a channel through which an administrate can modify pre-defined values. Port number of SNMP is 161(TCP) and 162(UDP).

9. DNS:

It stands for Domain Name Service. Every time you use a domain name, therefore, a DNS service must translate the name into the corresponding IP address. For example, the domain name www.abc.com might translate to 198.105.232.4.
Port number for DNS is 53.

10. DHCP:

It stands for Dynamic Host Configuration Protocol (DHCP).It gives IP addresses to hosts.There is a lot of information a DHCP server can provide to a host when the host is registering for an IP address with the DHCP server. Port number for DHCP is 67, 68.

Reference:

1- Computer Networking: A Top-Down Approach Featuring the Internet, 6th edition by James F. Kurose and Keith W.Ross

2- Computer Networks, 5th Edition by Andrew S. Tanenbaum

3- https://www.geeksforgeeks.org/protocols-application-layer/