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Set-1

(a) What do you mean by Physical layer? What is function of Physical layer?

(b) What are the types of any signal?

(c) Discuss the term transmission impairment and transmission media in physical layer?

Ans to the question No: 1(a)

Physical layer in the OSI model plays the role of interacting with actual hardware and signaling mechanism. Physical layer is the only layer of OSI network model which actually deals with the physical connectivity of two different stations. This layer define the hardware equipment, cabling, wiring, frequencies, pulse used to represent binary signals etc.

Physical layer provides its services to Data-link layer. Data link layer hands over frames to physical layer. Physical layer converts them to electrical pulses, which represent binary data. The binary data is then sent over the wired or wireless media.

Function of Physical layer :

Physical layer defines electrical and physical specifications for devices. The physical layer defines the relationship between a device and a transmission medium, such as a copper or optical cable.

Ans to the question NO: 1 (b)

Types of signal:

When data is sent over physical medium, it needs to be first converted into electromagnetic signals. Data itself can be analog such as human voice, or digital such as file on the disk. Both analog and digital data can be

represented in digital or analog signals.

Digital signals:

Digital signals are discrete in nature and represent sequence of voltage pulses. Digital signals are used within the circuitry of a computer system.

Analog signals:

Analog signals are in continuous wave form in nature and represented by continuous electromagnetic waves.

Ans to the question NO: 1 (c)

Transmission Impairment:

When signals travel through the medium they tend to deteriorate. This may have many reasons as given-

Attenuation:

For the receiver to interpret the data accurately, the signal must be ~~sufficiency~~ sufficiently strong. When the signal passes through the medium, it tends to get weaker. As it covers distance, it loses strength.

Dispersion:

As signal travels through the media, it tends to spread and overlaps. The amount of dispersion depends upon the frequency used.

Delay distortion:

Signals are sent over media with pre-defined speed and frequency. If the signal speed and frequency do not match, there are possibilities that signal reaches destination in arbitrary fashion. In digital media, this is very critical that some bits reach earlier than the previously sent ones.

Noise:

Random disturbance or fluctuation in analog or digital signal is said to be

Noise in signal, which may distort the actual information being carried. Noise can be characterized in one of the following class.

Thermal Noise:

Heat agitates the electronic conductors of a medium which may introduce noise in the media. Up to certain level, thermal noise is unavoidable.

Intermodulation:

When multiple frequencies share a medium, their interference can cause noise in the medium. Intermodulation noise occurs if two different frequencie

are sharing a medium and one of them has excessive strength or the computer component itself is not functioning properly, then the resultant frequency may not be delivered as expected.

Crosstalk:

This sort of noise happens when a foreign signal enters into the media. This is because signal in one medium affects the signal of second medium.

Impulse:

This noise is introduced because of irregular disturbance such as lightening, electricity, short-circuit, or faulty components

Digital data is mostly affected by this sort of noise.

Transmission media:

The media over which the information between two computer systems is sent, called transmission media. Transmission media comes in two forms-

Guided media:

All communication wires / cables are guided media, such as UTP, coaxial cables, and fiber optics. In this media the sender and receiver are directly

connected and the information is send through it.

Unguided media:

Wireless or open air space is said to be unguided media, because there is no connectivity between the sender and receiver. Information is spread over the air, and anyone including the actual recipient may collect the information.

Set-2

(a) What is multiplexing? What is channel capacity?

(b) Write down the difference between multiplexer (MUX) and de-multiplexer (DMUX)?

(c) What is switching? Types of switching?

Ans to the question NO: 1(a)

multiplexing:

Multiplexing is a technique to mix and send multiple data streams over a ~~sigle~~ single medium. This technique requires system hardware called multiplexer (MUX) for multiplexing the streams and sending them on a medium and de-multiplexer (DMUX) which takes information from the medium and distributes to different destinations.

Channel capacity: The speed of transmission of information is said to be the channel capacity we count it as data rate in digital world. It depends on numerious factor such

as -

Bandwidth: The physical limitation of underlying media.

Error-rate: Incorrect reception of information because of noise.

Encoding: The number of levels used for signaling.

Ans to the question No: 2 (b)

Difference between multiplexer (MUX) and de-multiplexer (DMUX):

(MUX)	(D-MUX)
Multiplexer processes the digital information from various sources into a single source.	Demultiplexer receives digital information from a single source and converts it into several sources.

MUX	DMUX
It is known as Data selector	It is known as Data Distributor
It is a digital switch	It is a digital circuit
It follows combinational logic type	It also follows combinational logic type
It has n data input	It has single data input
It has a single data output	It has n data output
It works on many to one operational principle	It works on one to many operational principle
In time division multiplexing, multiplexer is used at the tramitter end	In time division multiplexing, demultiplexer is used at the receiver end.

Ans to the question: 2(c)

Switching:

Switching is a mechanism by which data / information sent from source towards destination which are not directly connected networks have interconnecting devices, which receives data from directly connected sources, stores data, analyze it and then forwards to the next interconnecting device closest to the destination.

Types of switching:

Circuit switching:

It is a method of implementing a telecommunications network in which two network nodes establish a dedicated communications channel through the network before the nodes may communicate. The circuit functions as if the nodes were physically connected as with an electrical circuit.

Packet switching:

Packet switching is the transfer of small pieces of data across various networks. These data chunks or "packets" allow for faster, more ~~difficult~~ efficient data transfer. Often, when

a user sends a file accross network, it gets transferred in smaller data packets not in one piece.

Message switching:

message switching is a connectionless network switching technique where the entire message is routed from the source node to the destination node, one hop at a time. It was a precursor of packet switching.

Set-3

(a) What do you mean by data transmission?

(b) How to convert digital data into digital signals in computer network? Briefly explain.

(c) How to convert Analog data into digital signals in computer? Discuss in details?

Ans to the question NO: 3(a)

Data transmission:

Data transmission refers to the process of transfering data between two or more digital devices. Data is transmitted from one device to another in analog or digital format. Basically data transmission enables devices or components within devices to speak to each other.

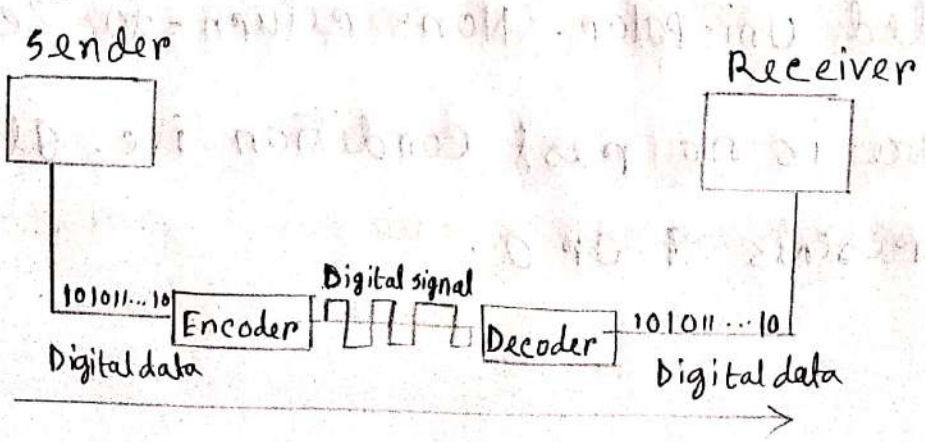
Ans to the question No: 3.(b)

Digital data into digital signal conversion:

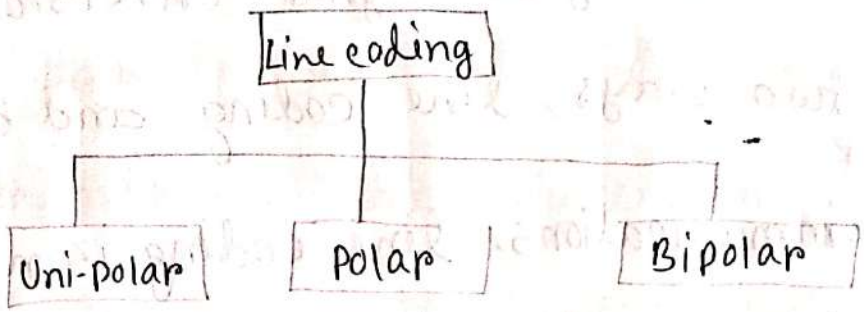
Digital data into digital signal conversion can be done in two ways, line coding and block coding. For all communications, line coding is necessary whereas block coding is optional.

Line coding:

The process for converting digital data into digital signal is said to be line coding. Digital data is found in binary format. It is represented internally as series of 1s and 0s

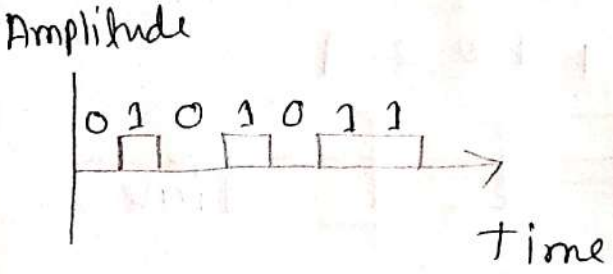


Digital signal is denoted by discreet signal, which represents digital data. There are three types of line coding schemes available.



Uni-polar Encoding:

Unipolar encoding schemes use ~~sio~~ single voltage level to represent data. In this case, to represent binary 1, high voltage is transmitted and to represent 0, no voltage is transmitted. It is also called Uni-Polar - Non-return-to-Zero, because there is no rest condition i.e. It either represents 1 or 0.



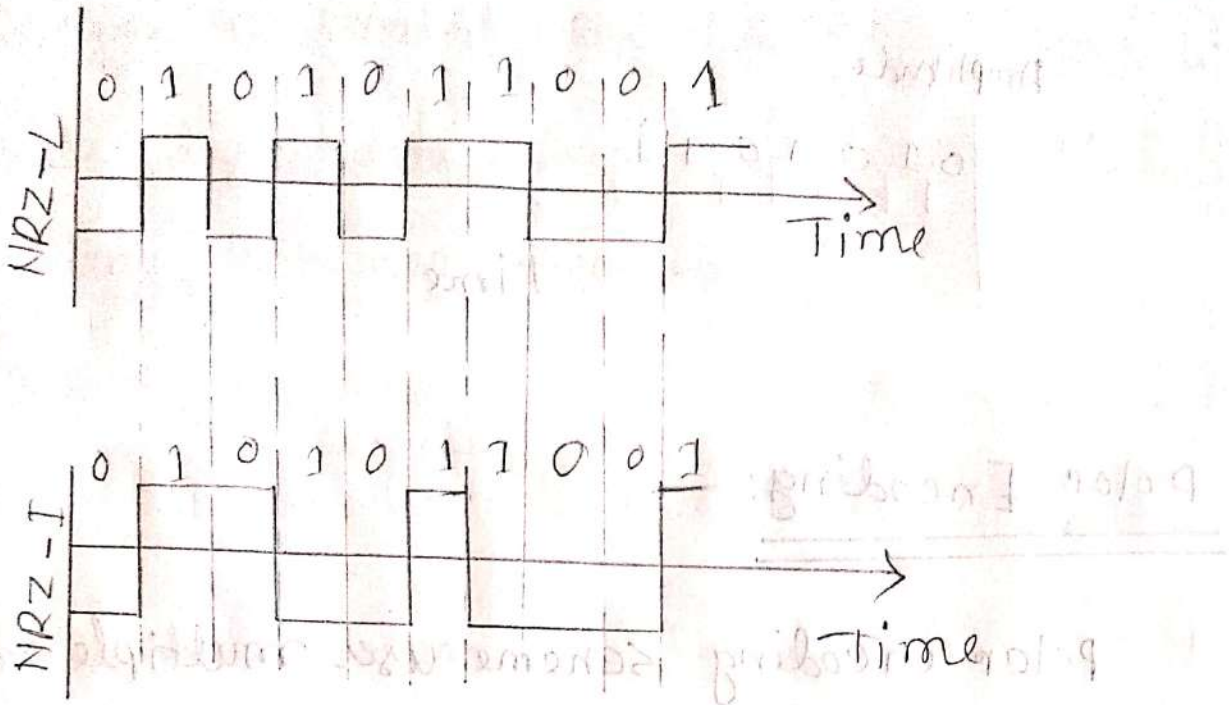
Polar Encoding:

Polar encoding scheme uses multiple voltage level to represent binary values. Polar encodings is available in four types.

Polar Non-Return to zero:

It uses two different voltage levels to represent binary values. Generally, positive voltage represents 1 and negative value represent 0. It is also NRZ because there is no rest condition.

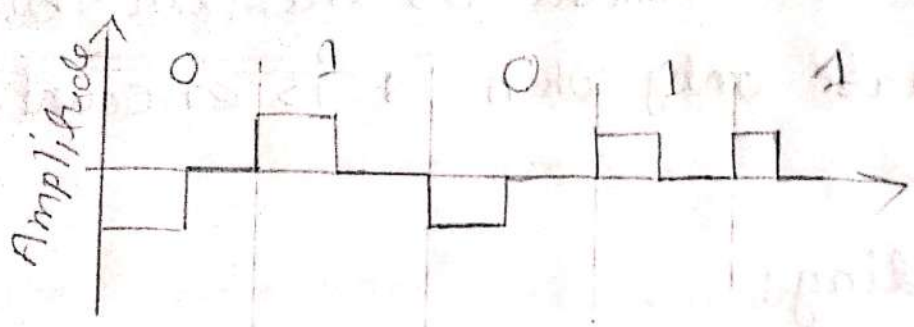
NRZ scheme has two variants: NRZ-L and NRZ-I.



NRZ-L changes voltage level at when a different bit is encounted whereas NRZ-I changes voltage when a 1 is encounted.

~~Ret~~ Return to Zero:

Problem with NRZ is that the receiver can not conclude when a bit ended and when the next bit is started, in case when sender and receiver's clock are not synchronized



RZ uses three voltage levels, positive voltage to represent 1, negative voltage to represent 0 and zero voltage for none. Signals change during bits not between bits.

manchester:

This encoding scheme is a combination of RZ and NRZ-L. Bit time is divided into two halves. It transits in the middle of the bit and changes phase when a differen bit is encounted.

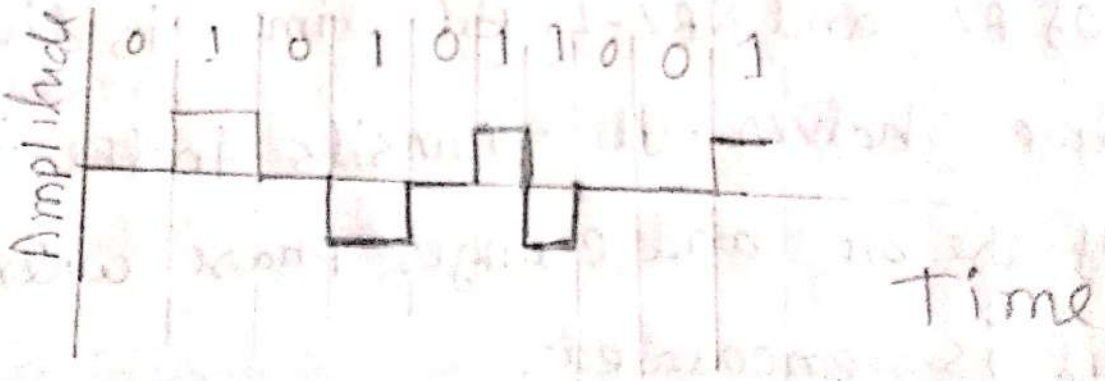
Differential manchester:

This encoding scheme is a combination of RZ and NRZ-I. It also

transit at the middle of the bit but change phase only when 1 is encounted.

Bipolar Encoding:

Bipolar encoding uses three voltage levels, positive, negative and zero. zero voltage represents binary 0 and bit 1 is represeoted by altering positive and negative voltages.



Block coding:

To ensure accuracy of the received data frame redundant bits are used. For example in even-parity one party bit is added to make the count of 1s in the frame even. This way the original number of bits is increased. It is called Block coding.

Block coding is represented by slash notation, mB/nB. means, m bit block is substituted with n-bit block where n>m. Block coding involves three steps:

- (*) Division
- (*) substitution
- (*) combination

After block coding is done, it is line ~~added~~ Coded for transmission.

Ans to the question No: 3(c)

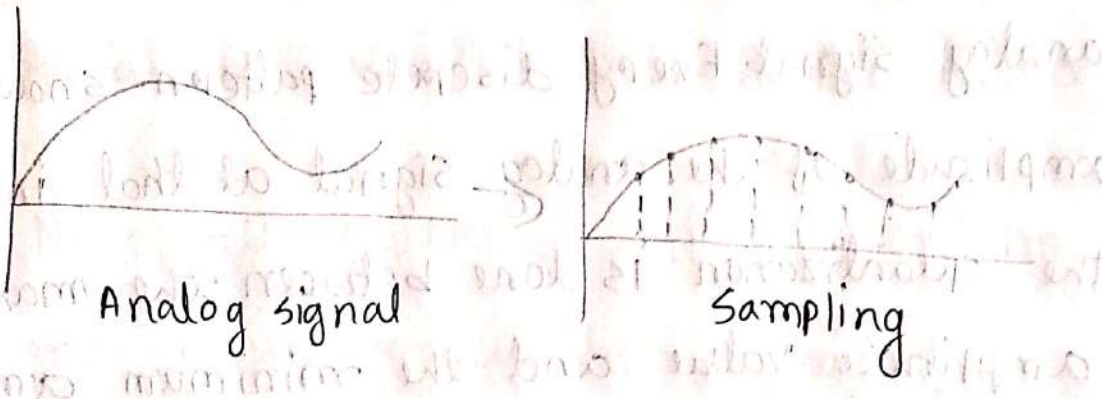
Analog Data into Digital signal conversion:

Microphones create analog voice and camera creates analog videos, which are treated is analog data. To transmit this analog data over digital signals, we need analog to digital conversion.

Analog data is a continuous stream of data in the wave form whereas digital data is discrete. To convert analog wave into digital data, we use pulse code modulation (PCM).

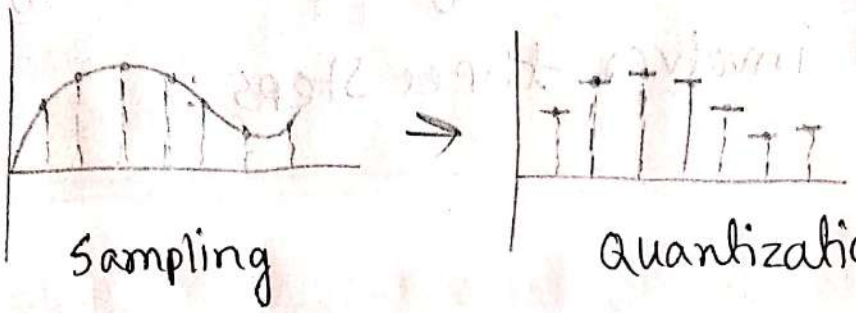
PCM is one of the most commonly used method to convert analog data into digital form. It involves three steps:

Sampling:



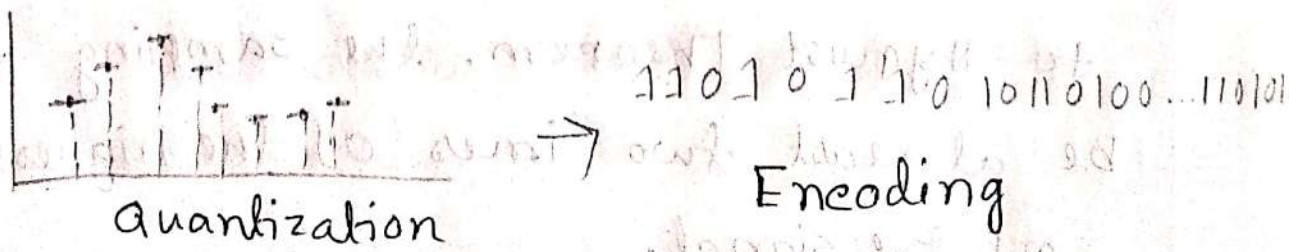
The analog signal is sampled every T interval. Most important factor in sampling is the rate at which analog signal is sampled. According to Nyquist Theorem, the sampling rate must be at least two times of the highest frequency of the signal.

Quantization:



Sampling yields discrete form of continuous analog signal. Every discrete pattern shows the amplitude of the analog signal at that instanel. The quantization is done between the maximum amplitude value and the minimum amplitude value. Quantization is approximation of the instantaneous analog value.

Encoding:



In encoding, each approximated value is then converted into binary format.

Set-4

(a) What do you mean by transmission mode? Types of transmission mode?

(b) Write down ~~Diff~~ difference between serial and parallel transmission mode?

(c) Note all difference between synchronous and asynchronous transmission?

Ans to the question NO: 4(a)

Transmission mode:

Data transmission mode defines the direction of the flow of information between two communication devices. It is also called Data communication or Directional mode. It specifies the direction of the flow information from one place to another in computer network.

There are two types of transmission mode:

- (x) Parallel transmission
- (x) Serial transmission.

Ans to the question No. 4(b)

Difference between serial and parallel transmission mode-

serial transmission	parallel transmission
In serial transmission, data flows in bi-direction.	In parallel transmission, data flows in multiple lines.
serial transmission is cost-efficient	It is not cost efficient
In this, one bit transferred at one clock pulse.	In this, eight bits transferred at one clock pulse
This transmission is slow	This transmission is fast.
This transmission is used for long distance	This transmission is used for short distance
The circuit used in serial transmission is simple	The circuit used in parallel Transmission is relatively complex.

Ans to the question: 4(c)

Difference between Synchronous and Asynchronous Transmission –

Synchronous Transmission	Asynchronous Transmission
In synchronous Transmission, Data is sent in form of blocks or frames.	In asynchronous transmission, Data is sent in form of byte or character.
synchronous transmission is fast.	Asynchronous transmis is slow
Synchronous transmission is costly.	Asynchronous transmissio is economical.
In synchronous transmission, time interval of transmission is constant.	In asynchronous transmission is not constant, it is random.

Synchronous transmission	Asynchronous transmission
In synchronous transmission there is no gap present between data.	In asynchronous transmission, there is present gap between data.
Efficient use of transmission line is done in synchronous transmission.	while in asynchronous transmission, transmission line remains empty during gap in character transmission
synchronous transmission needs precisely synchronized clocks for the information of new bytes.	Asynchronous transmission have no need of synchronized clocks as parity bit is used in this transmission for information of new bytes.

Set - 5

(a) What do you mean by analog transmission

(b) Difference between analog and digital transmission? In details.

(c) What do you mean by Transmission media? ~~Disse~~ Discuss different types of transmission media in details?

Ans to the question NO: 5(a)

Analog transmission is a transmission method of conveying information using a continuous signal which varies in amplitude, phase, or some other property in proportion to that information. Others define that as digital transmission and as a digital signal. It could be the transfer of an analog source signal, using an analog modulation method such as frequency modulation or Amplitude modulation or no modulation at all.

Ans to the question: 5(b)

Difference between analog transmission and digital transmission-

Analog transmission	Digital transmission
Amplitude, frequency or phase variations in the transmitted signal represent the information or message.	Amplitude, width or position of the transmitted pulses is constant. The message is transmitted in the form of code words.
Noise immunity is poor for AM, but improved for FM and PM.	Noise immunity is excellent.
It is not possible to separate out noise and signal. Therefore repeaters cannot be used.	It is possible to separate signal from noise. Therefore, repeaters can be used.
coding is not possible	coding techniques can be used to detect and correct the errors.

Analog transmission	Digital transmission
Bandwidth required is lower ~~that~~ than that for the digital modulation method.	Due to higher bit rates, higher channel bandwidth is required.
FDM is used for multiplexing	TDM is used for multiplexing.
Not suitable for transmission of secret information in military applications.	Due to coding techniques, it is suitable for military applications.
Analog modulation systems are AM, FM, PM, PAM, AWM etc	Digital modulation systems are PCM, DM, ADM, DPCM etc.

Ans to the question No: 5(c)

Transmission media:

Transmission media is a communication channel that carries the information from the sender to the receiver. Data is transmitted through the electromagnetic signals. It is a physical path between transmitted and receiver in data communication. In a copper. based network, the bits in the form of electrotical signals.

Types of transmission media:

* **Twisted Pair cable:** A twisted pair cable is made of two plastic insulted copper wires twisted together to form a single media. Out of these two wires, only one carries

carries actual signal and another is used for ground reference. The twists between wires are helpful in reducing noise and crosstalk.

There are two types of twisted pair cables :

(1) Shielded Twisted Pair (STP) cable

(2) Unshielded Twisted Pair (UTP) cable.

STP cables comes with twisted wire pair covered in metal foil. This makes it more indifferent to noise and crosstalk.

UTP has seven categories, each suitable for specifi use. In computer networks, Cat-5, Cat 5e and Cat-6 cables are mostly used. UTP cables are connected by RJ45 Connectors.

coaxial cable:

coaxial cable has two wires of copper. The core wire lies in the ~~ent~~ center and it is made of solid conductor. The core is enclosed in an insulting sheath. The second wire is wrapped around over the sheath and that too in turn encased by insulator sheath. This all is covered by Plastic cover.

Because of its structure, the coax cable is capable of carrying high frequency signals than that of twisted pair cable. The wrapped structure provides it a good shield against noise and crosstalk. coaxial cables provide high bandwidth rates of up to 450 mbs. There are three categories of coax cables namely, RG-59, RG-58, RG-11. RG stands for Radio Government.
cables are connected using BNC connector and BNC-T. BNC terminator is used to terminate the wire at the far ends.

Fiber optics:

Fiber optic works on the properties of light. When light ray hits at critical angle it tends to refracts at 90 degree. This Property has been used in fiber optic. The core of fiber optic cable is made of high quality glass or plastic. From one end of it light is emitted, it travels through it and at the other end light detector detects light stream and converts it to electric data.

Fiber optic provides the highest mode of speed. It comes in two modes, one is single mode fiber and second is multimode fiber. Single mode fiber can carry a

single ray of light b whereas multimode is capable of carrying multiple beams of light.

Fiber optic also comes in unidirectional and bidirectional capabilities. To connect and access fiber optic special type of connectors are used. These can be subscriber channel, straight Tip or MT-RJ.

Set - 6

(a) What do you mean by wireless transmission

(b) Discuss different types of wireless transmission in details

(c) ~~Differend~~ Difference between Frequency Division Multiplexing and Time Division multiplexing ?

Ans to the question NO:6(a)

Wireless Transmission:

Wireless transmission is a form of unguided media. Wireless communication involves no physical link established between two or more devices, communicating wirelessly. Wireless signals are spread over in the air and are received and interpreted by appropriate antennas.

When an antenna is attached to electrical circuit of a computer or wireless device, it converts the digital data into wireless signals and spread all over within its frequency range. The receptor on the other end receives these signals and converts them back to digital data.

Ans to the question No: 6(b)

Different types of wireless transmission:

Radio Transmission:

Radio is the transmission of signals through free space by modulation of electromagnetic waves with frequencies below those of visible light.

Radio frequencies are sub-divided into six bands. Radio waves at lower frequencies can travel through walls whereas higher RF can travel in straight line and bounce back. The power of low frequency waves decreases sharply as they cover long distance. High frequency radio waves have more power. Radio waves can have wavelength from 1mm - 100,000 Km and have frequency ranging from 3 Hz to 300 GHz.

Microwave Transmission:

Electromagnetic waves above 100MHz tend to travel in a straight line and signals over them can be sent by beaming those waves towards one particular station. Because microwaves travels in straight lines, both sender and receiver must be aligned to be strictly in line of sight. microwaves can have wavelength ranging from 1mm - 1 meter and frequency ranging from 300MHz to 30GHz.

Microwave antennas concentrate the waves making a beam of it. As shown in picture above, multiple antennas can be aligned to reach ~~father~~ farther. microwaves have higher frequencies and do not penetrate wall like obstacles.

Microwave transmission depends highly upon the weather conditions and the frequency it is using

Infraped Transmission:

Infraped wave lies in between visible light spectrum and microwaves. It has wavelength of 700-nm to 1-mm and frequency ranges from 300-GHz to 430-THz.

Infraped wave is used for very short range communication purposes such as televisio and it's remote. Infraped travels in a straight line hence it is directional by nature. Because of high frequency range, Infraped cannot cross wall-like obstacles.

Light transmission:

Electromagnetic waves within the frequency range of 400 THz - 790 THz are detected by the human eye. Light transmission is line of sight propagation and blocked by obstacles.

Ans to the question NO: ~~7(c)~~ 6(c)

Difference between frequency Division multiplexing and Time Division multiplexing-

FDM	TDM
The signals which are to be multiplexed are added in the time domain. But they occupy different slots in the frequency domain.	The signals which are to be multiplexed can occupy the entire bandwidth in the time domain
FDM usually preferred for the analog signals	TDM prefered for the digital signals.
Syncronization is not required	Syncronization is required
Due to bandwidth fading in the Tx medium all the FDM channels are affected	Due to fading only a few TDM channels will be affected
The FDM requires a complex circuity at Tx and Rx	TDM circuity is not very complex
FDM suffers from the problem of crosstalk due to imperfect BPF.	In TDM the problem of crosstalk is not severe.

Set-7

(a) What is transport layer? What is the function of transport layer?

(b) Write down the types of transport layer protocol?

(c) Discuss End-to-End communication in computer network

(d) Differentiate circuit switching and packet switching?

Ans to the question NO: 7 (a)

Transport layer:

The transport layer is the fourth layer in the open system interconnection OSI model. and is responsible for end-to-end communication over a network. This layer enables the be host to send and receive error corrected data, packets or messages over a network and is the network component that allows multiplexing.

Functions of transport layer:

- This layer is the first one which breaks the information data, supplied by Application layer in a to smaller units called segments. It numbers every byte in the segment and maintains their accounting
- This layer ensures that data must be received in the same sequence in which it was sent.

- This layer provides end to-end delivery of data between hosts which or may not belong to the same subnet.

- All server processes intend to communicate over the network are required equipped will well-known Transport service Access point also known as port number

Ans to the question NO: 7 (b)

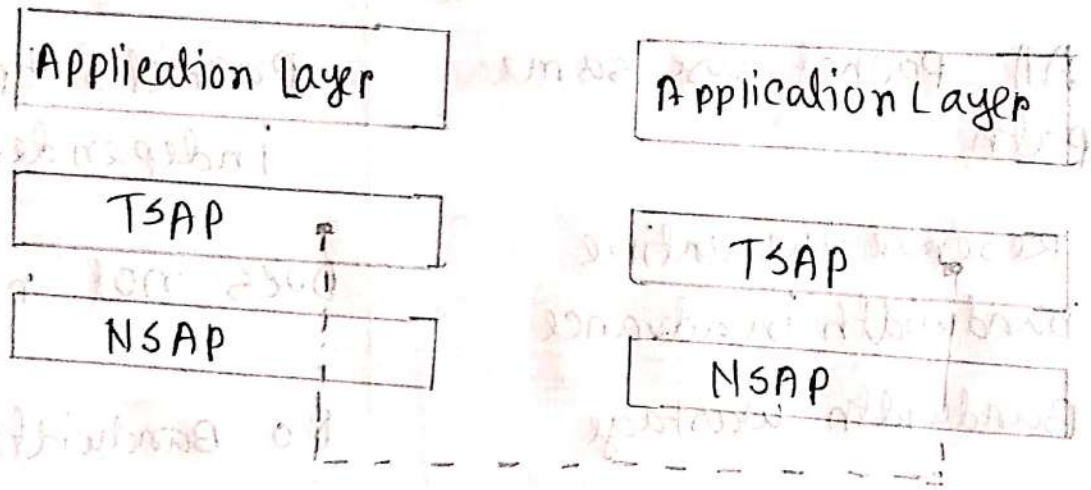
The two main Transport layer protocol are-

(A) Transmission control protocol: It provides reliable communication between two hosts.

(X) User Datagram protocol: It provides Unriable communication between two hosts.

Ans to the question No: 7 (c)

End-to-End communication: A process on one host identifies its peer host on remote network by means of TSAPS, also known as port numbers. TSAPS are very well defined and a process which is trying to communication with its peer knows this in advance.



For example, when a DHCP client wants to communicate with remote DHCP server, it always requests on port number 67. When a DNS client wants to communicate with remote DNS server, it always requests on port number 53 (UDP).

Ans to the question No: 7(d)

Difference between Circuit switching and Packet switching

Circuit switching	Packet switching
Physical Path between source and destination	No physical path
All packet use same path	Packets travel independently
Reserve the entire bandwidth in advance	Does not reserve
Bandwidth wastage	No Bandwidth wastage
No store and forward transmission	Supports store and forward transmission

Set-8

(a) What is UDP?

(b) Note down features of User Datagram Protocol?

(c) Explain the term UDP header?

(d) Write down all application of UDP?

Ans to the question No: 8(a)

User Datagram Protocol is a communications protocol that ~~facilities~~ facilitates the exchange of messages between computing devices in a network. It's an alternative to the transmission control protocol (TCP). In a network that uses the Internet Protocol, it is sometimes ~~ref~~ referred to as UDP/IP.

Ans to the question No: 8(b)

Features of UDP:

- ⊗ UDP is used when acknowledgement of data does not hold any significance.
- ⊗ UDP is good protocol for data flowing in one direction.
- ⊗ UDP is simple and suitable for query based communications.
- ⊗ UDP is not connection oriented.
- ⊗ UDP does not provide congestion control mechanism.

(*) UDP does not guarantee ordered ~~dit~~ delivery of data

(*) UDP is stateless.

(*) UDP is suitable protocol for streaming applications such as VOIP, multimedia streaming

Ans to the question: 8(c)

UDP Header:

UDP header is as simple as its function.

0 — 15	16 — 31
Source port	Destination port
Length	checksum

UDP header contains four main parameters:

- Source port: This 16 bits information is used to identify the source port of the packet.
- Destination port: This 16 bits information, is used identify application level service on destination machine.
- Length: Length field specifies the entire length of UDP packet. It is 16 bits field and minimum

checksum: This field stores the checksum value generated by the sender before sending. IPV-4 has this field as optional so when checksum field does not contain any value it is made 0 and all its bits are set to zero.

Ans to the question NO:8(d)

UDP application:

- Domain Name services
- Simple Network management protocol
- Trivial File Transfer Protocol
- Routing information Protocol
- Kerberos.