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Sub: _____

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Time:

Date: / /

Question- Set

Ques: 01 :-

(a) What is physical layer? What are the functions of physical layer?

(b) Difference between analog signal and digital signal.

(c) What is transmission media and channel capacity?

Ques: 02 :-

(a) Define switching and multiplexing.

(b) Difference between serial and parallel transmission.

(c) Explain the process of analog-to-digital conversion.

Sub: _____

Day

Time: / /

Date: / /

Ques: 03 :

798 - marks

- (a) Describe the different types of transmission media.
- (b) Difference between synchronous and asynchronous transmission.
- (c) Explain the process of analog-to-analog conversion.

Ques: 04 :

800 - marks

- (a) Describe different types of wireless transmission.

(b) Difference between Frequency division Multiplexing and Time Division Multiplexing.

- (c) Write the applications of Multiplexing.

Day

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Time:

Date: / /

Sub:

Ques: 05 :-

80 : and

(a) What is circuit switching? write the advantages and disadvantages of circuit switching.

(b) Explain the technique of message switching.

(c) Difference between circuit switching and packet switching.

100 : and

Ques: 06 :-

80 : and

(a) Difference between circuit switching and message switching.

100

(b) Write the advantages and disadvantages of packet switching.

100 : and

(c) Describe about wavelength Division multiplexing and code Division Multiplexing.

Ques: 07

- (a) What is Transport Layer? write the functions of transport layer.
- (b) Describe about End-to-end communication.
- (c) Write the features of Transmission Control protocol.

Ques: 08

- (a) What is UDP? write the features of UDP.
- (b) Write the parameters of UDP header and applications of UDP.
- (c) Describe different types of timer which user TCP to control and management various tasks.

Sub : _____

Day

Time :

Date : / /

To plan and answer to the question model of the physical layer.

@ To understand what is the physical layer.

Physical layer is the lowest layer of the OSI reference model. It is responsible for sending bits from one computer to another. It is also known as the physical connection layer.

This layer is not concerned with the meaning of the bits and deals with the setup of physical connection to the network and with transmission and reception of signals.

Functions of physical layer.

Following are the various functions performed by the physical layer of the OSI model.

1. Representation of bits: The bits must be encoded into signals for transmission.

It defines the type of encoding i.e. how 0's and 1's are changed to signal.

Sub:

Day

Time:

Date: / /

2. Data Rate: This layer defines the rate of transmission which is the number of bits per second.

3. Synchronization: It deals with the synchronization of the transmitter and receiver. The sender and receiver are synchronized at bit level.

4. Interface: The physical layer defines the transmission interface between device and transmission medium.

5. Line configuration: This layer connects devices with the medium. Point to point configuration and multipoint configuration.

6. Addressing: This layer identifies the devices and provides the path for transmission.

7. Multiplexing: This layer switches the signals of various users.

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Sub : _____

Day _____
Time : _____ Date : / /

6. Topologien : Devices must be connected with

the following topologies: Mesh, star, Ring, Bus

7. Transmission Modes : Physical layer defines the

direction of transmission between two devices:

Simplex, Half-Duplex, Full-Duplex

8. Deal with baseband and broadband transmission

Data from Data Link Layer

Data to Data Link Layer

Physical Layer

Physical Layer

Transmission Layer

Sub:

Day

Time:

Date: / /

Ans. to the question no: 01 (b): difference between analog signal and digital signal

Difference between analog signal and digital signal

Analog Digital

1. An analog signal is a continuous wave that changes over a time period.	1. A digital signal is a discrete wave that carries information in binary form.
2. Represented by sinewaves	2. Represented by squarewave
3. Human voice, natural sound, analog electronic devices are few examples.	3. Computers, Optical devices and other electronic devices.
4. Continuous range of values.	4. Discontinuous values.
5. Records sound waves as they are.	5. Converts into a binary waveform.
6. Only be used in analog devices.	6. Suited for digital electronics like computer, mobiles, and more.

Sub:

Day

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Time:

Date: / /

Ques. 01 (c) Answer to the question no: 01 (c)

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

1. Guided Media: All communication wires/cables are guided media such as UTP, Coaxial cable and Fiber optics.
2. Unguided Media: Wireless or open air space is said to be unguided media because there is no connectivity between the sender and receiver.

Channel Capacity. The speed of transmission of information is said to be channel capacity. We count it as data rate in digital world. It depends on numerous factors such as Bandwidth, the physical limitation of underlying media.

P.T.O

Sub:

Day

Time:

Date: / /

Error - Part i :- Incomplete reception of information

because of noise.

Encoding: The number of levels used for signal.

Amount of information

is proportional to the number of levels used.

For example, if we have 2 levels, then we can represent only 1 bit of information.

If we have 4 levels, then we can represent 2 bits of information.

If we have 8 levels, then we can represent 3 bits of information.

If we have 16 levels, then we can represent 4 bits of information.

If we have 32 levels, then we can represent 5 bits of information.

If we have 64 levels, then we can represent 6 bits of information.

If we have 128 levels, then we can represent 7 bits of information.

If we have 256 levels, then we can represent 8 bits of information.

If we have 512 levels, then we can represent 9 bits of information.

If we have 1024 levels, then we can represent 10 bits of information.

If we have 2048 levels, then we can represent 11 bits of information.

If we have 4096 levels, then we can represent 12 bits of information.

If we have 8192 levels, then we can represent 13 bits of information.

Sub: _____

Day

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Time: _____

Date: / /

Ans. to the que. no: 02 (a)

Switching:

Switching is a mechanism of signal based bond

Switching is a mechanism by which

data/information/agent from source towards

destination which are not directly connected.

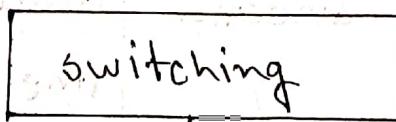
Networks have interconnecting devices, which receives data from directly connected source

stores data, analyze it, and then forward to

the next interconnecting device closer to the destination.

switching can be categorized as:

Circuit switching, message switching, packet switching



Circuit switching

Message switching

Packet switching

Sub:

Day

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Time: / / Date: / /

Multiplexing: Multiplexing is a technique to mix and send multiple data streams over a single medium. This technique requires system hardware called multiplexer for multiplexing the streams and sending them on a medium, and de-multiplexer which takes information from the medium and distributes to different distance.

Amt. to the que no: 02/(b)

Difference between serial and parallel transmission

Serial	Parallel
1. In serial transmission data flows in bit-direction	1. In parallel transmission data flows in multiple lines.
2. In serial transmission, one bit transferred at one clock pulse.	2. In parallel transmission eight bit transferred at one clock rate.

Serial	Parallel
3. Serial transmission is cost efficient.	3. Parallel transmission is not cost-efficient.
4. Serial transmission is slow in comparison of parallel transmission.	4. Parallel transmission is fast in comparison of serial transmission.
5. Generally, serial transmission is used for long distance.	5. Generally, parallel transmission is used for short distance.
6. The circuit used in serial transmission is simple.	6. The circuit used in parallel transmission is relatively complex.
7. Its performance is comparatively lower as compared to parallel transmission.	7. On the other hand, parallel transmission is more efficient in performance.

Sub:

Day

Time:

Date: / /

Ans. to the que no: 02(c)

1st ans.

Analog to Digital conversion

transmitter

Microphones create

analog voice and camera creates analog videos, which are treated as analog data. To transmit this analog data over digital signaling we need analog to digital conversion.

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

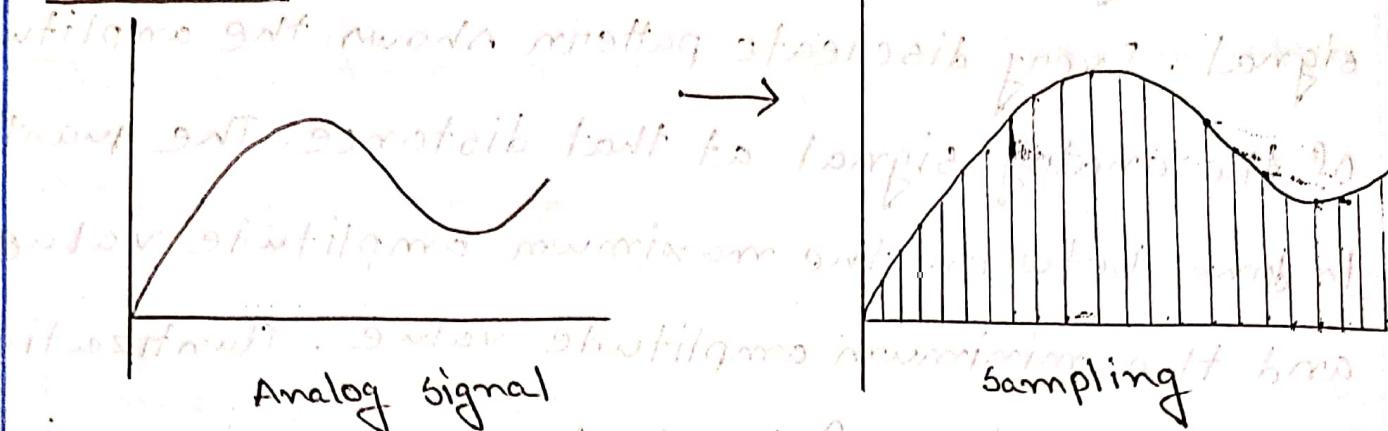
- i) Sampling
- ii) Quantization
- iii) Encoding.

no new information

following of samples

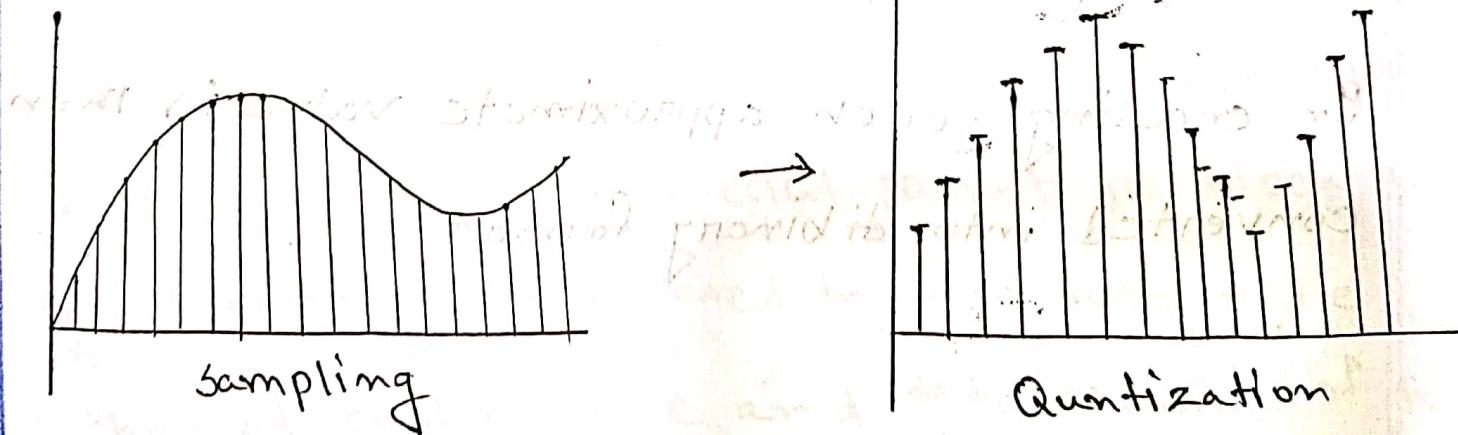
minimum of

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:



Sub:

Day

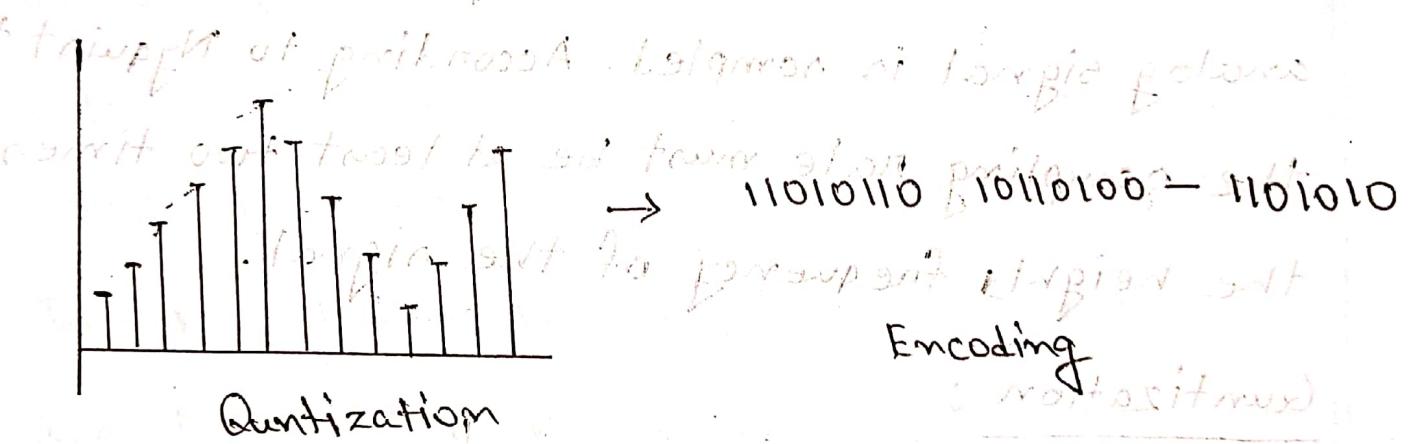
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Time:

Date: / /

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

Encoding: It is process of mapping of quantized instantaneous amplitude values into binary code words.



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

approximate

quantize

Answer no: 03 (a)

There are three major types of transmission media:-

1) Twisted pair cable :-

It contains consists of 2 separately insulated conductor wires wound about each other.

Generally, several such pairs are bundled together in a protective sheath. They are the most widely used transmission media. Twisted pair is of 2 types:-

i) Unshielded Twisted pair (UTP) : This type of

cable has the ability to block external interference and is used for telephonic applications.

ii) Shielded Twisted pair (STP) : This type of

cable consists of a special jacket to block external interference.

It is used in fast data rate

Ethernet and in voice and data channels of tel lines.

2) Coaxial cable :-

It has an outer plastic covering

Sub:

Day

Time:

Date: / /

containing 2 parallel conductors each having a separate insulated protection cover. The coaxial cable transmits information in two modes.

Baseband mode and Broadband mode. Cable TV's and analog television networks widely use coaxial cables.

3) Optical Fibre cable: It uses the concept of reflection of light through a core made up of glass or plastic. The core is surrounded by a less dense glass or plastic covering called the cladding which is used for the transmission

of large volumes of data. This cable can be unidirectional or bidirectional. The WDM supports 2 modes, namely unidirectional and bidirectional mode.

It has two modes of transmission i.e. single mode and multi-mode. The single mode has a core diameter of 8-10 micrometers and a cladding diameter of 125 micrometers. The multi-mode has a core diameter of 50-62.5 micrometers and a cladding diameter of 140 micrometers. The optical fiber is made of glass or plastic fibers which are very thin and flexible. They are used for long distance communication as they are less affected by noise and interference.

(Q8) Ans. to the que. no: 03 (b)

Difference between synchronous and Asynchronous transmission.

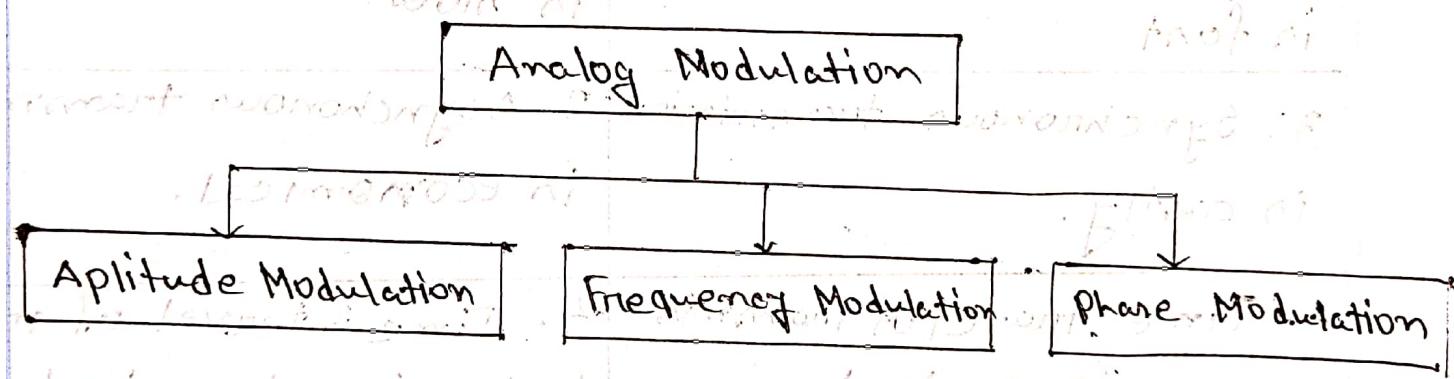
both have same principle of polarities

Synchronous	Asynchronous
1. In synchronous transmission Data is sent in form of blocks or frames.	1. In asynchronous transmission Data is sent in form of bytes or characters.
2. Synchronous transmission is fast.	2. Asynchronous transmission is slow.
3. Synchronous transmission is costly.	3. Asynchronous transmission is economical.
4. Time interval of transmission is constant.	4. Time interval of transmission is not constant.
5. There is no gap present between data.	5. There is gap present between data.
6. It is easy to design.	6. It is complex to design.

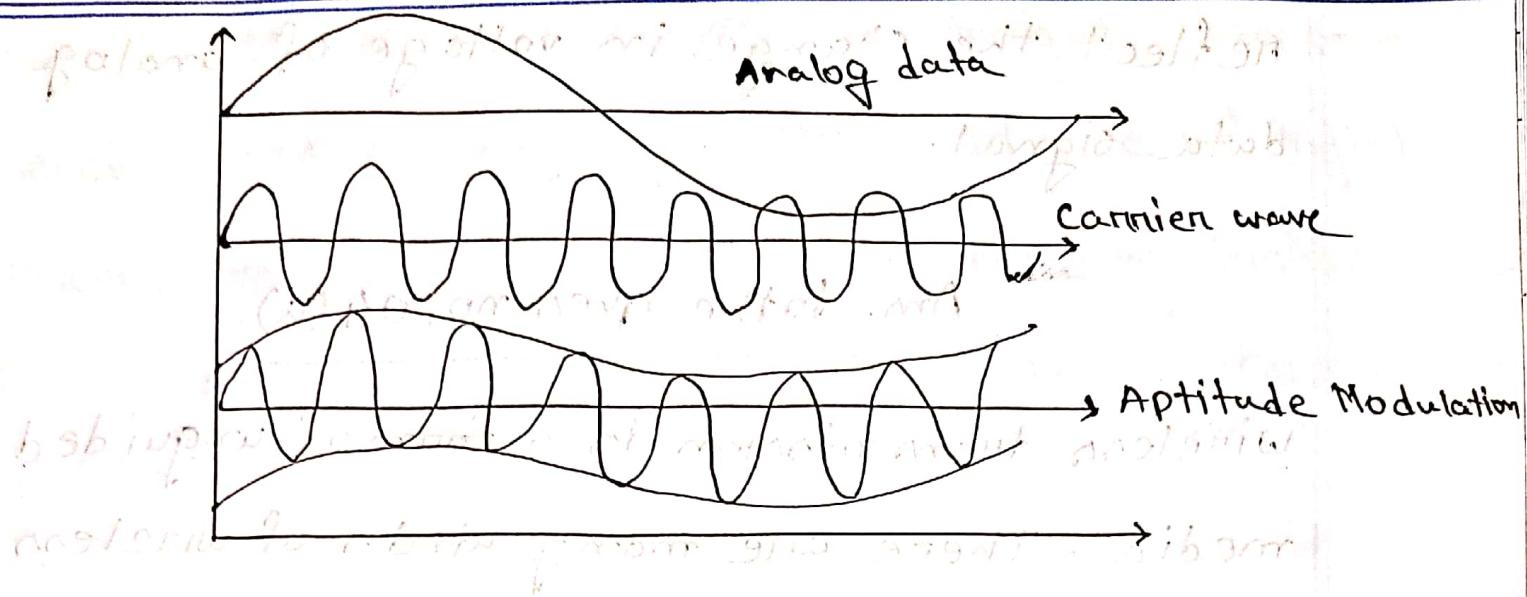
(Q) Q3 (c) Ans. to the que. no: 03 (c)

Analog to analog conversion:-

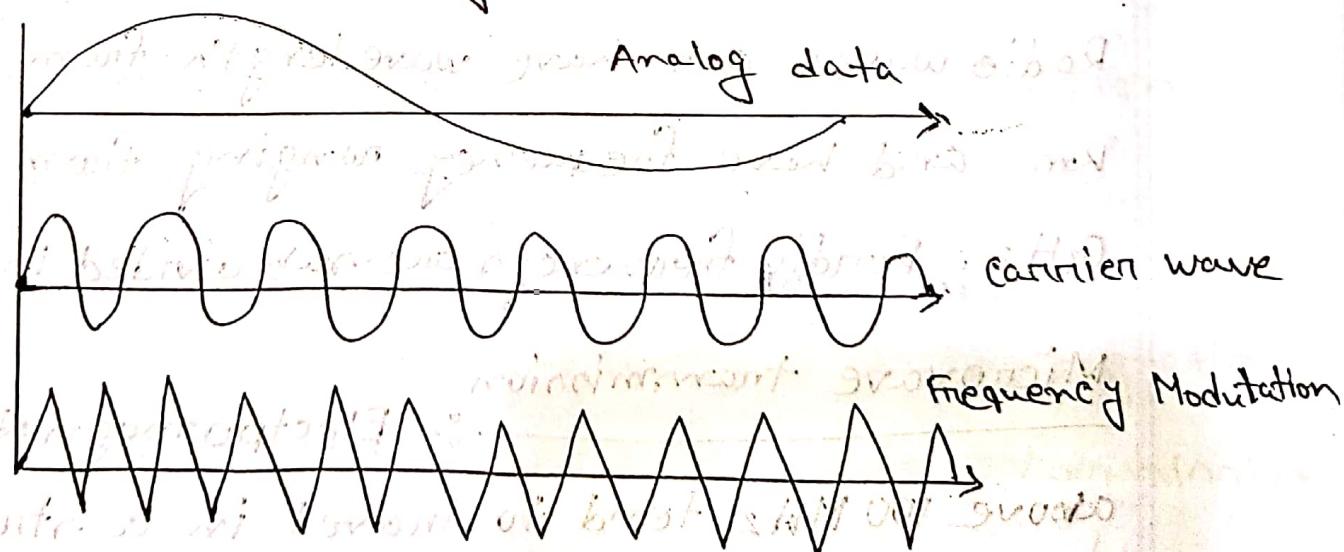
Analog signals are modified to represent analog data. This conversion is also known as Analog Modulation. Analog Modulation is required when bandpass is used. If Analog to analog conversion can be done in 3 ways.



Amplitude Modulation: In this modulation, the amplitude of the carrier signal is modified to reflect the analog data. Amplitude modulation is implemented by means of a multiplexer. The frequency and phase of carrier signal remain unchanged.



Frequency modulation:- In this modulation technique, the frequency of the carrier signal is modified to reflect the change in the voltage levels of the modulation signal, maintaining a fixed amplitude.



Phase Modulation:- In this modulation technique the phase of carrier signal is modulated in order to obtain narrow bandwidth signals.

Sub:

Day

Time:

Date: / /

reflect the change in voltage of analog data signal.

Ans. to the que no 104 (a)

Wireless transmission is a form of unguided media. There are many kinds of wireless transmission.

Radio transmission: Radio frequency is easier

to generate and because of large wavelength it can penetrate through walls and structures alike.

Radio waves can have wavelength from 1mm-1000000 km and have frequency ranging from 3 Hz to 300 GHz.

Radio frequencies are sub divided into 6 bands.

Microwave transmission

Electromagnetic waves above 100 MHz tend to travel in a straight line and signals over them can be sent by beaming those waves towards one particular station.

Sub:

Day

Time:

Date: / /

Because Microwave ~~not~~ travels in straight lines and receiver must be aligned to strictly in line of sight.

Microwaves can have wavelength ranging from 1mm - 1 meter and frequency range from 300 MHz to 300 GHz.

Uses: Ge wolf's eye, Platinum for measurement

Infrared transmission

Infrared wave lies in between visible light spectrum and microwaves. It has wavelength of 700 nm to 1mm and frequency ranges from 300 GHz to 430 THz. Infrared wave is used for very short range communication purpose in nuclear television and its remote.

Light Transmission

:- Highest most electromagnetic spectrum which can be used for data transmission in light or optical signaling. This is achieved by means of LASER. Laser works as TX (transmitter)

Sub:

Day

Time:

Date: / /

Bm and Photo-detectors work as Rx (receivers).

Ans. to the que. no: 04(6)

Difference between FDM and TDM

Basis	FDM	TDM
Defination	A technique that allows transmission of multiple signals using different frequency slots over a common link.	A technique that prefers the flow of multiple data signal over a communication link in different time domain.
Stands for	Frequency Division Multiplexing	Time Division Multiplexing
Multiplexing technique	Analog	Digital
Synchronization	Not needed	Necessary
Circuit Orientation	Complex	Comparatively simple
Cross talk	Exist	Does not exist
Propagation delay	Not sensitive	sensitive
Efficiency	Less efficient	More efficient
Cost	High	Comparatively Low

Sub: _____

Day _____
Time: / / Date: / /Ans. to the question no: 4 (c)

The application of Multiplexer:-

1. Communication system - A multiplexer is used in communication systems, which has a transmission system and also a communication network. A multiplexer is used to increase the efficiency of the communication system by allowing the transmission of data such as audio and video data from different channels.
2. Computer Memory - A multiplexer is used in computer memory to keep up a vast amount of memory in the computer and also to decrease the number of copper lines to connect the memory to other parts of the computer.
3. Telephone Network - A multiplexer is used in telephone networks to integrate the multiple audio signals on a single line of transmission.

Ans. to the ques. no: 05(a)

Circuit switching: When a dedicated path is established between the sender and receiver, for data transmission between sender and receiver, its called circuit switching.

Advantages of circuit switching

- Once path is set up, the only delay is in data transmission speed.
- No problem of congestion or garbled message.

Disadvantages of circuit switching

- Long set up time is required.
- A request token must travel to the receiver along with acknowledgement before any transmission can happen.
- Line may be held up for a long time.
- Inefficient use of communication channels.
- More bandwidth is required.

Sub:

Day

Time:

Date: / /

Ans. to the ques. no: 05 (b)

~~Central Switching~~ ~~two hop~~ ~~connected network~~
Message switching:

This is technique was somewhere in middle of circuit switching and packet switching. In message switching the whole message is treated as data unit and is transferred in its entirety. A switch working on message switching, first receives the whole message and buffers it until there are resources available to transfer it to the next hop. If the next hop is having enough resource to accommodate large size message, the message is stored and switch units. This technique was considered substitute to circuit switching. As in circuit switching the whole path is blocked for two entities only. Message switching is replaced by packet switching.

(a) Ans. to the que. no : 05 (c)

Difference between circuit switching and Packet switching.

Ques. No. 13 circuit switching	Ques. No. 13 Packet switching
<p>1. In circuit switching there are 3 phases</p> <ul style="list-style-type: none"> i) Connection Establishment ii) Data Transfer iii) Connection released 	<p>1. In packet switching direct data transfer takes place without a planned connection.</p>
<p>2. In circuit switching each data unit know the entire path address which is provided by the source.</p>	<p>2. In packet switching each data unit just know the final destination address intermediate path is decided by the routers.</p>
<p>3. It was initially designed for voice transmission.</p>	<p>3. It was initially designed for data transfer.</p>
<p>4. It is implemented at physical layer.</p>	<p>4. It is implemented at network layer.</p>

Sub:

Day

Time:

Date: / /

CircuitPacket

5. Its initial cost is low.

5. It demands high installation cost.

6. The protocols for delivery are simpler.

6. It requires complex protocol for delivery.

7. Charging happens per minute.

7. Charging happens per packet.

8. Each packet follows the same route.

8. Each packet does not follow the same route.

9. It does not store and forward transmission.

9. It does store and forward transmission.

Difference between circuit switching and message switching

CircuitMessage

1. Circuit switching is done by setting a physical path between two systems.

1. In message switching data is stored by one node then forwarded to another node to transfer data to another system.

Sub:

Day

Time:

Date: / /

Circuit	Message
2. In circuit switching, data is not stored.	2. In message switching data is first stored then forwarded to the next node.
3. It needs dedicated physical path.	3. It does not need dedicated physical path.
4. It is a geographical addressing.	4. It is a hierarchical addressing.
5. It is costly.	5. It is less costly than circuit switching.
6. Circuit switching routing is manual type routing.	6. Message switching routing is not manual type routing.
7. It reserves full bandwidth in advance.	7. It does not reserves the entire bandwidth in advance.
8. Change depends on time and distance.	8. Change is based on the number of bytes and distance.
9. Congestion occurs for per minute in circuit switching.	9. In message switching no congestion or very less congestion occurs.

(Q) Ans. to the que. no: 06 (b)

Advantage Of packet switching

- i) Delay in delivery of packet is less, since packet are sent as soon as they are available.
- ii) Switching device don't require message storage.
- iii) Data delivery can continue, even if some parts of the network face link failure.
- iv) It allows simultaneous usage of the same channel by multiple users.
- v) It ensures better bandwidth usage.

Disadvantages of Packet switching

- i) They are unsuitable for applications that cannot offer delays in communication like high quality voice calls.
- ii) Packet switching has high installation cost.
- iii) They require complex protocols for delivery.
- iv) Network problems may introduce errors in packets, delay in delivery of packet or loss of packets.

(a) Ques. no: 06 (c)

Wavelength Division Multiplexing: Light has different wavelength. In fiber optic mode, multiple optical carrier signals are multiplexed into an optical fiber by using different wavelengths.

This is an analog multiplexing technique and is done conceptually in the same manner as FDM but uses light as signals.

Code Devision Multiplexing: Multiple data signals can be transmitted over a single frequency by using code devision Multiplexing FDM devices. the frequency in smaller channels but CDM allows its user to full bandwidth and transmit signals all the time using a unique code. CDM uses orthogonal codes to spread signals.

Ans. to the ques. no: 06 (c)

Answer to the question 07(a)

Transport layer, In computer networking, the transport layer is the layer which provides reliable delivery of data between hosts. In the layered architecture of protocols in the network stack in the internet protocol suite and the OSI model.

Functions of Transport layer:

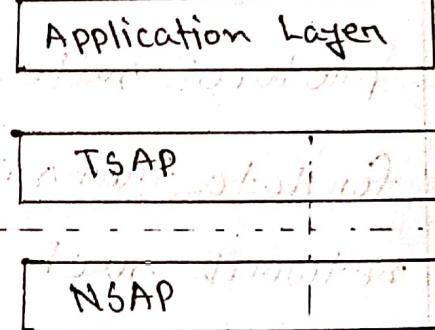
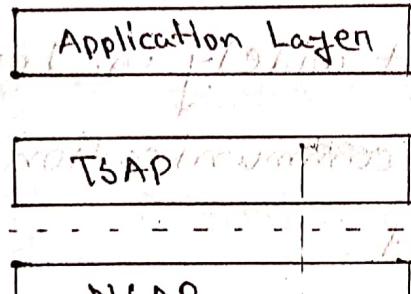
- i) This layer is the first one which breaks the information data, supplied by application layer into smaller units called segments. It numbers every bytes in the segment and maintains their accounting.
- ii) This layer ensures that data must be received in same sequence in which it was sent.
- iii) This layer provides end to end delivery of data between hosts which may or may not belong to the same subnet.
- iv) All servers process intend to communicate over the network are equipped with wellknown transport service Access Points (TSAPs) also known as port number.

Ans to the que no : 07(b)

End-to-End Communication

A process on host identifies its peer host on remote network by means of TSAPs, also known as port numbers. TSAPs are very well defined.

(a) For one host which has a process which is trying to communicate with its peer known 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).

The two main transport layer protocols are:-

- i) Transmission control Protocol : It provides reliable communication between two hosts.
- ii) User Datagram Protocol : It provides unreliable communication between two hosts.

Ans. to the que. no: 07 (c)

The transmission control protocol (TCP) is one of the most important protocols of internet protocol suite. It is most widely used protocol

for data transmission in communication

network such as internet.

Features of transmission Control Protocol :

- i) TCP is reliable protocol that is, the receiver always sends either positive or negative acknowledgement about the data packet to the sender.

Q1) Explain what the data reaches intended

i) destination in the same order it was sent.

iii) TCP is connection oriented. TCP requires that connection between two remote points be established before sending actual data.

iv) TCP provides error checking and recovery mechanism.

v) TCP provides end-to-end communication.

vi) TCP provides flow control and quality of service.

vii) TCP operates in client/server point-to-point mode

viii) TCP provides full duplex server, i.e. it can

perform roles of both receiver and sender.

Ans. to the que. no: 08(a)

UDP stands for user datagram protocol. UDP is a connectionless transport layer communication protocol available of the TCP/IP protocol suite.

Features of UDP:

- i) UDP is used when acknowledgement of data does not hold any significance.
- ii) UDP is a good protocol for data flowing in one direction.
- iii) UDP is simple and suitable for query based communications.
- iv) UDP is not connection oriented.
- v) UDP does not provide congestion and control mechanism.
- vi) UDP does not guarantee ordered delivery of data.

vii) UDP in stateless :- Q7U No notes

viii) UDP is suitable protocol for streaming;

foraging for good quality of streaming applications such as VOIP, multimedia streaming.

Ans. to the que. no: 08 (b)

UDP header contains four parameters:-

Source Port :- This 16 bit information is used to identify the source port of the packet. Destination port

Destination Port :- This 16 bits information, is used to identify application level service on destination machine.

Length :- Length field specifies the entire length of UDP Packet. It is 16 bits field and minimum value is 8 byte, i.e. the size of UDP header itself.

Checksum :- This field stores the checksum value generated by the sender before sending.

Application of UDP :- used at port 910 (iv)

i) Domain Name services

ii) Simple Network Management protocol

iii) Trivial File Transfer Protocol

iv) Routing Information Protocol

v) kerberos

Ans. to the que. no: 08 (c)

Hence UDP is used to transmit data.

Ans. to the que. no: 08 (c)

TCP uses different types of timer to control flow and management various tasks.

keep alive timer :-

i) This timer is used to check the integrity and validity of a connection.

ii) When keep alive time expires, the host sends a probe to check if the connection

still exists.

Prabir

Retransmission Time :-

- i) This timer maintains stateful session of data sent
- ii) If the acknowledgement of send data does not receive with the Retransmission time, the data segment is sent again.

Persist timer :

- i) TCP session can be purged by either host by sending window size 0.
- ii) To resume the session - a host needs to send window size with some layer value.

Time Wait :

- i) After releasing a connection either of the hosts waits for a Time-wait-time to terminate the connection complete.
- ii) Timed out can be a maximum of 240 second.