Biyani's Think Tank

Concept based notes

Electronic Communication & Data Communication

(BCA Part-II)

Megha Saxena
M.Sc. (IT)
Lecturer
Deptt. of Information Technology
Biyani Girls College, Jaipur

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Biyani Group of Colleges

Sector-3, Vidhyadhar Nagar,
Jaipur-302 023 (Rajasthan)
Ph : 0141-2338371, 2338591-95 • Fax : 0141-2338007
E-mail : acad@biyanicolleges.org
Website :www.gurukpo.com; www.biyanicolleges.org

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Preface

I am glad to present this book, especially designed to serve the needs of the students. The book has been written keeping in mind the general weakness in understanding the fundamental concepts of the topics. The book is self-explanatory and adopts the “Teach Yourself” style. It is based on question-answer pattern. The language of book is quite easy and understandable based on scientific approach.

Any further improvement in the contents of the book by making corrections, omission and inclusion is keen to be achieved based on suggestions from the readers for which the author shall be obliged.

I acknowledge special thanks to Mr. Rajeev Biyani, *Chairman* & Dr. Sanjay Biyani, *Director* (*Acad.*) Biyani Group of Colleges, who are the backbones and main concept provider and also have been constant source of motivation throughout this Endeavour. They played an active role in coordinating the various stages of this Endeavour and spearheaded the publishing work.

I look forward to receiving valuable suggestions from professors of various educational institutions, other faculty members and students for improvement of the quality of the book. The reader may feel free to send in their comments and suggestions to the under mentioned address.

Author

Syllabus

B.C.A. Part-II

Electronic Communication and Data Communication

Modulation [Principles of Modulation, AM and FM Modular Circuits, Pulse Code Modulation, Basebeand Modulation, M-ary Pulse Modulation waveforms, Duobinary signaling and decoding. Digital Band-pass Modulation] Demodulation [Basics of Demodulation and detection, signals and Noise, Detection of Binary Signal in Gaussain Noise, Demodulation of shaped Pulses, Digital Signal in Gaussain Noise, Demodulation of shaped Pulses, Digital Band Pass Demodulation], Data Transsion [Basic Concepts. Data Communication Systems, Serial Data formats. encoded data formats, error detection and correction], information about microwave [Electromagnetic spectrum, Serial Data formats, encoded data formats, error detection and correction], information about microwave in Communications, FM Microwave Radio Repeaters, [Satellite, Geosynchronous Satellites, Look angles, Orbital classifications, Spacing and Frequency allocation, Multiple accessing, Channel Capacity.] and optical fiber communication [Basic concept of light propagation, Fiber Cables, Optical fiber versus Metallic cable facilities, Light sources, Optical Detectors, Fiber cable losses, wave division multiplexing, fiber distributed data interface the fiber channel, SONET]. ISDN [ISDN services, subscriber access to ISDN, B Channels, D Channels, H channels, ISDN services, subscriber access to ISDN, B Channels, D Channels, H channels, ISDN layers, Broadband ISDNI, DSL [Digital Subscriber Lines : HDSL, VDSL,SDSI, IDSL].

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Chapter-1

Modulation

Q.1 What is Moudulation?

Ans.: Modulation is a process of converting a digital signal from a computer into an analog signal, the telephone system will accept or the process of changing some characterstic (amplitude, frequency or phase) of a carrier wave in accordance with the intensity of signal is known as ***Modulation.***

Q.2 How many types of Modulation?

Ans.: Accordingly, there are three types of Modulation :

(i) Amplitude Modulation

(ii) Frequency Modulation

(iii) Phase Modulation

(i) Amplitude Modulation : When the amplitude of high frequency carrier wave is changed in accordance with the intensity, it is called ***Amplitude Modulation.***

Amplitude Modulation is done by an electronic circuit called ***Modulator.***

Advantages :

(i) Amplitdue Modulation is easy to implement.

(ii) It can be used both for analog and digital signals.

Disadvantages :

(i) It is affected by the electrical noise signal.

(ii) As the strength of the signal decreased in a channel with distance travelled, it reaches a minimum level unacceptable for satisfactory communications.

(ii) Frequency Modulation : A Frequency Modulation signal has constant amplitude but varies in frequency over time to convey informaiton.

Advantages :

(i) Frequency modulated wave is least affected by the noise due to electrical distrubance.

Disadvantages :

(i) Frequency modulated signal has a wide spectrum or range of frequencies and therefore needs much higher bandwith than amplitude modulation.

(ii) The number of FM Signals that one can transmit over a channel with a fixed total bandwidth is smaller than the number of AM signals one can transmit through the same medium.

(iii) Phase Modulation : In PM transmission, the phase of the carrier signal is modulated to follow the changing voltage level (amplitude) of the modulating signal. The peak amplitude and frequency of the carrier signal remain constant, but as the amplitude of the information signal changes, the phase of the carriere changes correspondingly.

Q.3 What is Digital Bandpass Modulation?

Ans.: The bandwidth of an information signal is simply the difference between the highest and lowest frequencies contained in the information and the bandwidth of the communication channel is the difference between the highest and lowest frequencies that channel will allow to pass through it called bandpass.

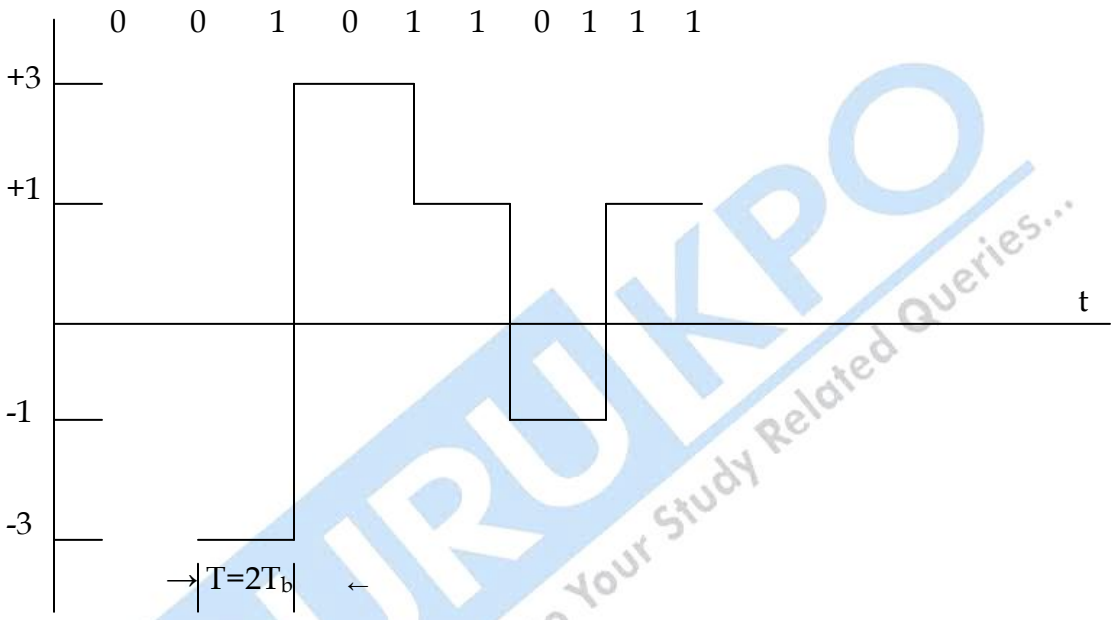
The bandwidth of a communication channel must be sufficiently large to pass all significant information frequencies.

Q.4 What is Base-band M-ary Pam Transmission?

Ans.: In the base-band binary PAM system Figure the pulse amplitude modulator produces binary pulses, that is, pulse with one of two possible amplitudes levels. On the other hand, in a base-band of M-ary PAM system, the pulse-amplitude modulator produces one of M possible amplitude levels, with M>2. This form of pulse modulation is illustrated in Figure for the case of quaternary (M = 4) system and the binary data sequence 0010110111. The waveform shown in Figure is based on the electrical representation for each of the four possible debits (pairs of bits) is shown in Figure.

In M-ary system, the information source emits a sequence of symbols from an alphabet that consists of M symbols. Each amplitude level at the pulse-amplitude modulator output corresponds to a distinct symbol, so that there are M distinct amplitude levels to be transmitted. Consider then an M-ary PAM system with a signal alphabet that contains M equally likely and statistically independent symbols, with the symbol duration denoted by t seconds. We refer to 1\T as the signaling rate of the system, which is expressed in symbols per second or bauds. It is informative to relate the signaling rate of this system to that of an equivalent binary PAM system, which is expresses in symbols per second or bauds. It is informative to relate the signaling rate of this system to that of an equivalent binary PAM system for which the value of M is 2 and the successive binary symbols 1 and are equally likely and statistically independent, with the duration of either symbol denoted by T_b seconds. Under the conditions described here, the binary PAM system produces information at the rate $1\backslash T_b$ bits per seconds. We also observe that in the case of quaternary PAM system, for example, the four possible symbols may be identified with the debits 00, 01, 10 and 11. We thus see that each symbol represents 2 bits of information, and 1 baud is equal to 2 bits per second. We may generalize this result by stating that in an M-ary PAM system, 1 baud is equal to $\log_2 M$ bits per second, and the symbol duration T of the M-ary PAM system is therefore, in a given channel bandwidth, we find that by using an M-ary PAM system, we are able to transmit information at a rate that is $\log_2 M$ faster than the corresponding binary PAM system. However, to realize the same average probability of

symbol error, and M-ary PAM system requires more transmitted power. Specifically, we find that for M much larger than 2 and an average probability of symbol error small compared to 1, the transmitted power must be increased by a factor of $M^2/\log_2 M$, compared to a binary PAM system as $T=T_b \log_2 M$.



Digit	Amplitude
00	-3
01	-1
11	+1
10	+3

In a base band M-ary system first of all, the sequence of symbols emitted by he information source is converted into an M-level PAM pulse train is shaped by a transmit filter and then transmitted over the communication channel, which corrupts the signal waveform with both noise and distortion. The received signal is passed through a receive filter and then sampled at an appropriate rate in synchronism with the transmitter. Each sample is compared with preset

threshold values (also called slicing levels), and a decision is made as to which symbol was transmitted. We therefore, find that the designs of the pulse amplitude modulator and the decision-making device in M-ary PAM are more complex than those in a binary PAM system. Inter-symbol interference, noise and imperfect synchronization cause errors to appear at the receive output. The transmit and receive filters are designed to minimize these errors.

Q.5 What is Duo Binary Signaling and Decoding?

Ans.: "Dou" implies doubling of the transmission capacity of a straight binary system. This particular form of correlative-level coding is also called *class I partial response.*

Consider a binary input sequence b_k consisting of uncorrelated binary symbols 1 and 0, each having duration T_b. As before, this sequence is applied to a pulse-amplitude modulator producing a sequence of short pulse whose amplitude A_k is defined by

$$A_k = \begin{cases} +1 & \text{if symbol } b_k \text{ is 1} \\ -1 & \text{if symbol } b_k \text{ is 0} \end{cases} \qquad \text{Eq.(3.1)}$$

When the sequence is applied to a duo-binary encoder, it is converted into a three-level output, namely -2, 0, +2. The two level sequence A_k first passed through a simple filter involving a single delay element and summer. For every unit impulse applied to the input of this filter we get two unit impulses spaced b seconds apart at the filter output. We may therefore express the duo binary coder output C_k as the sum of the present input pulse a_k and its previous value a_{k-1}, as

$$C_k = a_k + a_{k-1} \qquad \text{Eq.(3.2)}$$

One of the effects of the transformation is to change the related three-level pulses. This correlation between the adjacent pulses may be viewed as introducing inter-symbol interfaces into the transmitted signal in a artificial manner.

The original two-level a_k may be detected from the duo binary-coded sequences c_k by involving the use of previous equation. Especially, let at

represent the estimate of the original pulse a_k as conceived by the receiver at time $t = kt_b$. Then, subtracting the previous estimate a_{k-1} from c_k, we get

$$A_k = c_k + a_{k-1} \qquad \text{Eq.(3.3)}$$

It is apparent that if c_k is received without error and if also the previous estimate a_{k-1} at time $t = (k-1)T_b$ corresponds to a correct decision ,then the current estimate a k will be correct too. The technique of using a stored estimate of the previous symbol is called *decision feedback*. However, a major drawback of this detection procedure is that once errors are made they tend to prototype through the output because a decision on the current input a_k depends on the correction of the decision made on the previous input A_{k-1}.

A practical means of avoiding the error propagation is to use *precoding* before the duo binary coding, the preceding operation performed on the binary data sequence b_k converts it into another binary sequence D_k defined by

$$D_k = b_k + d_{k-1} \qquad \text{Eq.(3.4)}$$

Where the symbol denotes module-two addition of the binary digits b_k and d_{k-1}. This addition is equivalent to a two point EXCLUSIVE OR operation, which is performed as follows :

$$D_k = \begin{cases} \text{Symbol 1 if either symbol } b_k \text{ or symbol } d_{k-1} \text{ is 1} \\ \text{Symbol 0} \quad \text{otherwise} \end{cases} \qquad \text{Eq.(3.5)}$$

The recoded binary sequence d_k is applied to a pulse amplitude modulator, producing a corresponding two-level sequence of short pulses a_k, where a_k= +1 as before

This sequence of short pulses is next applied to the duo binary coder, thereby producing the sequence C_k that is related to a_k as follows :

$$C_k = a_k + a_{k-1} \qquad \text{Eq.(3.6)}$$

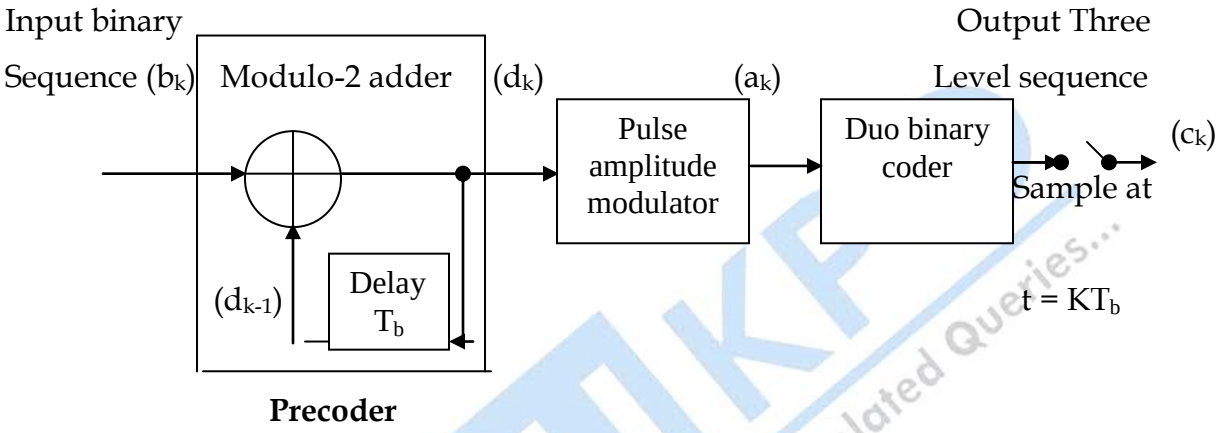
The combined use of Eq(1.4) and (1.6) yields :

$$C_k = \begin{cases} 0 \quad \text{if data symbol } b_k \text{ is 1} \\ \pm 2 \quad \text{if data symbol } b_k \text{ is 0} \end{cases} \qquad \text{Eq.(3.7)}$$

From (3.7) we deduce the following decision rule for detecting the original binary sequence {b k } from {c_k} :

If $|c_k| < 1$, say symbol b k is 1

If $|c_k| > 1$ say symbol b k is 0



Precoder

When c_k =1, he receiver simply makes a random guess in favour of symbol 1 or 0. A useful feature of this detector is that no knowledge of any input sample other than the present one is required.

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Chapter-2

Demodulation

Q.1 What do you mean by Demodulation?

Ans.: **Demodulation** is the act of removing the **modulation** from an analog signal to get the original baseband signal back. Demodulation is necessary because the receiver system receives a modulated signal with specific characteristics and it needs to turn it to base-band.

There are several ways of demodulation depending on what parameters of the base-band signal are transmitted in the carrier signal, such as amplitude, frequency or phase. For example, if we have a signal modulated with a linear modulation, like AM (Amplitude Modulated), we can use a synchronous detector. On the other hand, if we have a signal modulated with an angular modulation, we must use an FM (Frequency Modulated) demodulator or a PM (Phase Modulated) demodulator. There are different kinds of circuits that make these functions.

An example of a demodulation system is a modem, which receives a telephone signal (electrical signal) and turns this signal from the wire net into a binary signal for the computer.

Q.2 What are the different types of Demodulation?

Ans.: **Types of Demodulation :**

i) **AM Demodulation :** An AM signal can be rectified without requiring a coherent demodulator. For example, the signal can be passed through an envelope detector (a diode rectifier). The output will follow the same curve as the input baseband signal. There are forms of AM in which the

carrier is reduced or suppressed entirely, which require coherent demodulation.

ii) **FM Demodulation :** There are several ways to demodulate an FM signal. The most common is to use a discriminator. This is composed of an electronic filter which decreases the amplitude of some frequencies relative to others, followed by an AM demodulator. If the filter response changes linearly with frequency, the final analog output will be proportional to the input frequency, as desired. Another one is to use two AM demodulators, one tuned to the high end of the band and the other to the low end, and feed the outputs into a different amp. Another is to feed the signal into a phase-locked loop and use the error signal as the demodulated signal.

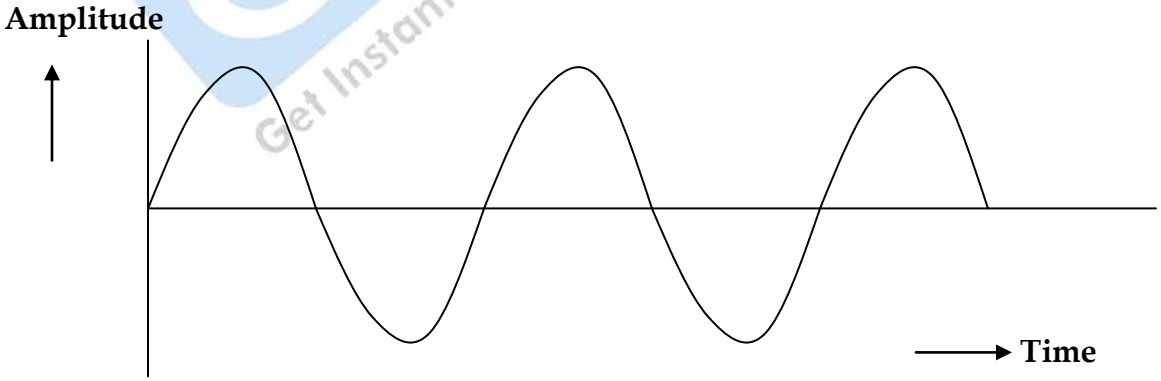
Q.3 What are Signals ?

Ans.: A *signal* is a codified message, that is, the sequence of states in a communication channel that encodes a message. In a *communication system*, a *transmitter* encodes a *message* into a signal, which is carried to a *receiver* by the communications *channel*.

Electric signal can be in **analog** or **digital** form.

Analog Signal : In analog signal, the amplitude changes countinously with respect to time with no breaks or discontinuities .

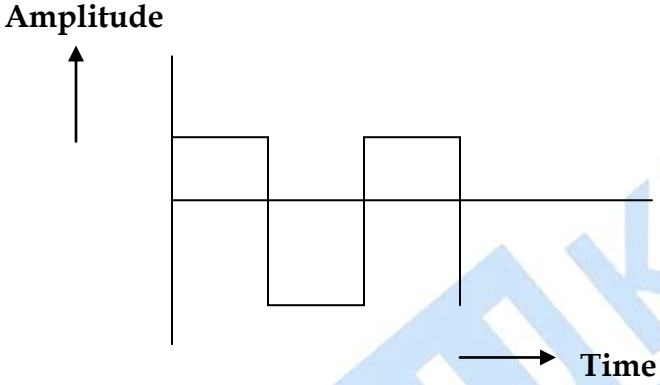
Ex- Any music system conveys the songs in the analog form. Cassettes are recorded using analog recording system and playing the music gives you the analog sound waves.



Digital Signal : It is described as discrete. Their amplitude maintains a constant level for a prescribed period of time and then it changes to another level.

Digital signals are digital representations of discrete-time signals, which are often derived from analog signals.

- All binary signals are digital but all digital signal are not necessarily a binary signal.



Types of Digital signal : 1) Low level, 2) High level, 3) Rising Edge, and 4) Falling Edge.

Q.4 What do you mean by Noise in Demodulation?

Ans.: Electrical noise : Noise is defined as any undesirable electrical energy that falls within the passband of the signal.

For ex- In audio recording,any unwanted electrical signals that fallss within the audio frequency band will interface with the music and tharefore are considered noise.

Types of Electrical Noise :

(1) Man Made Noise

(2) Thermal Noise

Correlated Noise : It is correlated to the signal and can not be present an a circuit unless there is a signal. It is produecd by non linear amplification and inter modulation distortion.

In data communication, all circuits are non-linear and they produce non-linear distortion.

Inter modulation distortion is the generation of unwanted sum and difference frequencies produced when two or more signals are amplified in a non-linear device.

Impulse Noise : It is the high amplitude peaks of short duration in the total noise spectrum.

It consist of sudden burst of irregular shaped pulses that generally last between a few mili seconds and several miliseconds.

Common source are –electric motor, appliances etc.

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Chapter-3

Data Transmission and Communication

Q.1 What is Pulse-Code Modulation?

Ans.: In Pulse-Code Modulation (PCM), a message signal is represented by a sequence of coded pulse, which is accomplished by representing signal in discrete from in both time and amplitude. The basis operations performed in the transmitter of a PCM system are sampling, quantizing and encoding.

Sampling : The application of sampling permits the reduction of the countinuously varying message signal to limited number of discrete values per second.

Quantization : The sampled version of the message signal is then quantized, thereby providing a new representation of the signal that is discrete in both time and amplitude.

Encoding : To exploit the advantage of sampling and quantizing for the purpose of making the transmitted signal more robust to interference and other channel degradations, we require the use of an encoding process to translate the discrete set of sample values to a more appropriate form of signal.

Q.2 What is Data Transmission?

Ans.: The test prepared on a PC is usually stored and then transmitted over a communication channel (e.g. a telephone channel) with a single character being sent at a time. This form of data transmission is called asychronous transmission, as opposed to synchronous transmission, in which a sequence of encoded characters is sent over the channel. Encoded characters produced by a mixture of asynchronous and synchronous terminals are combined by means of data multipexers. The multiplexed stream of data so formed is then applied to a device called a modem (modulator – demodulator) for the purpose of transmission over the channel.

Q.3 How many modes of Transmission Modes are there?

Ans.: There are three methods of data transmission :

(1) Simplex

(2) Half-Duplex

(3) Full-Duplex

Simplex : In Simplex Comunication Mode, there is one way communciation transmission. Television transmission is a very good example of simplex communication.

Half Duplex : In Half Duplex Mode, both units communicate over the same medium, but only one unit can send at a time. While one is in send mode, the other unit is in receive mode.

Full Duplex : A Full Duplex System allows information to flow simulaneouly in both direcions on the transmission path. Example – Telephone.

Q.4 What is Data Communication?

Ans.: Data communication is the exchange of data between two devices via some form of transmission medium such as wire cable. The effectiveness of a data communication system depends on three fundamental characterstics :

(1) **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.

(2) **Accuracy :** The system must deliver the data accurately.

(3) **Timeliness :** The system must deliver data in a timely manner.

Q.5 What are the components of Communication System?

Ans.: A Data Communication System has five components :

(1) **Message :** The message is the information (data) to be communicated. It can consist of text, numbers, pictures, sound or video or any combination of these.

(2) **Sender :** The sender is the device that sends the data message.

(3) **Receiver :** The receiver is the device that receives the message.

(4) **Medium :** The transmission medium is the physical path by which a message travels from sender to receiver.

(5) **Protocol :** A protocol is a set of rules that governs data communication.

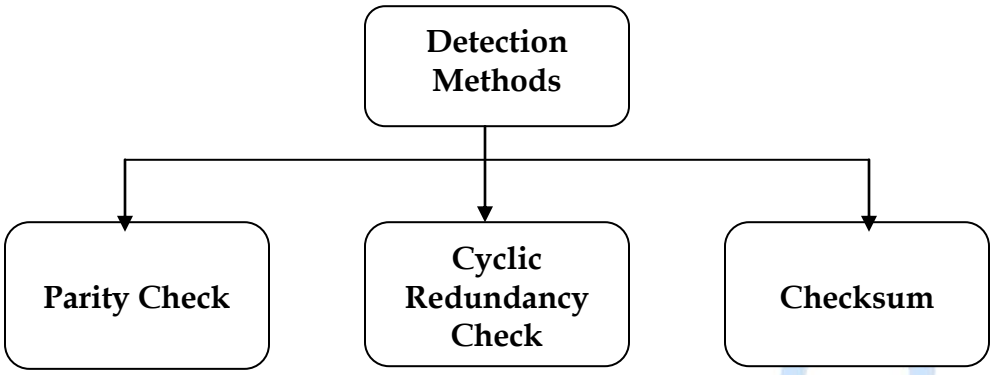
Q.6 What do mean by Error Detection?

Ans.: Data can be corrupted during transmission. For reliable communication errors must be detected and corrected.

Some of the error detection process are :

Redundancy : One error detection mechanism would be to send every data unit twice. The receiving device would then be able to do-bit-for-bit comparison between the two versions of the data. Any discrepancy would indicate an error, and an appropriate correction mechanism could be set in place .It would also be insupportably slow. Instead of repeating the entire data system, a shorter group of bits may be appended to the end of each unit. This technique is called redundancy because the extra bits are redundant to the information, they are discarded as soon as the accuracy of the transmission has been determined.

Three types of redundancy checks are common in data communications : **Parity, Cycle Redundancy Check (CRC) and Checksum.**



Detection Methods

Parity Check :

(1) **Simple Parity Check :** In this technique, a redundant bit called a parity bit is added to every data unit so that the total number of 1s is the unit (including the parity bit) becomes even(or odd).

(2) **Two-dimensional Parity Check :** A better approach is the Two-dimensional parity check. In this method a block of bits is organized in a table .First we calculate the parity bit for each data unit. Then we organize them into a table.

Cyclic Redundancy Check (CRC) : CRC is based on binary division. In CRC instead of adding bits to achieve a desired parity, a sequence of parity bits, called the CRC is appended to the end of a data unit so that the resulting data unit becomes exactly divisible by a second, predetermined primary number. At its destination, the incoming data unit is divided by the same number .If at this step there is no remainder, the data unit is assumed to be intact and is therefore accepted. A remainder indicates that the data unit has been damaged in and therefore must be rejected.

The redundancy bits used by CRC are derived by dividing the data unit by a predetermined divisor, the remainder is the CRC. To be valid a CRC must

have exactly one less bit than the divisor, and appending it to end of the data string must make the resulting bit sequence exactly divisible by the divisor.

Checksum : The checksum is based on the concept of redundancy.

Checksum Generator : In the sender, the checksum generator subdivides the data unit into equal segments of n bits. These segments are added using one complement arithmetic in such a way that the total is also n bits long.

The total (sum) is then complemented and appended to the end of the original data unit as redundancy bits, called the checksum.

Checksum checker : The receiver subdivides the data unit and adds all segments and complements. The result of the data unit is intact, the total value found by adding the data segments and the checksum field should be zero. It the result is not zero, the packet contains an error and the receiver rejects it.

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Chapter-4

Microwaves

Q.1 What are Microwaves?

Ans.: 'Microwaves' is a description term used to identify electromagnetic waves in the frequency spectrum ranging approximately from 1 Gigahertz to 30 Gigahertz. It corresponds to wavelengths from 30 cm to 1 cm. Sometimes higher frequencies are also called Microwaves. Microwaves are unidirectional. At lower frequencies microwaves do not pass through buildings. Microwaves communication is widely used for long distance telephone communication, cellular telephones, television distribution.

Following are the **Characteristics of Microwave Communication :**

(1) A microwave is inexpensive as compared to fiber optics system.

(2) Microwaves systems permit data transmission rates of about 16 Giga bits per second. At such high frequencies, Microwaves systems can carry 250,000 voice channels at the same time.

Q.2 What are the characterstics of Microwaves?

Ans.: **Microwave Link :** The maturity of radio frequency technology has permited the use of a microwave link as the major trunk channel for long distance communication.

(1) **Freedom from Land Acquisition Rights :** The acquisition of right to lay cabling, and have permanent access to repeater stations is a major cost in the provision of cable communications. The use of radio links,that require only the acquisition of the transmitter/receiver station, removes this requirements .It also simplifies the maintenance and repair of the link.

(2) **Ease of Communication over Difficult Terrain :** Some terrains make cable laying extremely difficult and expensive,even if the land acquisition cost is negligible.

(3) **Bandwidth Allocation is Extremely Limited :** Unlike cabling system,that can increase bandwidth by laying more cables, the radio frequency bandwidth allocation is finite and limited.

(4) **Atmospheric Effects :** The use of free space communication results in susceptibility to weather effects particularly rain.

(5) **Transmission Path needs to be Clear :** Microwave communication requires line-of-sight, point to point communication.

(6) **Interference :** The microwave system is open to radio frequency interference.

Q.3 What are the types of Microwaves Communication System?

Ans.: There are two types of Microwaves Communication System :

(1) Terrestrial

(2) Satellite

Terrestrial Microwave System : Terrestrial microwave system use directional parabolic antennas to send and receive signals in the lower giga hertz range. The signals are highly focused and the physical path must be line-of-sight. Relay towers and repeaters are used to extend signals. Terrestrial microwave system is used whenever cabling is cost-prohibitive such as in hilly areas or crossing rivers, etc.

Some characteristics of Terrestrial Microwave System :

(i) **Frequency Range :** Most Terrestrial microwave system produce signals in the low gega hertz range usually at 4 to 6 GHz and 21 to 23 GHz.

(ii) **Cost :** Short-distance systems can be relatively inexpensive.

(iii) **Installation :** Line-of-sight requirements for microwave system make installation difficult.

(iv) **Band-width Capacity :** Capacity varies depending on the frequencies used but data rates are from 1 to 10 MBPS.

(v) **Attenuation :** Attenuation is affected by frequency, signal strength, antenna size, atmospheric conditions.

(vi) **Electromagnetic Interference (EMI) :** Microwave signals are vulnerable to EMI, jamming and eavesdropping.

Satellite Microwave Systems : A communication satellite is basically a microwave relay station placed precisely at 36,000 km above the equator where its orbit speed exactly matches the earth's rotation speed. Since a satellite is positioned in a geo-synchronous orbit, it appear to be stationary relative to earth and always stays over the same point with respect to the earth .This allows a ground station to aim its antenna at a fixed point in the sky.

Some characteristics of Satellite Microwave System :

(i) **Frequency Range :** Satellite links operate in the low giga hertz range 4-6 GHz and 11-14 GHz .

(ii) **Cost :** The cost of building and launching a satellite is extremely high.

(iii) **Installation :** Satellite microwave installation for orbiting satellites is extremely technical and difficult.

(iv) **Bandwidth Capacity :** Capacity depends on the frequency used. Typical data rates are 1 to 10 Mbps.

(v) **Attenuation :** Attenuation depends on frequency, power, antenna size and atmospheric conditions.

Q.4 What are the Uses of Microwave Communication?

Ans.: By using frequency division multiplexing up to 5,400 telephone channels on each microwave radio channel, with as many as ten radio channels combined into one antenna for the *hop* to the next site, up to 70 km away can be sent.

1) Wireless LAN protocols, such as Bluetooth use microwaves.

2) Microwaves are used to establish metropolitan area networks.

3) Wide Area Mobile Broadband Wireless Access

4) Cable TV and Internet access on coaxial cable as well as broadcast television use some of the lower microwave frequencies. Some mobile phone networks, like GSM, also use the lower microwave frequencies.

5) Microwave radio is used in broadcasting and telecommunication transmissions. Typically, microwaves are used in television news to transmit a signal from a remote location to a television station from a specially equipped van.

Remote Sensing :

6) Radar uses microwave radiation to detect the range, speed, and other characteristics of remote objects, automatic door openers

7) A Gunn diode oscillator and waveguide are used as a motion detector for automatic door openers.

8) Most radio astronomy uses microwaves.

9) Microwave imaging.

Navigation :

10) Global Navigation Satellite Systems (GNSS) including the American Global Positioning System (GPS).

Power :

11) A microwave oven uses microwave.

12) Microwave heating is used in industrial processes for drying and curing products.

13) Many semiconductor processing techniques use microwaves. Microwaves can be used to transmit power over long distances.

14) Microwaves can be used to transmit power over a long distance.

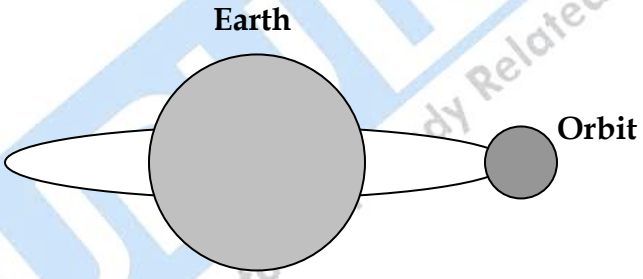
□ □ □

Chapter-5

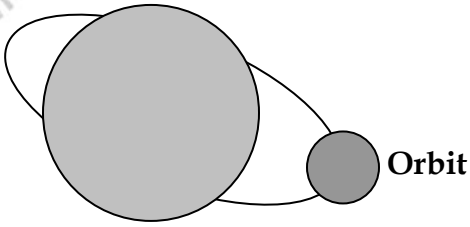
Satellite

Q.1 What are Orbits?

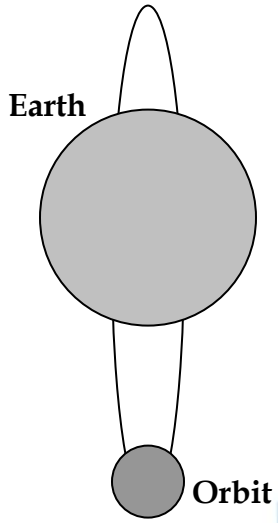
Ans.: An artificial satellite needs to have an **orbit**, the path in which it travels around the earth. The orbit can be Equatorial, Inclined or Polar.



Equatorial-Orbit Satellite



Inclined-Orbit Satellite



Polar-orbit satellite

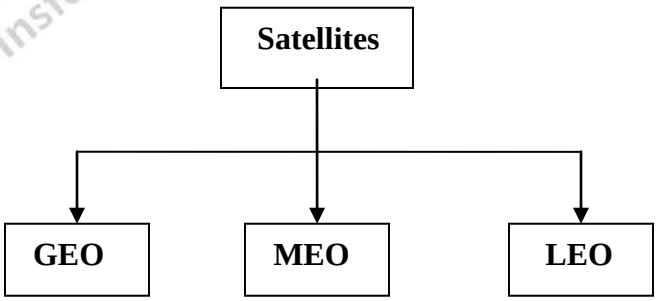
The Period of a satellite, the time required for a satellite to make a complete trip around the earth, is determined by Kepler's law, which defines the period as a function of the distance of the satellite from the center of the earth.

$$\text{Period} = C * \text{Distance}^{1.5}$$

Here C is a constant approximately equal to1/100. The period is in seconds and the distance in kilometers.

Q.2 In how many categories Orbits are classified?

Ans.: Based on the location of the orbit, satellites can be divided into three categories : **GEO, MEO & LEO.**



Satellite Categories

GEO Satellites : Line of sight propagation requires that the sending and receiving antennas be locked onto each other's location at all times. For this reason, a satellite that moves faster or slower than the earth's rotation is useful only for short period of time. To ensure constant communication, the satellite must move at the same speed as the earth so that it seems to remain fixed above a certain spot. Such satellites are called geosynchronous.

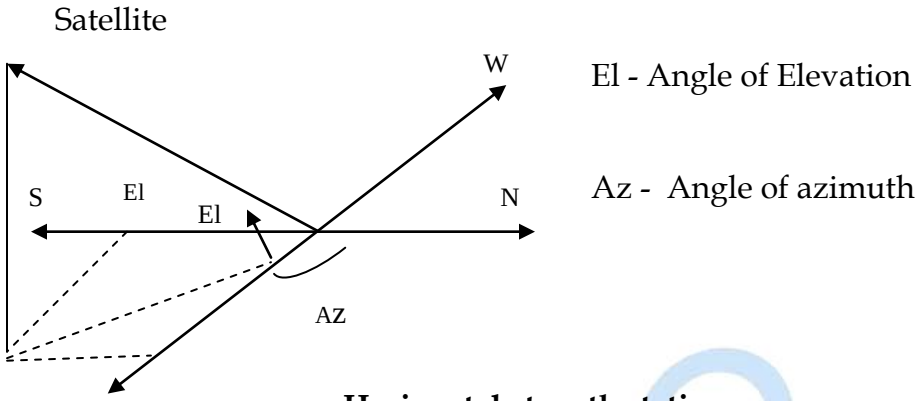
MEO Satellites : Medium-Earth orbit (MEO) satellites are positioned between the two van Allen belts. A satellite at this orbit takes approximately 6 hours to circle the earth.

GPS : One example of MEO satellite system is **Global Positioning System (GPS).**

LEO Satellite : Low-Earth Orbit (LEO) satellites have polar orbits. The altitude is between 500 to 200 km, with a rotation period of 90 to 120 min. The satellite has a speed of 20,000 to 25,000 km/h. Because LEO satellites are close to the earth, the round-trip time propagation delay is normally less than 20 ms, which is acceptable for audio communication.

Q.3 What are Look Angles?

Ans.: To maximize transmission and reception, the direction of maximum gain of the earth station antenna, referred to as the antenna *boresight*, must point directly at the satellite. To align the antenna in this way, two angles must be known. These are the *azimuth*, or angle measured from the true north, and the elevation, or angle measured up from the local plane. The *azimuth* and *elevation angles* are usually referred to as the *look angles.*



Angle of azimuth Az and elevation El measured with reference to the local horizontal plane and true north

Q.4 Give some examples of Artificial Satellites ?

Ans.: Astronomical Satellites are satellites used for observation of distant planets, galaxies, and other outer space objects.

Biosatellites are satellites designed to carry living organisms, generally for scientific experimentation.

Communications Satellites are satellites stationed in space for the purpose of telecommunications.

Miniaturized Satellites are satellites of unusually low weights and small sizes. New classifications are used to categorize these satellites: minisatellite (500–200 kg), microsatellite (below 200 kg), nanosatellite (below 10 kg).

Navigational Satellites are satellites which use radio time signals transmitted to enable mobile receivers on the ground to determine their exact location.

Reconnaissance Satellites are Earth observation satellite or communications satellite deployed for military or intelligence applications. Little is known about the full power of these satellites, as governments who operate them usually keep information pertaining to their reconnaissance satellites classified.

Earth Observation Satellites are satellites intended for non-military uses such as environmental monitoring, meteorology, map making etc.)

Space Stations are man-made structures that are designed for human beings to live on in outer space.

Tether Satellites are satellites which are connected to another satellite by a thin cable called a tether.

Weather Satellites are primarily used to monitor Earth's weather and climate.

Q.5 What is Geo-Synchronous Satellite?

Ans.: The Satellite that are placed in geostationary orbit are called Geo-Synchronous Satellite.

For the orbit to be geostationary it has to satisfy two requirements. First the orbit in Geo-synchronous which requires the satellite to beat an altitude of 22,300 miles. Second the satellite is placed in orbit directly above the equator . Viewed from earth, a satellite in geo-stationary orbit appears to be stationary in the sky. Consequently, an earth station does not have to track the satellite; rather it merely has to point its antenna along a fixed direction, pointing toward the satellite. Communication satellites in geostationary orbit offer the following capabilities :

- Broad Area Coverage
- Reliable Transmission Links
- Wide Transmission Bandwidths

Q.6 What is Spacing and Frequency Allocation?

Ans.: **Spacing and Frequency Allocation :** There are well defined frequency bands allocated for satellite use , the exact frequency allocations depending on the type of services .The frequency band also differ depending on the geographic region of the earth in which the earth stations are located. Frequency allocations are made through the International Telecommunication Unit (ITU). The most widely used bands at present are the C band and the Ku band. Uplink transmissions in the C band are normally at 6 GHz and downlink transmission normally at 4 GHz. The band is sometimes referred to as the 6/4 GHz band. For each band, the bandwidth available is 500 MHz.

For each band the higher frequency range is used for the uplink. The reason is that losses tend to be greater at higher frequency and it is much easier to increase the power from an earth station rather than from a satellite to compensate for it.

To make the most of the available bandwidth, polarization discrimination is used.

Q.7 What do you understand by Channel Capacity?

Ans.: The word transponder is coined from transmitter-responder and it refers to the equipment channel through the satellite that connects the receive antenna with the transmit antenna.

The transponder itself is not a single unit of equipment, but consists of some units that are common to all transponder channels and others that can be identified with a particular channel. The transponder amplified the uplink signals received and transmit to downlink signals.

□ □ □

Chapter-6

Optical Fiber Communication

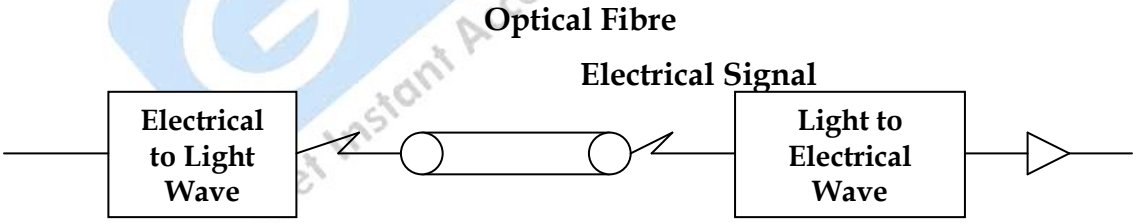
Q.1 What are Fibre Optics Cable?

Ans.: Optic fiber is the newest from of bounded media. This media is superior in data handling and security. The fiber optic cable transmits light signals rather than electrical signals. It is far more effective than the other network transmission media.

Each fiber has an inner core of glass or plastic that conducts light. There are two types of light sources for which fiber cables are available. These are :

(i) Light Emitting Diodes (LEDs)

(ii) Light Amplification by Stimulated Emission Radiation (Lasers)



Transmission through Optical Fibers

In a single mode fiber, the core is 8 to 10 microns. In multimode fibers, the core is about 50 microns in diameter.

Towards its source side is a converter that converts electrical signal into light waves. These light waves are transmitted over the fiber. Another converter placed near the sink coverts the light waves back to electrical signals by photoelectric diodes. These electrical signals are amplified and sent to the receiver. Optical fibers may be of the type of multi mode or single mode.

Q.2 Give some characteristics of Fiber-Optic Cable.

Ans.: Fiber-Optic Cable has the following characteristics :

Cost : Fiber-optic cable is more expensive than copper cable

Installation : Fiber-optic cable is more difficult to install than copper cable.

Bandwidth capacity : Because it uses light, which has higher frequency than electrical signals, fiber optics cabling provides data rates from 100 Mbps to 2 Gigabits per second.

Node capacity : In the case of Ethernet network, fiber optic cables have the useful upper limit of around 75 nodes on a single collision domain.

Attenuation : Fiber-optic cable has much lower attenuation than copper wires.

Electromagnetic Interference : Electromagnetic interference is not subjected to electrical interface.

Mode of Transmission : Fiber optic channels are half duplex.

Q.3 Compare Fiber Optics Cable with Copper Wire.

OR

What are the advantages of Fiber Optics Cable over Copper Wire.

Ans.: Fiber optic cable has many advantages over copper wire as a transmission media these are :

(a) It can handle much higher bandwidth than copper. Due to the low attenuation, repeaters are needed only about every 30 km on fiber lines, versus about every 5 km for copper.

(b) Fiber is not affected by power surges, electromagnetic interference, or power failures. Nor is it affected by corrosive chemicals in the air.

(c) Fiber is lighter than copper.

(d) Fiber does not leak light and are quit difficult to tap.

Q.4 What are the disadvantages of Fiber Cables?

Ans.: Fiber cables has the following disadvantages :

(a) Fiber is an unfamiliar technology requiring skills which may not be easily available.

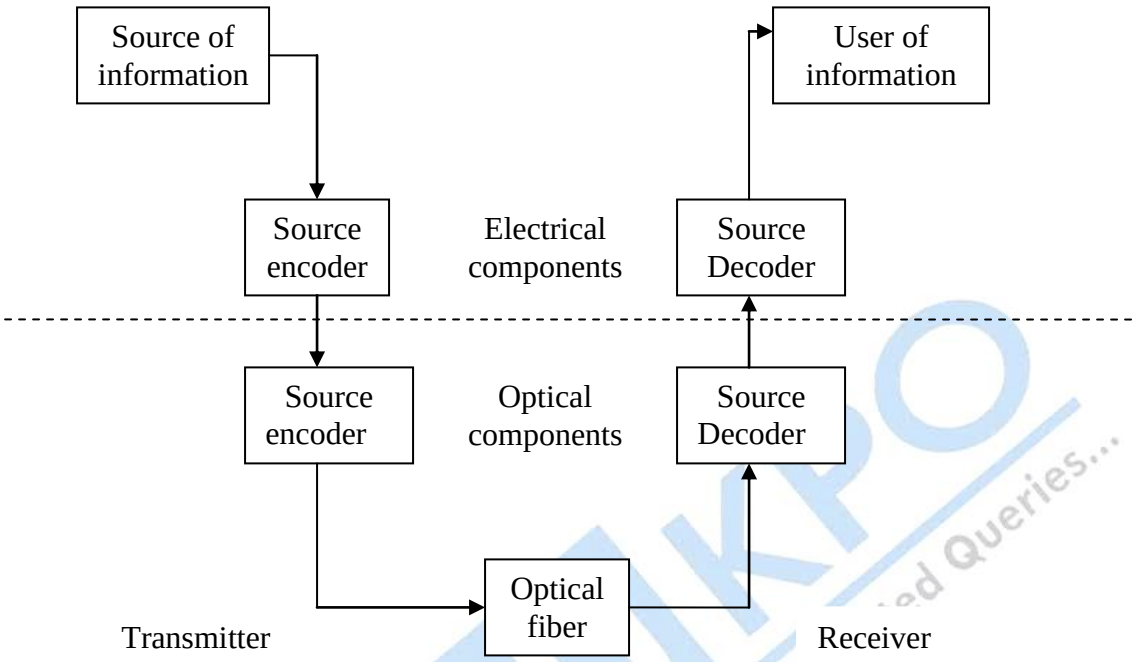
(b) Since optical transmission is inherently unidirectional, two way communications requires either two fiber cables or two frequency bands on one fiber.

(c) Fiber interfaces cost more than electrical interfaces.

Q.5 What are Light Sources and Optical Detectors?

Ans.: The transmission of information in the form of light propagating within an **optical** fiber requires the construction of an optical communication system. The source encoder in the transmitter is used to convert the message signal from an analog source of information into a stream of bits. The source encoder and source decoder are of electrical design. The optical components of the system are represented by the optical source in the transmitter, the optical fiber as the transmission medium and the optical detector in the receiver part of the system. The transmitter emits pulses of optical power, with each pulse being "on" or "off" in accordance with the source output.

For the optical source we may use an injection laser diode (ILD) or a light emitting diode (LED). The ILD and LED are both solid-state semiconductor devices that can be modulated by varying the electrical current used to power the devices.



Block diagram of optical communication system

The *collector efficiency* of the fiber depends on its core diameter and acceptance solid angle. The acceptable solid angle refers to the range of angles captured in the core of the fiber via total internal reflection; the acceptance angle expressed in radians defines the *numerical aperture* of the optical fiber .During the course of propagation along the fiber, a light pulse also suffers fiber loss .

At the receiver, the *optical detector* converts the pulses of optical power emerging from the fiber into electrical pulses. The choice of optical detector and its associated circuitry determines the receiver *sensitivity*.

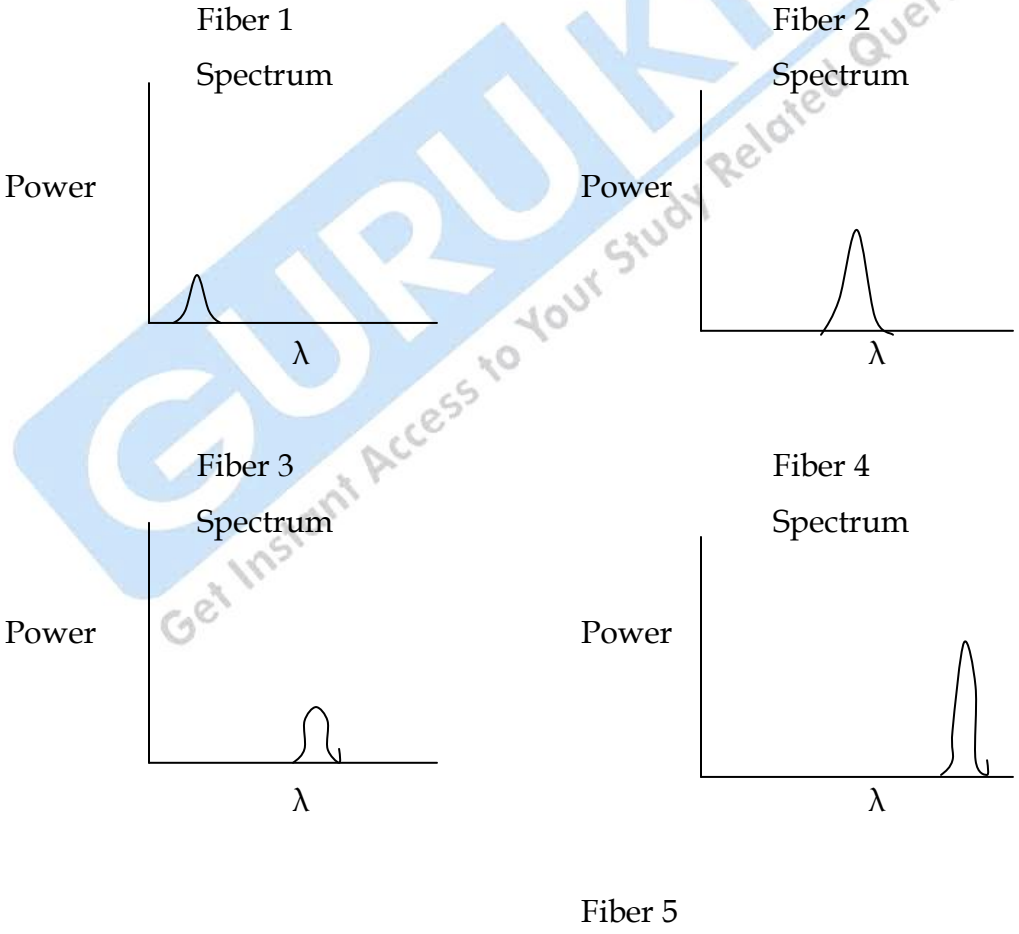
It is apparent that a light wave transmission link differs from its metallic wire or coaxial cable counterpart in that power, rather than current, propagates through the optical fiber waveguide.

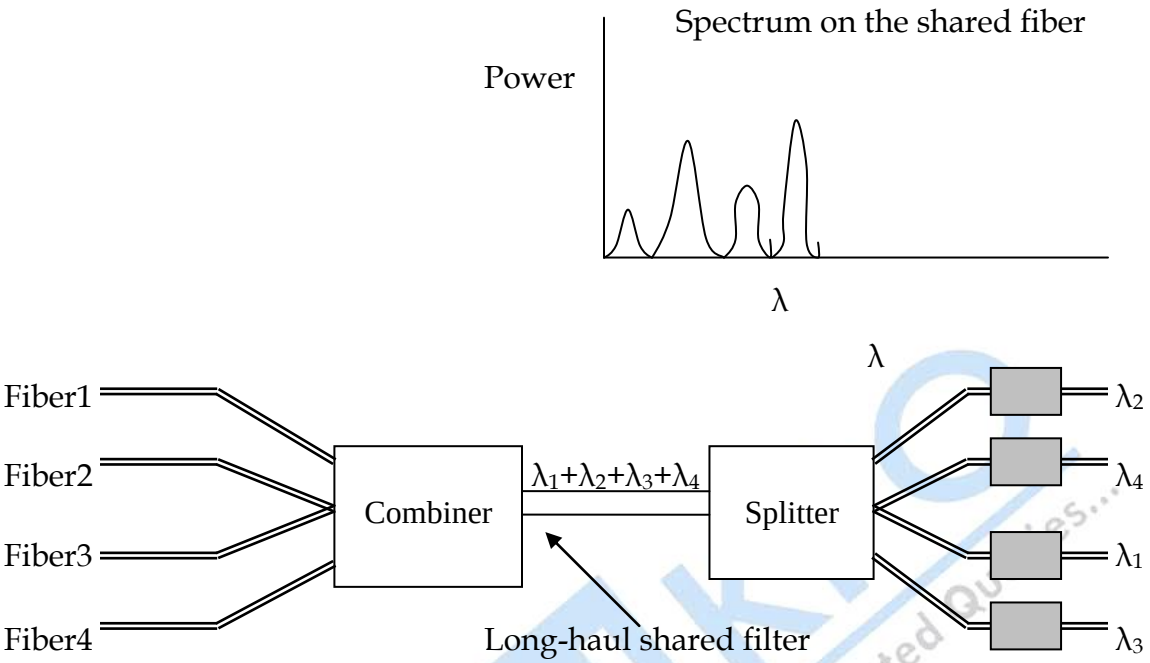
In the design of a light wave transmission link, two separate factors have to be considered; *Transmission bandwidth* and *signal losses*.

Q.7 What do you understand by Wavelength Division Multiplexing ?

Ans.: For fiber optic channels, a variation of frequency division multiplexing is used. It is called **WDM (Wavelength Division Multiplexing).** In the given fig. four fibers come together at an optical combiner, each with its energy present at a different wavelength. The four beams are combined onto a single shared fiber for transmission to a distant destination. At the far end, the beam is split up over as many fibers as there were on the input side. Each output fiber contains a short, specially-constructed core that filters out all but one wavelength.

The resulting signals can be routed to their destination or recombined in different ways for additional multiplexed transport.

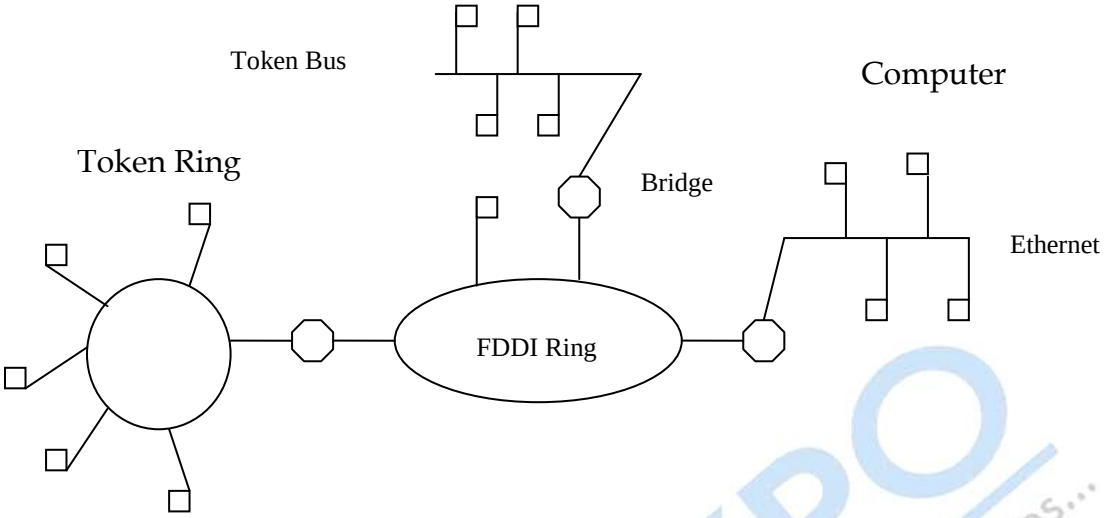




Q.8 What is fiber distributed data interface (FDDI) ?

Ans.: FDDI is ring based network and it is implemented without hubs. FDDI uses fiber-optic cables to implement very fast, reliable networks .FDDI uses multimode fibers because the additional expenses of single mode fiber is not needed for networks running at only 1000 Mbps. It also uses LEDs rather than lasers.

The FDDI cabling consists of two fiber rings, one transmitting clockwise and another transmitting counterclockwise. If either one breaks at the same point the two rings can be joined into a single ring.



An FDDI Ring being used as a backbone to connect LANs and computers

□ □ □

Chapter-7

ISDN

Q.1 What is ISDN?

Ans.: ISDN is a set of protocol that combines digital telephony and data transport services. The whole idea is to digitize the telephone network to permit the transmission of audio, video and text over existing telephone lines.

The goal of ISDN is to form a wide area network that provides universal end-to-end connectivity over digital media.

Q.2 What are the features provided by ISDN?

Ans.: The features likely to be provided by ISDN system are :

(i) Telephones with multiple buttons for instant call setup to arbitrary telephones anywhere in the world will be available.

(ii) Telephones display the caller's telephone number, name, and address on a display screen while ringing.

(iii) It allows the telephone to be connected to a computer so that the caller's database record is displayed on the screen as the call comes in.

(iv) Call forwarding and conference calls worldwide.

(v) Advanced non-voice services are remote electricity meter reading, on-line medical burglar and smoke alarms that automatically call the hospital, police or fire department respectively and give their address to speed up response.

Q.3 What are the services provided by ISDN?

Ans.: The ISDN provides fully integrated digital services to users. These services fall into the following three categories :

(1) Bearer Services

(2) Tele Services

(3) Supplementary Services

Bearer Services : Bearer services provide the means to transfer information(voice, data, video) among the users without the network manipulating the content of that information. They can be provided using circuit-switched, packet-switched or cell switched network.

Tele Services : In tele servicing the network may change or process the contents of the data. Tele services include telephony, telex, tele-fax , video-tax ,telex and teleconferencing .

Supplementary Services : Supplementary services are those services that provide additional functionality to the bearer services and tele-services. Example of these services are reverse charging, call waiting and message handling.

Q.4 What is Broadband ISDN?

Ans.: Broadband is a service or system requiring transmission channels capable of supporting rates greater than the primary rates.

The term B-ISDN is used to refer and emphasize the broadband aspects of ISDN.

With B-ISDN services, specially video services requiring data rates in excess.

Broadband ISDN Services : Broadband ISDN provides two types services:

(i) Interactive

(ii) Distributive

Interactive Services : Interactive services are those services which need two way transfer between either two subscribes or between a subscriber and a service provider.

Distributive Services : Distributive services are of simplex communication from which is sent from a service provider to subscribers. The subscriber does not have to transmit a request each time a service is desired. These services can be without or with user control.

Q.5 What is BRI and PRI?

Ans.: Basic Rate Interface (BRI) : The entry level interface to ISDN is the Basic Rate Interface (BRI) is a 144 kbit/s service delivered over a pair of standard telephone copper wires. The 144 kbit/s rate is broken down into two 64 kbit/s data channels ('B' channels) and one 16 kbit/s signalling channel ('D' channel).

The Interface specifies three different network interfaces :

- The *U interface* is a two-wire interface between the exchange and the *Network Terminating Unit* which is usually the demarcation point in non-North American networks.
- The *T interface* is a serial interface between a computing device and a *Terminal Adapter*, which is the digital equivalent of a modem.
- The *S interface* is a four-wire bus that ISDN consumer devices plug into; the S & T reference points are commonly implemented as a single interface labeled 'S/T' on an NT1
- The *R interface* defines the point between a non-ISDN device and a terminal adapter (TA) which provides translation to and from such a device.

Primary Rate Interface (PRI) : The other ISDN service available is the Primary Rate Interface (PRI) which is an E1 (2048 kbit/s) in most parts of the world. An E1 is 30 'B' channels of 64 kbit/s, one 'D' channel of 64 kbit/s and a timing and alarm channel of 64 kbit/s. North America and Japan use T1s of 1544 kbit/s. A T1 has 23 'B' channels and 1 'D' channel for signalling.

Q.6 What are the different channels in ISDN?

Ans.: ISDN standard defines three channel types ,each with a different transmission rate : **Bearer Channel, Data Channel, and Hybrid Channel.**

Channel Rates

Channel	Data Rates
Bearer (B)	64
Data (D)	16, 64
Hybrid (H)	384, 1536, 1920

B Channels : A bearer channel (B)channel is defined at a rate of 64 Kbps. It is the basic user channel and can carry any type of digital information in full-duplex mode as long as the required transmission rate does not exceed 64 Kbps. For example a B channel can be used to carry digital data, digitized voice or other low data rate information.

D Channels : A data channel (D channel) can be either 16 or 64 Kbps depending on the need of the user. The D channel serves two purposes. First it carries signals information to control circuit switched calls on associated B channels at the user interface. In addition the D channel may be used for packet switching at times when no signaling information is waiting.

H Channel : H channels are provided for user information at higher bit rates .The user may use such a channel as a high speed trunk or subdivided the channel according to the user's own TDM scheme .Example of applications include fast facsimile, video, high speed data, high quality audio and multiple information streams at lower data rates.

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Chapter-8

Digital Subscriber Lines

Q.1 What is HDSL?

Ans.: The high-bit-rate digital subscriber line (HDSL) was designed as an alternative to the T-1 line (1.544 Mbps). The T-1 line uses alternate mark inversion (AMI) encoding, which is very susceptible to attenuation at high frequencies. This limits the length of a T-1 line to 3200 ft (1 km). For longer distances, a repeater is necessary, which means increased costs.

HDSL is less susceptible to attenuation. A data rate of 1.544 Mbps (sometimes up to 2 Mbps) can be achieved without repeaters up to a distance of 12000 ft (3.86 km). HDCL uses two twisted pairs (one pair for each direction) to achieve full-duplex transmission.

Q.2 What is SDSL?

Ans.: The symmetric digital subscriber line (SDSL) is a one twisted-pair version of HDSL. It provides full-duplex symmetric communication supporting up to 768 kbps in each direction. SDSL, which provides symmetric communication, can be considered an alternative to ADSL. Although this meets the needs of most residential subscribers, it is not suitable for businesses that send and receive data in large volumes in both directions.

Q.3 What is VDSL?

Ans.: The very high-bit-rate digital subscriber line (VDSL), an alternative approach that is similar to ADSL, uses coaxial, fiber-optic, or twisted-pair cable for short distances. The modulating technique is DMT. It provides a range of bit rate (25 to 55 Mbps) for upstream communication at distances of 3000 to 10,000 ft. The downstream rate is normally 3.2 Mbps.

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BACHELOR OF COMPUTER APPLICATIONS
(Part II) EXAMINATION
(Faculty of Science)
(Three – Year Scheme of 10+2+3 Pattern)
PAPER 219
ELECTRONIC COMMUNICATION AND DATA COMMUNICATION

Year - 2011

Time allowed : One Hour **Maximum Marks : 20**

The question paper contains 40 multiple choice questions with four choices and students will have to pick the correct one (each carrying ½ mark).

1. A device which converts analog signal to digital and digital to analog is:
   (a) A modem (b) An encoder
   (c) A decoder (d) a packet ( )

2. Which unit is used for data transmission speed?
   (a) Baud (b) Pulse
   (c) Hz (d) None of the above ( )

3. In simplex data transmission mode:
   (a) One way
   (b) Both way
   (c) Both (a) and (b)
   (d) None of the above ( )

4. Network are judged by :
   (a) Security
   (b) Reliability
   (c) Performance
   (d) All of the above ( )

5. Communication system is combination of :
   (a) Hardware (b) Software
   (c) Data Transfer (d) All of the above ( )

6. Which of the following is not physical media?
   (a) Twisted pair (b) Coaxial cable
   (c) Microware (d) Optical fibre cable ( )

7. Which multiplexing technique is used to transmit analog signal?
   (a) FDM
   (b) Synchronous TDM
   (c) Either (a) or (b)
   (d) None of the above ( )

8. In digital communication BPSK stands for:
   (a) Binary Phase Shift Keying
   (b) Band Pass Selective Keying
   (c) Baseband Polarity Shift Keying
   (d) Burst purse signal keying ( )

9. Modulation is the process of:
   (a) Changing analog signals to digital signals
   (b) Changing the format of a text file
   (c) Changing digital signals to analog signals
   (d) None of the above ( )

10. A television broadcast is an example of…….transmission.
   (a) automatic (b) half Duplex
   (c) full duplex (d) simplex ( )

11. A repeater takes weak and corrupt signals and:
   (a) Amplifies it
   (b) Regenerates it
   (c) Resample it
   (d) None of the above ( )

12. The signal between two modems is:
   (a) PSK (b) QAM
   (c) Digital (d) Analog ( )

13. In parallel data transmission:
    (a) Each bit uses a separate wire
    (b) Each bit uses the same wire
    (c) Each character is proceeded by start and stop bit
    (d) The protocol X.25 is used to transfer data ( )

14. Microwave repeaters link repeaters are typically 50 km apart:
    (a) Because of atmospheric
    (b) Because of output tube power limitations
    (c) Because of earth's curvature
    (d) None of the above ( )

15. Satellite used for international communication are known as:
    (a) Casmat (b) Marisat
    (c) Domsat (d) Intelsat ( )

16. High speed transmission of large amounts of data is best done using?
    (a) baseband (b) bandwidth
    (c) broadband (d) broadbase ( )

17. A half duplex channel:
    (a) Sends data one way only
    (b) Sends data both ways but not same time
    (c) Sends data both ways at same time
    (d) None of the above ( )

18. The CRC circuit is basically a :
    (a) Decoder circuit (b) Multiplexer circuit
    (c) Shift register circuit (d) Adder circuit ( )

19. Which technique is used to transmit digital data over optical fiber?
    (a) ASK (b) FSK
    (c) PSK (d) QPSK ( )

20. Crosstalk is a part of :
    (a) Attenuation (b) Data Transmission
    (c) Noise (d) Signals ( )

21. Fiber optics have maximum segment:
    (a) 500 m (b) 200 m

(c) 100 m (d) 2000 m ( )

22. WAN hardware includes:
(a) Multiplexers and routers
(b) EDI
(c) Bridges and Modems
(d) All of the above ( )

23. Data transmission using telephone system is:
(a) Time division multiplexing
(b) Space division multiplexing
(c) Frequency division multiplexing
(d) All of the above ( )

24. Synchronous transmission data from various users:
(a) Require header
(b) Do not require header
(c) Sometime require header
(d) None of the above ( )

25. An example of digital, rather than analog communication is:
(a) DDD (b) DDS
(c) WATS (d) DDT ( )

26. FDDI is a :
(a) Ring network (b) Star network
(c) Mesh network (d) Bus Network ( )

27. SONET is a good example of which kind of multiplexing?
(a) TDM
(b) FDM
(c) SDM
(d) All of the above ( )

28. Which of the following is a voice band channel?
(a) Telephone lines
(b) Telegraph line
(c) Coaxial cable
(d) Microwave system ( )

29. Which of the following device copies electrical signals from one Ethernet to another?
    (a) Bridge (b) Repeater
    (c) Hub (d) Passive Hub ( )

30. Twisted pair wire is called:
    (a) UTP cable (b) Coaxial cable
    (c) Microwave cable (d) Optical cable ( )

31. The…….channel has the lowest data rate :
    (a) B (b) C
    (c) D (d) H ( )

32. Which error detection method involves polynomials?
    (a) VRC (b) LRC
    (c) CRC (d) Checksum ( )

33. The binary synchronous protocol is:
    (a) Full duplex (b) Half Duplex
    (c) Simplex (d) None of the above ( )

34. Microwave system permits data transmission rates of about:
    (a) 256 MB (b) 512 MB
    (c) 56 KB (d) 16 GB ( )

35. Channel coding is used to:
    (a) Secure the channel
    (b) Minimizing the interface in the channel
    (c) Protect the information against channel noise
    (d) None of the above ( )

36. Satellite in ground communication takes place through:
    (a) Medium wave
    (b) Short Wave
    (c) Microwave
    (d) None of the above ( )

37. AM and FM are example of …….encoding.
    (a) digital to digital
    (b) digital to analog
    (c) analog to digital

(d) analog to analog ( )

38. Radio communication frequency ranges from:
(a) 3 kHz to 300 kHz
(b) 300 kHz to 3 GHz
(c) 3 kHz to 300 GHz
(d) 3 kHz to 3000 GHz ( )

39. In ISDN……..the network can change or process the contents of the data:
(a) bearer services
(b) tale – services
(c) supplementary services
(d) None of the above ( )

40. Commercial TV is an example of:
(a) Messaging service
(b) Conversational service
(c) Distributive service without user control
(d) Distributive service with user control ( )

Answer Key

1. ( )	2. ( )	3. ( )	4.( )	5. ( )	6. ( )	7. ( )	8. ( )	9. ( )	10. ( )
11. ( )	12.( )	13. ( )	14. ( )	15. ( )	16. ( )	17. ( )	18. ( )	19. ( )	20. ( )
21. ( )	22. ( )	23. ( )	24. ( )	25. ( )	26. ( )	27. ( )	28. ( )	29. ( )	30. ( )
31. ( )	32. ( )	33. ( )	34. ( )	35. ( )	36. ( )	37. ( )	38. ( )	39. ( )	40. ( )

DESCRIPTIVE PART - II

Year 2011

Time allowed : 2 Hours **Maximum Marks : 30**

Attempt any four questions out of the six. All questions carry 7½ marks each.

1. (a) Explain the term modulation. Why is modulation necessary in communication system?
   (b) Explain analog to analog modulation. Discuss AM and FM.

2. (a) Discuss various propagation mode in OFC.
   (b) Discuss the advantage and disadvantage of OFC media.

3. (a) What is noise ? Explain different types of noise how can it be reduced?
   (b) What is SONET? Explain SONET architecture using diagram.

4. (a) Differentiate synchronous and asynchronous data transmission. Which one is better and why?
   (b) Discuss various data encoding formats.

5. (a) Explain the process of AM modulation.
   (b) Explain TDM (Time Division Multiplexing Technique.

6. Write short notes on any two:
   (a) Encoding data format
   (b) FM microwave repeaters
   (c) Do binary signaling.

ELECTRONIC COMMUNICATION AND DATA COMMUNICATION

OBJECTIVE PART- I

Year - 2010

Time allowed : One Hour **Maximum Marks : 20**

The question paper contains 40 multiple choice questions with four choices and student will have to pick the correct one (each carrying ½ mark).

1. Before information can be transmitted it must be transformed into:
   (a) Electromagnetic Signals (b) Periodic signals
   (c) Aperiodic Signals (d) Low Frequency Sin waves ( )

2. Which unit is used for measuring data transmission speeds?
   (a) Band (b) Hz
   (c) Modem (d) Pulse ( )

3. A device that converts analog signals to digital signals is:
   (a) A modem
   (b) Encoder
   (c) A pocket
   (d) None of the above ( )

4. Which of the following divides the high speed signal into frequency bands?
   (a) t-switch (b) Modem
   (c) FDM (d) TDM ( )

5. AM and FM are examples of encoding:
   (a) Digital to Digital (b) Digital to Analog
   (c) Analog to Digital (d) Analog to Analog ( )

6. A .....is device that is a source of destination for binary digital data.
   (a) Data terminal equipment
   (b) Digital terminal encoder
   (c) Digital transmission equipment
   (d) Data transmission equipment ( )

7. In digital communication, BPSK stands for:
   (a) Binary phase shift keying
   (b) Band pass selective keying
   (c) Baseband polarity shift keying
   (d) Burst pulse signal keying ( )

8. The way be which we receive various stations in a radio:
   (a) TDM (b) FDM
   (c) Both TDM and FDM (d) None of the above ( )

9. Modulation is the process of:
   (a) Changing analog signals to digital signals
   (b) Changing the format of a text file
   (c) Changing digital signals to analog signals
   (d) None of the above ( )

10. Demodulation is the process of :
   (a) Converting
   (b) Converting analog signals to digital signals
   (c) Combining many low speed channels into one high speed channel
   (d) Dividing the high speed signals into frequency bands ( )

11. Phase locked loop (PLL) is a system, which:
   (a) Change the phase of the signals
   (b) Look the phase by looking through the signal
   (c) Converts phase changes to frequency changes
   (d) Generates a signals that has a fixed relation to the phase of a reference signals ( )

12. A television broadcast is an example of .....transmission:
   (a) automatic (b) Half duplex
   (c) full- duplex (d) simplex ( )

13. In simplex transmission:
   (a) data format is simple
   (b) data transmission is one way
   (c) data can be transmitted to small distance only
   (d) none of the above ( )

14. Communication system is combination of:
   (a) Hardware (b) Software

(c) Data transfer links (d) All of the above ( )

15. In long-distance data transmission system, the most preferable mode of communication of:
(a) Serial transmission (b) Parallel transmission
(c) Either serial or parallel transmission (d) None of the above ( )

16. The performance of a data communication network depends on:
(a) The number of users
(b) The transmission media
(c) The hardware and software
(d) All of the above ( )

17. Which error detection methods involves polynomials:
(a) VRC (b) LRC
(c) CRC (d) Checksum ( )

18. The binary synchronous protocol is:
(a) Full duplex (b) Half duplex
(c) Simplex (d) None of the above ( )

19. The CRC circuits is basically is :
(a) Decoder circuit
(b) Multiplexer circuit
(c) Decoder circuit
(d) Adder circuit ( )

20. Which of the following is not a guided media of transmission:
(a) UTP
(b) STP
(c) Laser beam
(d) Fiber optic cable ( )

21. Satellite ground communication takes place through:
(a) Medium wave (b) Short wave
(c) Microwave (d) None of the above ( )

22. When microwave signals follow the curvature of the earth, this known as:
(a) Faraday effect
(b) Ducting

(c) Scattering
(d) Resonance ( )

23. The absolute value of the difference between the lowest and the highest frequencies of signal is known as the :
(a) Spectrum
(b) Amplitude
(c) Phase
(d) Bandwidth ( )

24. Cross talk is the effect of :
(a) Multiple OFC (b) One wire on the another
(c) Change in signal shape (d) Talk being crosses ( )

25. Microwave systems permit data transmission rates of about:
(a) 256 MB (b) 512 MB
(c) 56 KB (d) 16 GB ( )

26. The signal from, a satellite is aimed at a specific area on the earth, it is called;
(a) Period (b) Footprint
(c) Orbit (d) Uplink ( )

27. In which orbit 100% of the earth's surface can be covered with a single satellite:
(a) Equatorial orbit
(b) Polar orbit
(c) Inclined orbit
(d) All of the above ( )

28. Satellites used for intercontinental communication are known as:
(a) COMSAT
(b) MARISAT
(c) DOMSAT
(d) INTELSAT ( )

29. Network topology; consisting of nodes attached in a ring, without a host computer is known is:
(a) Star
(b) Ring
(c) Bus
(d) None of the above ( )

30. ATM can be.....as transmission medium :
(a) Twisted pair wire (b) Coaxial cable
(c) Fiber optic cable (d) All of the above ( )

31. Which of the following is not graded transmission line?
(a) Pair of wire
(b) Wave guides
(c) Laser beam
(d) None of the above ( )

32. .....is the propagation mode subject to the most distortion:
(a) Multimode single single index
(b) Multimode graded index
(c) Multimode step step index
(d) Single mode ( )

33. Which of the following is a light source used in optical fiber?
(a) PIN Diodes (b) APD
(c) Laser Diodes (d) Junction Diodes ( )

34. The most common distance limiting factor for multimode fiber when carrying high bit rate traffic is:
(a) Attenuation loss
(b) Chromatic dispersion
(c) Fresnel loss
(d) Model dispersion ( )

35. Which of the following is not a reason to use flexible optical circuits?
(a) Low loss distribution
(b) Protection of fiber
(c) Small size
(d) Compact and band easily ( )

36. Fiber optics have maximum segment:
(a) 500m
(b) 200m
(c) 100m
(d) 2000m ( )

37. SONET is the standard for.....network:
    (a) Twisted pair cable
    (b) Co-axial cable
    (c) Ethernet
    (d) Fiber optic cable ( )

38. Commercial TV is an example of:
    (a) Massaging services
    (b) Conversational services
    (c) Distributive services without user control
    (d) Distribution services with user control ( )

39. The.....channel has the lowest data rate:
    (a) B
    (b) C
    (c) D
    (d) H ( )

40. In ISDN.....the network can change or process the contents of the data:
    (a) Bearer services
    (b) Tele services
    (c) Supplementary services
    (d) None of the above ( )

Answer Key

1. (a)	2. (a)	3. (a)	4. c)	5. (d)	6. (c)	7. (a)	8. (b)	9. (c)	10. (b)
11. (d)	12. d)	13. (b)	14. (d)	15. (a)	16. (d)	17. (c)	18. (b)	19. (a)	20. (c)
21. (c)	22. (b)	23. (d)	24. (c)	25. (d)	26. (b)	27. (a)	28. (d)	29. (b)	30. (d)
31. (a)	32. (b)	33. (c)	34. (d)	35. (b)	36. (a)	37. (d	38. (c)	39. (c)	40. (b)

DESCRIPTIVE PART - II

Year 2010

Time allowed : 2 Hours ***Maximum Marks : 30***

Attempt any four questions out of the six. All questions carry 7½ marks each.

Q.1 (a) Explain amplitude, frequency and phase of a signal.

(b) Write a short note on side band frequency.

Q.2 (a) What is the need of modulation in long distance communication?

(b) What is M-ary puse modulation?

Q.3 Write a short note on following:

(a) Duobinary signaling.

(b) PCM waveforms (digital encoding)

Q.4 (a) Explain the process of FM demodulation.

(b) Explain signals and noise

Q.5 (a) What are the advantages of synchronous mode of data transmission?

(b) What is normal operation bit shifting? Why is it used?

Q.6 (a) Explain the advantages and disadvantages of OFC media.

(b) Advantages of Optical Fiber systems?

ELECTRONIC COMMUNICATION AND DATA COMMUNICATION

OBJECTIVE PART- I

Year - 2009

Time allowed : One Hour **Maximum Marks : 20**

The question paper contains 40 multiple choice questions with four choices and student will have to pick the correct one (each carrying ½ mark).

1. In optical fibre, light does not propagate best in window centered in:
   (a) 800 nm (b) 1300 nm
   (c) 1500 nm (d) None of the above ( )

2. .....is often used for navigation purpose.
   (a) Amps (b) IS-95
   (c) Iridium (d) GPS ( )

3. Twenty four voice signals are to be multiplexed and transmitted over twisted pair. What is the bandwidth required for FDM?
   (a) 24 KHz (b) 48 KHz
   (c) 96 KHz (d) None of the above ( )

4. What is the centre frequency in an FM signal?
   (a) Unmodulated carrier frequency (b) Sine wage
   (c) Side Bank (d) Base Bank ( )

5. For separating channels in FDM, it is necessary to use:
   (a) Time slots (b) Band pass filter
   (c) Differentiation (d) None of the above ( )

6. The signal from a satellite is aimed at a specified area called the .....
   (a) Period (b) Foot print
   (c) Orbit (d) Uplink ( )

7. The .....is not used for voice communication.
   (a) IS-95 system (b) Global system

(c) GPS (d) Iridium system ( )

8. The VLF and LF bands use.....Propagation for communication.
(a) Ground (b) Sky
(c) Line of sight (d) Space ( )

9. A software that allows a personal computer to pretend it as a terminal is.....
(a) Autodialing (b) Bulletin board
(c) Modem (d) Terminal emulation ( )

10. Which of the following medium is used for broadband local networks?
(a) Coaxial cable (b) Optical Fibre
(c) CATU (d) UTP ( )

11. A range of microwave frequencies more easily passed by the atmosphere than are the offered is called a:
(a) Window (b) Critical Frequency
(c) Gyro frequency range (d) Resonance in atmosphere ( )

12. Which of the following SONET layers corresponds to the OSI's datta link layer?
(a) Path (b) Line
(c) Section (d) All of the above ( )

13. In a SONET system ..... can remove signals from a path:
(a) An STS multiplier (b) A regenerator
(c) An add/drop multiplexer (d) A repeater ( )

14. In fibre optics the signal source is:
(a) Radio (b) Light
(c) Microwave frequency (d) None of the above ( )

15. The detectors in fibre optics communication are:
(a) Laser diode (b) LED
(c) P-i-n diodes (d) None of the above ( )

16. Trans receivers for thick net cables are often connected using .....
(a) Ghost taps (b) Vampire taps
(c) Witch widgets (d) Skeleton clamps ( )

17. Which device is used at a receiving end of an optical fibre?

(a) LEO (b) Interferometer
(c) Photodiode (d) None of the above ( )

18. A frequency increases, radio transmission becomes increasingly
(a) Attenuated (b) Rapid
(c) Line of sight (d) Sensitive to emission ( )

19. The uplink frequency in the satellites is:
(a) Transmitter (b) Receiver
(c) Refraction (d) Both a and b ( )

20. The transmission of digital signal at the original frequency without modulation is called:
(a) baseband signaling (b) Broadband signaling
(c) Digital signaling (d) Analog signaling ( )

21. Which layer SONET does not consists?
(a) Photo layer (b) Section layer
(c) Path layer (d) Root layer ( )

22. In SONET frame, overhead and data (pay load) in as STS-1 are arranged in a matrix configuration of.....
(a) Nine rows of 90 octets (b) Six rows of 60 octets
(c) Five frames (d) Eight frames ( )

23. In ISDN, the channel having the lowest data rate is:
(a) B (b) C
(c) D (d) H ( )

24. .....is come times called 2B + D.
(a) Primary rate ISDN (b) Basic rate X.25
(c) Primary rate ATM (d) Basic rate ISDN ( )

25. .....was designed to provide digital communication over existing phone lines.
(a) X.25 (b) ISDN
(c) ATM (d) Frame relay ( )

26. HDLC is a .....protocol.
(a) Character oriented (b) Byte oriented
(c) Bit oriented (d) Count oriented ( )

27. Which error detection methods take care of burst errors?
(a) Check Sum (b) CRC
(c) REC (d) Both a and b ( )

28. Which error detection methods used one's complement arithmetic?
(a) Check sum
(b) CRC
(c) Simple parity check
(d) Two-dimension parity check ( )

29. In CRC there is no error, if the remainder at the receiver is.....
(a) Equal to the remainder at the sender
(b) Zero
(c) None zero
(d) The quotient at the sender ( )

30. If the ASCII character P is sent and character D is received, what type of error is this?
(a) Single bit (b) Multiple bit
(c) Burst (d) Recoverable ( )

31. Pulse communication system that is inherently highly immune to noise is:
(a) PCM (b) PAM
(c) PPM (d) PWM ( )

32. The most commonly employed system of communication for commercial radio is:
(a) AM (b) FM
(c) PM (d) PCM ( )

33. A PCM system involves the following conversion.
(a) Analog to pulse width (b) Voltage to frequency
(c) Analog to binary code (d) Digital to analog ( )

34. It is the form of modulation in which the amplitude of a carrier wave is varied in direct proportion to that a modulating signal:
(a) FM (b) AM
(c) PM (d) FSK ( )

35. Modulation index in an FM signal:
(a) Varies inversely as the frequency deviation

(b) Varies directly as the modulating frequency
(c) Varies directly as the frequency deviation
(d) None of the above ( )

36. Which one of the following communication is digital?
(a) AM (b) FM
(c) Delta (d) PAM ( )

37. If a 20 KHz audio signal is to be sent accurately with an 8-bit PCM digital signal, how often the audio signal should be sampled:
(a) 25 times every μsec (b) Once every μ sec
(c) Once every 50 μ sec (d) 10 times every μ sec ( )

38. Band limited signals are:
(a) Transmission of signals without modulation
(b) A signal all of the whose energy is contained with in finite frequency range
(c) Simultaneous transmission of data to a number of stations
(d) All of the above ( )

39. When the modulating frequency is doubled, the modulation index is halved and the modulating voltage remain constants, the modulation system is:
(a) Transmission of signals without modulation
(b) A signal all of whose energy is contained with in finite frequency range
(c) Simultaneous transmission of data to a number of stations
(d) All of the above ( )

40. Quantizing noise in a PCM system can be reduced by:
(a) Decreasing the number of standard level
(b) Having more number of samples per second
(c) Using low noise circuitry in PCM receiver
(d) Increasing number of standard level ( )

Answer Key

1. (d)	2. (d)	3. (c)	4. (a)	5. (b)	6. (b)	7. (c)	8. (a)	9. (c)	10. (b)
11. (b)	12. b)	13. (c)	14. (b)	15. (c)	16. (c)	17. (c)	18. (c)	19. (a)	20. (a)
21. (d)	22. (a)	23. (c)	24. (d)	25. (b)	26. (c)	27. (d)	28. (a)	29. (a)	30. (a)
31. (a)	32. (b)	33. (c)	34. (b)	35. (c)	36. (d)	37. (c)	38. (b)	39. (c)	40. (b)

DESCRIPTIVE PART - II

Year 2009

Time allowed : 2 Hours ***Maximum Marks : 30***

Attempt any four questions out of the six. All questions carry 7½ marks each.

Q.1 (a) What is Modulation? Explain different types of modulation techniques.

(b) Write a note on wave division multiplexing.

Q.2 (a) What is the frequency range of ratio communication? Explain methods used to propagate radio waves.

(b) Explain the principles of fibre optic transmission.

Q.3 (a) What do you mean by microwave in communication? Explain different types of antennas used in microwave communication with the help of appropriate diagrams.

(b) Explain types of bipolar encoding.

Q.4 (a) Discuss the concept of redundancy in error detection and also explain different types of redundancy checks used in data communication.

(b) Write a note on Duobinary signaling and decoding.

Q.5 (a) What is the different between basic rate interface and primary rate interface with respect to ISDN?

(b) What is the relationship ISDN layers and OSI model layers?

Q.6 (a) Explain the application area of SONET.

(b) Why are communication satellites in geo-synchronous orbit?

ELECTRONIC COMMUNICATION AND DATA COMMUNICATION

OBJECTIVE PART- I

Year - 2008

Time allowed : One Hour **Maximum Marks : 20**

The question paper contains 40 multiple choice questions with four choices and student will have to pick the correct one (each carrying ½ mark).

1. .....are rules the govern a communication exchange:
   (a) Media (b) Criteria
   (c) protocols (d) All of these ( )

2. A television broadcast is an example of .....transmission:
   (a) Automatic
   (b) Half-duplex
   (c) Full-duplex
   (d) simplex ( )

3. Before information can be transmitted it must be transformed into .....
   (a) electromagnetic signals (b) periodic signals
   (c) aperiodic signals (d) low-frequency sine waves ( )

4. A periodic signal completed one cycle in 0.0001 seconds. What is its frequency;
   (a) 1 KHz (b) 100 KHz
   (c) 10 KHz (d) 1 KHz ( )

5. Which of the following can be determined from a frequency-domain graph representation of a signal?
   (a) Bandwidth (b) Phase
   (c) Power (d) All of these ( )

6. What is the bandwidth of a signal that ranges from 40 Hz to 4 KHz:
   (a) 36 Hz
   (b) 396 KHz
   (c) 3.96 Hz

(d) 3.96 KHz ( )

7. Given two sine waves A and B. If the Frequency of A is twice that of B, then the period of B is.....of A.
   (a) One-half
   (b) twice
   (c) the same as
   (d) one-fourth ( )

8. ASK, PSK, FSK and QAM are examples of .....encoding:
   (a) digital-to analog
   (b) digital-to digital
   (c) analog-to-analog
   (d) analog-to-digital ( )

9. If the baud rate is 400 for a 4 PSK signal, the bit rate is .....bps:
   (a) 800
   (b) 100
   (c) 1600
   (d) 200 ( )

10. If the frequency spectrum of a signal has a band width of 500 Hz with the highest frequency at 0.6 KHz what should be the sampling rate according to the Nyquist theorem?
   (a) 500 samples/sec
   (b) 1000 samples/sec
   (c) 1200 samples/sec
   (d) 6000 samples/sec ( )

11. If the baud rate for a QAM signal is 2000 and the bit rate is 8000, how many bits are there per signal element:
   (a) One bit
   (b) Six bits
   (c) Four bits
   (d) Sixteen bits ( )

12. Given an AM radio signal with a bandwidth of 10 - KHz and the highest frequency component at 605 KHz, what is the frequency of the carrier signal :
   (a) 600 KHz
   (b) 700 KHz

(c) 615KHz
(d) 610 KHz ( )

13. Which encoding method uses alternating positive and negative values for is:
(a) Polar (b) Unipolar
(c) Bipolar (d) All of these ( )

14. Which encoding method uses alternating positive and negative values for is:
(a) NRZ - e
(b) Differential Manchester
(c) Manchester
(d) AMI ( )

15. If the maximum values of a PCM signal is 15 and the minimum value is –15, how many bits used for coding?
(a) Five (b) Four
(c) Three (d) Six ( )

16. In asynchronous transmission, the gap time between bytes is.....
(a) Fixed
(b) A function of the data rate
(c) variable
(d) zero ( )

17. A .....is a device that transmits or receives data in the form of an analog or digital signal through a network:
(a) digital connecting equipment
(b) data converting equipment
(c) digital communication equipment
(d) data circuit-terminating equipment ( )

18. .....are the highest frequency electromagnetic waves in use for long distance data communication:
(a) Radio waves
(b) Visible light waves
(c) Gamma rays
(d) Cosmic rays ( )

19. At the lower end (Smaller frequency) of the electromagnetic spectrum we have.....
(a) Radio waves
(b) ultraviolet light

(c) power and voice
(d) infrared light ( )

20. Which of the following represents "megabytes per second"?
(a) Mbps (b) Mbps
(c) Mps (d) mps ( )

21. In an optical fiber the inner core is.....the cladding:
(a) Mbps (b) mbps
(c) Mps (d) mps ( )

22. Radio communication frequencies range from.....
(a) 3 Hz to 300 KHz (b) 3 KHz to 300 KHz
(c) 3 KHz to 300 MHz (d) 3 KHz to 300 GHz ( )

23. In .....propagation, low frequency radio waves hug the earth:
(a) Surface (b) troposphere
(c) Ionosphere (d) space ( )

24. If the angle of refraction of alight ray is 90 degree and the angle of incidence is 48 degree, the critical angle is.....degree:
(a) 42 (b) 48
(c) 138 (d) 96 ( )

25. .....is the propagation method subject to the most distortion:
(a) Multimode graded-index
(b) Multimode single index
(c) Multimode step index
(d) Single mode ( )

26. Which error detection method consists of a parity bit for each data unit as well as en entire data unit of parity bits?
(a) LRC (b) VRC
(c) CRC (d) CHECKSUM ( )

27. Which error detection method involves polynomials ?
(a) LRC (b) CRC
(c) VRC (d) CHECKSUM ( )

28. If the data unit is 111111, the divisor 1010, and the remainder 110, what is the dividend at the receiver?

(a) 1010110 (b) 110101111
(c) 11111111 (d) 111111010 ( )

29. FEC stands for:
(a) Forward error control
(b) Fast error control
(c) Fast error correction
(d) Forward error correction ( )

30. In FDDI, data normally tea travel on.....
(a) The primary ring
(b) The secondary ring
(c) both rings
(d) neither ring ( )

31. Commercial TV is an example of.....
(a) Messaging services
(b) Conversational services
(c) Distributive services without user control
(d) Distributive services with user control ( )

32. The.....channel is used for application requiring a transmission rate greater than 64 Kbps:
(a) B (b) C
(c) D (d) H ( )

33. The.....channel can be used for control of B channels:
(a) B (b) C
(c) D (d) E ( )

34. Which ISDN plane is associated with signaling and the D channel?
(a) User (b) Control
(c) Management (d) Supervisory ( )

35. Which B-ISDN access method is designed for customers who need to receive distributive services but no to provide distributive services to others:
(a) 155.520 Mbps full duplex
(c) 155.520 and 622.080 Mbps asymmetrical duplex
(a) 622.080 Mbps full duplex

(c) 400 Mbps full duplex ( )

36. The optical link between any two SONET devices is called:
(a) a section (b) a line
(c) a path (d) a photonic ( )

37. SONET is a standard for.....
(a) Internet (b) Coaxial cable
(c) Ethernet (d) Fiber-optic cable ( )

38. A single satellite.....orbit can cover complete surface of earth:
(a) Polar (b) geosynchronous
(c) inclined (d) all of these ( )

39. DSL stand for:
(a) Direct subscriber line
(b) Digital subscriber line
(c) Direct signal line
(d) Digital signal line ( )

40. Doubinary signaling technique uses:
(a) Inter symbol interference
(b) Inter Modulation
(c) Quantization
(d) Electromagnetic interference ( )

Answer Key

1. (c)	2. (d)	3. (a)	4. (c)	5. (a)	6. (d)	7. (b)	8. (b)	9. (c)	10. (c)
11. (c)	12. (c)	13. (a)	14. (b)	15. (d)	16. (a)	17. (d)	18. (a)	19. (c)	20. (a)
21. (b)	22. (d)	23. (a)	24. (b)	25. (d)	26. (c)	27. (b)	28. (a)	29. (d)	30. (c)
31. (c)	32. (d)	33. (c)	34. (d)	35. (b)	36. (b)	37. (c)	38. (b)	39. (b)	40. (a)

DESCRIPTIVE PART - II

Year 2008

Time allowed : 2 Hours ***Maximum Marks : 30***

Attempt any four questions out of the six. All questions carry 7½ marks each.

Q.1 (a) What is the need of modulation in long distance communication?

(b) What is M-array pulse modulation? Describe giving suitable examples.

Q.2 (a) What do you mean by the term redundancy with respect to error correction and detection techniques.

(b) Using the Cyclic Redundancy Check (CRC) error detection method, find the sequence of redundant bits i.e. CRC for the data 100100 when the CRC generator (divisor) used in 1101.

Q.3 (a) Explain transmission in attenuator. Discuss its type.

(b) What do you mean by the term propagation modes with respect to optical fiber communication? Discuss the various propagation modes, used in optical fiber communication.

Q.4 (a) What is ISDN? List various ISDN channels available for subscriber access to ISDN (List only)

(b) What do you mean by an orbit of a satellite? What are Geo-synchronous satellites? Discuss various advantages and disadvantages of using Geo-synchronous statellites.

Q.5 (a) What do you mean by digital to digital encoding?

(b) Describe ASK, FSK, PSK and QAM digital to analog encoding techniques using suitable bit se1quence and diagram.

Q.6 Write short notes on the following:

(a) Duobinary signaling

(b) PCM Technique

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ELECTRONIC COMMUNICATION AND DATA COMMUNICATION

OBJECTIVE PART- I

Year - 2007

Time allowed : One Hour **Maximum Marks : 20**

The question paper contains 40 multiple choice questions with four choices and student will have to pick the correct one (each carrying ½ mark).

1. In simplex transmission:
   (a) Data formats is simple
   (b) Data transmission is one way
   (c) Data can be transmitted to small distance only
   (d) None of the above ( )

2. In half duplex data transmission:
   (a) Data can be transmitted in one direction only
   (b) Data can be transmitted in both direction
   (c) Data can be transmitted in both directions simultaneously
   (d) None of the above ( )

3. In digital data transmission:
   (a) Baud rate is always smaller or equal to bit rate
   (b) Baud rate is equal to bit rate
   (c) Baud rate is always higher than bit rate
   (d) None of the above ( )

4. Network are judged by:
   (a) Security
   (b) Reliability
   (c) Performance
   (d) All of the above ( )

5. Computers in a computer network are connected by:
   (a) Telephone line only
   (b) Satellite channel only

(c) Either telephone line or satellite channel
(d) None of the above ( )

6. In.....transmission a start bit and a stop bit form a character byte.
(a) asynchronous
(b) synchronous
(c) parallel
(d) none of the above ( )

7. Communication system is combination is:
(a) Hardware
(b) Software
(c) Data transfer links
(d) All of the above ( )

8. The velocity of transmission of energy in free space is given by:
(a) C = f (b) C = f /
(c) C=fx (d) None of the above ( )

9. Which of the following is not a guided media of transmission of RF energy?
(a) UTP
(b) STP
(c) Laser Beam
(d) Fiber optic cable ( )

10. Frequency range of human voice and audible to human ears is usually in the range of:
(a) 200 KHz to 600 KHz
(b) 400 Hz to 3.4 KHz
(c) 100 MHz to 400 MHz
(d) None of the above ( )

11. Transmission media are usually categorized as:
(a) Fixed or unfixed
(b) Guided or unguided
(c) Determine or indeterminate
(d) None of the above ( )

12. A base is:
(a) Signals after modulation
(b) Signals without modulation

(c) Transmission of signals to a number of station
(d) None of the above ( )

13. AM and FM are examples of.....encolding.
(a) digital to digital
(b) digital to analog
(c) analog to digital
(d) analog to analog ( )

14. In cyclic redundancy checking the divisor is.....the CRC.
(a) the same size as
(b) one bit less than
(c) one bit more than
(d) two bits more than ( )

15. Two binary values are represented by two different frequencies in:
(a) ASK (b) PSK
(c) FSK (d) None of the abvoe ( )

16. For optical fibre used in point to point transmission the repeater spacing is:
(a) 10- 100 km (b) 2-10 km
(c) 1 -10 km (d) None of the above ( )

17. For carrying digital data cover long distance using either analog signal or digital signal at appropriate spaced points, we must use:
(a) Amplifier
(b) Repeater
(c) Either amplifier or repeater
(d) None of the above ( )

18. A balanced modulator can be used to generate:
(a) PSK
(b) DPSK
(c) FSK
(d) None of the above ( )

19. Microwave link repeater are typically 50 km apart because of:
(a) Atmospheric attenuation (b) Loss of line of sight condition
(c) Attenuation of energy by the ground (d) Cost ( )

20. The ground wave eventually disappears as one moves away from the transmitter because of:
(a) Interference from the sky above (b) Loss of line of sight condition
(c) Attenuation of energy by the ground (d) Maximum signal-hope distance limitation ( )

21. In long-distance data transmission system, the most preferable mode of communication is:
(a) Serial transmission (b) Parallel transmission
(c) Either serial or parallel transmission (d) None of the above ( )

22. Which multiplexing technique is used to transmit analog signals?
(a) FDM (b) Synchronous TDM
(c) Either a or b (d) None of the above ( )

23. During transmission, the distortion of the signals depends in:
(a) The duration of transmission
(b) Frequency of the signal
(c) Both a and b
(d) None of the above ( )

24. Network topology, consisting of nodes attached in a ring, without a host computer is knows as:
(a) Star (b) Ring
(c) Bus (d) None of the above ( )

25. A repeater takes a weak and corrupt signal and.....
(a) Amplifies it (b) Regenerates it
(c) Resembles it (d) None of the above ( )

26. A very popular base CAN Ethernet uses:
(a) Coaxial cable (b) Twisted pair wire
(c) Optical fibre (d) None of the above ( )

27. The overhead in TDM is:
(a) Synchronization (b) Clock recovery
(c) Error control (d) Control ` ( )

28. Which of the following is a light source used in optical fibers?
(a) PIN diodes (b) APD

(c) Laser diodes (d) Junction diodes ( )

29. The hamming code in a method of:
(a) Error detection (b) Error correction
(c) Error encapsulation (d) Both a and b ( )

30. The BRI composed of:
(a) Two B channels and one D channel
(b) Two B channels and one H channel
(c) Two B channels and two D channel
(d) Two B channels and two H channel ( )

31. ATM is an acronym for:
(a) Asynchronous transfer mode
(b) Automatic telecommunication method
(c) Asynchronous Transmission mode
(d) None of the above ( )

32. Internet connection in India is routed through:
(a) VSNL gateway (b) WAN
(c) LAN (d) None of the above ( )

33. ATM can use.....as transmission medium:
(a) Twisted-pair wire (b) Coaxial cable
(c) Fiber-optic cable (d) All of the above ( )

34. The main function of WORMS is:
(a) To infect the system files
(b) Reduce the network and system capability
(c) Both a and b
(d) None of the above ( )

35. Mobile computing is accomplished using:
(a) Mobile device (b) Mobile Software
(c) Communication medium (d) All of the above ( )

36. A digital channel implies that the channel:
(a) Is digitize
(b) Is carrying digital data
(c) Is without carrier

(d) None of the above ( )

37. Which of the following is not a graded transmission line?
(a) Pair of wires
(b) Wave guides
(c) Laser beam
(d) None of the above ( )

38. Which of the following is not a goal of computer network?
(a) Resource sharing
(b) Low reliability
(c) Load Sharing
(d) All of the above ( )

39. Channel coding is used to:
(a) Secure the channel
(b) Minimizing the interference in the channel
(c) Protect the information against channel noise
(d) None of the above ( )

40. Satellite is ground communication takes place through:
(a) Medium Wave (b) Short wave
(c) Microwave (d) None of the above ( )

Answer Key

1. (b)	2. (b)	3. (a)	4. (d)	5. (c)	6. (a)	7. (b)	8. (a)	9. (c)	10. (b)
11. (b)	12. (d)	13. (d)	14. (c)	15. (c)	16. (a)	17. (b)	18. (d)	19. (b)	20. (b)
21. (a)	22. (a)	23. (b)	24. (b)	25. (b)	26. (a)	27. (a)	28. (c)	29. (b)	30. (a)
31. (a)	32. (a)	33. (d)	34. (c)	35. (b)	36. (b)	37. (c)	38. (b)	39. (c)	40. (c)

DESCRIPTIVE PART - II

Year 2007

Time allowed : 2 Hours ***Maximum Marks : 30***

Attempt any four questions out of the six. All questions carry 7½ marks each.

Q.1 (a) Explain the term modulation. Why is modulation necessary in communication system?

(b) Why is AM and FM employed for radio transmission in India?

Q.2 Compare the following transmission medium:

(a) Twisted pair-wire and optical fibre cable.

(b) Terrestrial microwave link and satellite microwave link.

Q.3 (a) Draw the digital signal encoding format for NRZ-1 and differential Manchester coding for digital singal 01001100011.

(b) Explain the scheme to detect BPSK signals.

Q.4 (a) In Broadband ISDN, what are difference between distributive services &interactive services.

(b) What is SONET? Explain SONET architecture using diagram.

Q.5 (a) What do you understand by multiplexing. Compare FDM with TDM.

(b) What are the advantages by synchronous mode of data transmission?

Q.6 Short notes on the following:

(a) Encoding Data Format

(b) Duobinary Signaling

ELECTRONIC COMMUNICATION AND DATA COMMUNICATION

OBJECTIVE PART- I

Year - 2006

Time allowed : One Hour **Maximum Marks : 20**

The question paper contains 40 multiple choice questions with four choices and student will have to pick the correct one (each carrying ½ mark).

1. A baseband is:
   (a) Signals after modulation
   (b) Signals without modulation
   (c) Transmission of signals to a number of stations
   (d) None of the above ( )

2. The performance of a data communication network depends on.....
   (a) The number of users
   (b) The transmission media
   (c) The Hardware and software
   (d) All of the above ( )

3. Communication between a computer and a keyboard involves .....transmission.
   (a) Simplex
   (b) Half Duplex
   (c) Full duplex
   (d) Automatic ( )

4. A periodic signal completes one cycle in 0.001 seconds. What is the frequency?
   (a) 1 Hz
   (b) 100 Hz
   (c) 1000 Hz
   (d) 1 MHz ( )

5. If the bandwidth of a singal is 6 KHz and the lowest frequency is 54 KHz, what is the highest frequency?
   (a) 57 KHz (b) 51 KHz

(c) 48 KHz (d) 60 KHz ( )

6. AM and FM are examples of.....encoding.
   (a) digital to digital
   (b) digital to analog
   (c) analog to digital
   (d) analog to analog ( )

7. Which of the following is most affected by noise?
   (a) PSK
   (b) ASK
   (c) FSK
   (d) QAM ( )

8. If the frequency spectrum of a signal has a bandwidth of 400 Hz with the highest frequency at 500 Hz, what should be the sampling rate according to the Nyquist theorem?
   (a) 1000 samples/sec
   (b) 800 samples/sec
   (c) 100 samples/sec
   (d) 900 samples/sec ( )

9. Given an AT radio signal with a bandwidth of 100 KHz and the highest frequency component at 700 KHz, what is the frequency of the carrier signal?
   (a) 705 KHz
   (b) 700 KHz
   (c) 690 KHz
   (d) 710 KHz ( )

10. In.....transmission a start bit and a stop bit frame a character byte.
    (a) Asynchronous serial (b) Synchronous serial
    (c) Parallel (d) Asynchronous parallel ( )

11. A.....is a device that is a source of or destination for binary digital data.
    (a) Data terminal equipment
    (b) Digital Terminal Encoder
    (c) Digital transmission equipment
    (d) Data transmission equipment ( )

12. The signal between two modems is:

(a) PSK (b) QAM
(c) Digital (d) Analog ( )

13. Transmission media are usually categorized as:
(a) Fixed or unfixed (b) Determinate or indeterminate
(c) Guided or unguided (d) Metallic or nonmetallic ( )

14. At the lower frequency end of the electromagnetic spectrum we have:
(a) Radio waves
(b) Power and voice
(c) Ultraviolet light
(d) Infrared light ( )

15. In an environment with many high-voltage devices, the best transmission medium would be:
(a) Twisted- pair cable (b) Coaxial cable
(c) Optical fiber (d) The atmosphere ( )

16. If the critical angle is 50 degree and the angle of incidence is 60 degree, the angle of reflection is.....degree.
(a) 10
(b) 110
(c) 60
(d) 50 ( )

17. Radio communication frequency ranges from.....
(a) 3 KHz to 300 KHz (b) 300 KHz to 3 GHz
(c) 3 KHz to 300 GHz (d) 3 KHz to 3000 GHz ( )

18. .....is the propagation mode subject to the most distortion.
(a) Multimode single index (b) Multimode graded-index
(c) Multimode step-index (d) Single mode ( )

19. Error detection is usually done in the .....layer of the OSI model.
(a) Physical (b) data link
(c) network (d) all of the above ( )

20. Which error detection method involves polynomials?
(a) VRC (b) LRC
(c) CRC (d) Checksumk ( )

21. In cyclic redundancy checking, the divisor is.....the CRC.
    (a) The same size as
    (b) One bit less than
    (c) One bit more than
    (d) Two bit more than ( )

22. Which error detection method, consists of just redundant bit per data unit?
    (a) VRC
    (b) LRC
    (c) CRC
    (d) Checksum ( )

23. The.....channel has the lowest data rate.
    (a) B
    (b) C
    (c) D
    (d) H ( )

24. The BRI is composed of:
    (a) Two B channels and one D channel
    (b) Two B channels and one H Channel
    (c) One B channels and two D channels
    (d) One B channels and two H channels ( )

25. Which ISDN plance is associated with signaling and the D channel?
    (a) User
    (b) Control
    (c) Management
    (d) Supervisory ( )

26. In.....Services all transmission is real time between the two entities.
    (a) Conversational (b)Messaging
    (c) Retrieval (d)distributive ( )

27. Which B-ISDN access method is designed for customers who need to receive distributive service but do not provide distributive services to others?
    (a) 155.520 Mbps full duplex
    (b) 155.520 and 622.080 Mbps asymmetric full duplex
    (c) 622.080 Mbps full duplex

(d) 400 Mbps full duplex ( )

28. Commercial TV is an example of:
(a) Messaging services
(b) Conversational services
(c) Distributive services without user control
(d) Distributive services with user control ( )

29. The loss of energy as the signal propagates through transmission media is:
(a) Delay distortion (b) Attenuation
(c) Adsorption (d) Noise ( )

30. What does SONET and ATM stands for:
(a) Synchronous on-line network and Asynchronous Transfer Machin
(b) Synchronous Optical Network and Asynchronous Transfer Mode
(c) System Operator Network and Automated Teller Machine
(d) None of the above ( )

31. The signal from a satellite is aimed at a specific area on the earth, it is called:
(a) Period (b) Footprint
(c) Orbit (d) Uplink ( )

32. Which of the following topology is used in FDDI networks?
(a) Star topology
(b) Ring topology
(c) Bus topology
(d) Mesh tolology ( )

33. In which, orbit 100% of the earth's surface can be convered with a single satellite?
(a) Equatorial orbit (b) Polar Orbit
(c) Inclined orbit (d) All of the above ( )

34. Duo binary signalling technique uses:
(a) Inter symbol interference
(b) Interference
(c) Inter frequency interference
(d) None of the above ( )

35. DSL describe.....that the used to carry digital information onto existing telephone lines

(a) Lines (b) Modems
(c) Switches (d) None of the above ( )

36. A method for multiplexing several fiber optic channels into a single transmission is knows is:
(a) Time division multiplexing
(b) Wave division multiplexing
(c) Phase division multiplexing
(d) Amplitude division multiplexing ( )

37. When microwave signals follow the curvature of the earth, this is known as:
(a) Faraday effect (b) Ducting
(c) Scatting (d) Resonance ( )

38. Which of the following is a light source used in optical fibers?
(a) PIN diodes (b) APD
(c) Laser diodes (d) Resonance ( )

39. The Hamming code is a method of :
(a) Error detection (b) Error correction
(c) Error encapsulation (d) Both A and B ( )

40. In.....the network can change or process the contents of the data.
(a) Bearer Services
(b) Tele services
(c) supplementary services
(d) None of the above ( )

Answer Key

1. (b)	2. (d)	3. (a)	4. (c)	5. (d)	6. (d)	7. (b)	8. (a)	9. (c)	10. (a)
11. (c)	12. (d)	13. (c)	14. (c)	15. (c)	16. (c)	17. (c)	18. (a)	19. (b)	20.(c)
21. (c)	22. (d)	23. (a)	24. (a)	25. (b)	26. (b)	27. (b)	28. (c)	29. (b)	30. (b)
31. (b)	32. (b)	33. (a)	34. (a)	35. (d)	36. (a)	37. (b)	38. (c)	39. (d)	40. (b)

DESCRIPTIVE PART - II

Year 2006

Time allowed : 2 Hours ***Maximum Marks : 30***

Attempt any four questions out of the six. All questions carry 7½ marks each.

Q.1 (a) What is Modulation and Demodulation?

(b) Explain analog to analog Modulation - Discuss FM and AM.

Q.2 (a) What are error detection/correction codes. Explain one error of detection and one error correction code.

(b) Explain characteristics of Microwave communication.

Q.3 (a) What is Noise? Describe different types of noise and how can it be reduce?

(b) Explain satellite?

Q.4 (a) Discuss features and working principle of Fiber Optic Cable.

(b) What are propagation modes in OFC?

(c) Why digital signaling is used?

Q.5 (a) Explain FM microwave radio repeaters.

(b) Discuss various data encoding formats.

Q.6 (a) Explain the serial data transmission with its advantages and disadvantages.

(b) Draw a communication system and explain it.

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