TELACOMMUNICATION SYSTEMS

(EC1391)

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UNIT – I

METHODS OF COMMUNICATION

PART - A

1. Define transmission line:

A transmission line is a two-wire cable that connects the transmitter to the antenna or the antenna to the receiver. The purpose of the transmission line is to carry the RF energy for the desired distance.

2.State the classification of transmission line.

- Balanced line
- Unbalanced line
-

3.Define unbalanced line with an example.

In an unbalanced line, there are two conductors of which one is connected to the ground.

Eg. Co-axial cable

Coax is an unbalanced line since the current in the center conductor is referenced to the braid, which is connected to ground.

4.Define balanced line with an example.

A Balanced line is made up of two parallel conductors spaced from one another by a distance of ½ inch up to several inches.

Eg. a two-wire balanced line

5.State the relation between wavelength and frequency.

Wavelength is the length or distance of one cycle of an ac wave. It is also the distance that an ac wave travels in the time required for one cycle of that signal.

Wavelength is expressed as the ratio of the speed of light to the frequency of the signal

6.Define velocity factor.

Velocity factor F, is the ratio of the transmission speed in the transmission line V_L and transmission speed in free space Vs.

7.Define characteristic impedance.

An RF generator connected to the transmission lines sees an impedance that is a function of the inductance and capacitance in the circuit. This impedance is known as the characteristic impedance Zo. It is also referred to as the surge impedance.

8.Define standing waves.

The forward and reflected signals on an incorrectly terminated transmission line produce a wave known as a standing wave. A standing wave is the unique distribution of voltage and current along a transmission line that is not terminated in its characteristic impedance.

9.Define standing wave ratio.

The magnitude of the standing waves on a transmission line is determinedby the ratio of the maximum current to the minimum current along the line, or the ratio of the maximum voltage to the minimum voltage. These ratios are referred to as the standing wave ratio. [SWR]

10. Define polarization

The direction of the electric field specifies the polarization of the antenna. If the electric field is parallel to the earth, the electromagnetic wave is said to be horizontally polarized. If the electric field is vertical to the earth , the wave is said to be vertically polarized.

11. Define antenna.

An antenna, or aerial is one or more electrical conductors of a specific length that radiate radio waves generated by a transmitter or that collect radio waves at the receiver.

12. What are the modes of radio wave propagation?

- Ground waves
- Sky waves
- Space waves
-

13. Define ground waves and what is the frequency range of ground waves?

The ground or surface wave leaves the antenna and remains close to the earth. The ground wave will actually follow the curvature of the earth and can, therefore, travel at distances beyond the horizon.

The ground waves are the main signal path for radio signals in the 30Khz to 3 MHz range.

14. What is sky wave?

A sky-wave signal is one that is radiated by the antenna into the upper atmosphere where it is bent or reflected back to earth.

15. What is ionosphere?

The upper atmosphere is ionized by the ultraviolet rays.This ionized region is called as the ionosphere.

16.What are the layers in ionosphere?

There are four layers in ionosphere. They are D,E,F1 and F2.

17.Define space waves.

A method of radio signal propagation is by direct or space waves. A direct wave travels in a straight line directly from the transmitting antenna to the receiving antenna. It is also referred to as line-of-sight communication.

18.State the function of repeater?

A repeater is a combination of a receiver and a transmitter. The function of the repeater is to pick up the signal from a transmitter, amplify it, and retransmit it on another frequency to the receiver.

19.State the frequency range of microwaves.

Microwaves are signals with a frequency greater than 1 GHz. The microwave region is generally considered to extend to 30 GHz, although some definitions include frequencies up to 300 GHz.

20.State the challenges of microwaves.

- Measurements
- Components
- Transit time
- Interelectrode capacitance
- Interlead inductance

The analysis of electronic circuits at lower frequencies is based upon current-voltage relationships. The analysis of circuits at higher frequencies is based upon electric field and magnetic field. Power measurements are also common in microwave frequency.

21. What are the applications of microwaves?

The major applications of microwaves are in the field of

- Telephone Communications
- Radar
- Television stations and networks
- Space Communication
- Medical field
- Industrial applications
- Radio Astronomy

22.Define resonant cavity.

A resonant cavity is one, which is often a hollowed out section in a block of metal. By machining the cavity, very precise dimensions can be obtained for a specific frequency.

23.List the frequency and power ranges of Klystron Amplifier.

The frequency range of the Klystron Amplifier is as low as UHF and up to 100 GHz. The power range is from some milliwatts to thousands of watts.

24.Define velocity modulation.

The electric and magnetic fields in the cavity influence the electron beam . On one half of the cycle,the electrons are speeded up and on the other half cycle of input they are slowed down. This speeding up and slowing down of the electron beam is known as velocity modulation.

25.State the applications of Reflex Klystron.

They are commonly used for microwave signal generation and for local oscillators in microwave receivers.They are being gradually replaced in most microwave equipments.

26.What are the applications of magetron?

- Pulsed magnetrons are used in Radar systems.
- Continous Wave magnetrons generate thousands of watts of power.
- CW magnetron is mainly used for heating purpose.(micowave ovens)

27.State the main benefit of TWT.

The primary benefit of TWT is its extremely wide bandwidth. It is one of the most versatile micro wave RF power amplifier.

28.State the application of TWT.

One of the most common application of TWTs is as power amplifiers in satellite transponders. The TWTs can be used in both continuous and pulsed modes of operation with power levels up to several thousand watts.

29.Define Doppler effect.

The frequency shift occurs when there is relative motion between the transmitting station and the remote object is known as the Doppler effect.

30.State the applications of Radar.

Radar is widely used in

- Defense weapon systems
- Safety and navigation applications
- Altimeters to measure height
- Tracking Radars are used in missiles.

PART - B

1.Explain the different types of transmission lines with suitable diagrams.

Ans: Definition of transmission line
Balanced line
Unbalanced line

2.Explain about the generation of standing waves under different conditions.

Ans: The ideal transmission line application
Standing waves
Shorted load
Open load
Calculating SWR
Applications:
Impendence matching
Resonant lines

3.Explain the different types of low frequency antennas with suitable diagrams.

Ans: Depole antenna
Folded dipole
Ground plane antennas
Directional antennas

4.Explain the different types of antenna arrays with suitable diagrams.

Ans: Parasitic arrays
Driven arrays
Collinear arrays
Broadside array
Endfire array
Log periodic antenna

5.Explain the modes of radiowave propogation.

Ans: Ground ways
Sky waves
Space waves

6.Explain the challenges and applications of microwaves.

Ans: Challenges
Measurements
Components
Transit time
Interelectrode capacitance

Interlead inductance

Applicaions

Telecomunications

Cable TV

Medical field

Industry

Radio Astronomy

Radar

7.Explain the construction and operation of Klystron amplifier.

Ans: Construction

Operation

Applications

8.Explain the construction and operation of ReflexKlystron Oscillator.

Ans: Construction

Operation

Applications

9.Explain the construction and operation of magnetron and TWT

Ans: Construction

Operation

Applications

10.Explain the operation of pulsed radar with suitable Block Diagram.

Ans: Construction

Operation

UNIT-II

INTRODUCTION TO SATELLITE COMMUNICATIONS

1. Define orbit.

   The satellite can be rotated around the earth through various paths. These paths are called orbits of the satellite. These orbits are used to cover the specific application areas.

2. State the basic function of satellite transponder.

   The transmitter-receiver combination in the satellite is known as a transponder. The basic function of a transponder is amplification and frequency translation.

3. List the satellite orbits.

   Satellite orbits about the earth are either circular or elliptical. The satellite orbits are:

   - Inclined orbit
   - Polar orbit
   - Geostationary orbit

4. Define inclined orbit.

   An inclined orbit is used to cover the polar region. It is not that frequently used. The height of the inclined orbit is such that it covers the required area of the region of interest.

5. Define polar orbit.

   Satellite orbits with inclinations of 90° are called polar orbit. Polar orbits are used for special applications like navigational satellites.

6. Define geostationary orbit.

   The circular equatorial orbit is exactly in the plane of equator on earth. All the points in this orbit are at equal distance from earth surface, and a satellite in this orbit appears to be stationary to the point of earth. Therefore this orbit is called geostationary orbit.

7. Define geosynchronous orbit.

   When the inclination of the orbit is not zero and eccentricity is not zero, it is called as geosynchronous orbit. The period of geosynchronous orbit is equal to the period Of revolution of earth with itself.

8. Compare geostationary & geosynchronous orbits.

s.no	Geostationary orbit	Geosynchronous orbit.
1.	The orbit is circular	The orbit is non-circular
2.	The orbit lies in equatorial plane. Its inclination is zero,	The orbit is inclined with respect to equatorial plane.

3.	A satellite in this orbit appears to be stationary with respect to earth.	A satellite in this orbit appears to oscillate with respect to a point on earth.
4.	Period of satellite in this orbit is 23hrs 56mins and 4.1sec.	Period of satellite in this orbit is 23hrs 56mins and 4.1sec.
5.	There is only one geostationary orbit.	There can be many geostationary orbits.

9. Define perigee and apogee.

   The point in the orbit where the satellite is closest to the earth is called the perigee.

   The point in the orbit where the satellite is farthest from the earth is called the apogee.

10. Define sidereal and synodic periods.

    The time that takes for a satellite to complete one orbit is called as Sidereal period.

    Synodic period is another method for expressing the time for one orbit. It is the period of time that elapses between the successive passes of the satellite over a green meridian of earth longitude.

11. Define angle of inclination and angle of elevation.

    The angle of inclination of a satellite orbit is the angle formed between the line that passes through the center of the earth and the North Pole and a line that passes through the center of the earth but which is also perpendicular to the orbital plane.

    The angle of elevation of a satellite is that angle that appears between the line from the earth station's antenna to the satellite and the line between the earth station's antenna and the earth's horizon.

12. State the uplink frequency and downlink frequency.

    A typical uplink frequency is 6 GHz and a common downlink frequency is 4 GHz.

13. What is the bandwidth of a communication satellite?

    The bandwidth of a communication satellite is 500 MHz which is an incredibly wide bandwidth capable of carrying an enormous number of signals.

14. What are the techniques for increasing channel capacity?

    Two of the techniques for increasing channel capacity are:

    - Frequency reuse
    - Spatial isolation

15. What are the major subsystems in a communication satellite?

    The major subsystems in a communication satellite are

    - Communications subsystems
    - Power subsystems
    - Telemetry tracking and control(TTC) subsystems
    - Propulsion subsystems

- Attitude stabilization subsystems
- Antenna subsystems

16. Write short notes on telemetry tracking and control subsystem.

All satellites have a telemetry tracking and control (TTC) subsystem that allows a ground station to monitor and control conditions in the satellite. The TTC subsystem contains a receiver that picks up commands from a ground station and translates them into control signals that initiate some action on board. The telemetry system is used to report the status of the on-board subsystems to the ground station. A command and control system permits the ground station to control the satellite.

17. What is the basic transponder configuration?

There are three basic transponder configurations used in communication systems. They are

- single conversion transponder
- double conversion transponder
- regenerative transponders

18. State the major subsystems in a satellite earth station.

The major subsystems in a satellite earth station are:

- Transmit subsystems
- Receive subsystems
- Power subsystems
- Antenna subsystems
- Telemetry tracking and control(TTC) subsystems
- Ground control equipment (GCE) subsystems.

19. What is the function of a diplexer?

The diplexer is a waveguide assembly that allows one antenna to be shared by a transmitter and a receiver.

20. List the applications of a satellite

Some of the applications of a satellite are:

- Surveillance or observation
- Navigation
- TV broadcast
- Satellite telephones

Part-B

1. Explain different satellite orbits with suitable diagrams.

- Satellite orbits
- Orbit shapes
- Satellite speed and period

- Satellite angles

2. Explain operation of common satellite with satellite block diagrams
    - Communication subsystem
    - Antenna subsystem
    - Power subsystem
    - Telemetry tracking and control subsystem(TTC)
    - Propulsion subsystem
    - Altitude subsystem

3. Explain the function of satellite earth station with suitable block diagrams.
    - Transmit subsystem
    - Receive subsystem
    - GCE subsystem
    - Power subsystem
    - Antenna subsystem

4. Describe the applications of satellite.
    - Navigation
    - Surveillance
    - Satellite telephone
    - TV distribution

UNIT-III

INTRODUCTION TO FIBER OPTIC COMMUNICATION

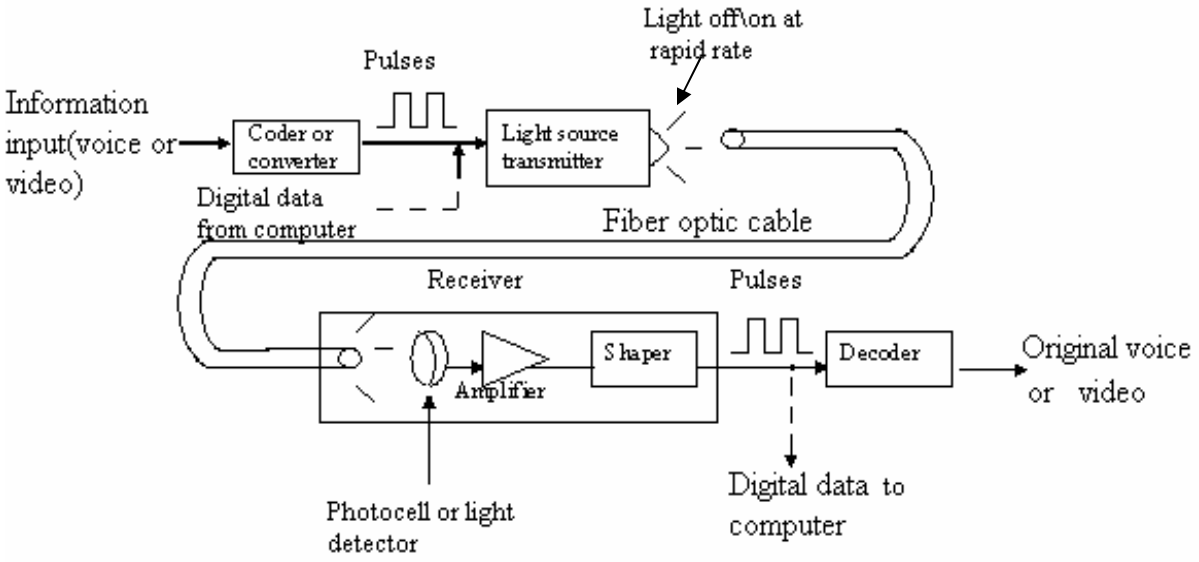
Part-A

1. State the frequency range of optical fiber communication.

   The frequency range of optical fiber communication is:

   3×10^{11} to 3×10^{16} Hz.

2. Draw the basic elements of fiber optic communication system.



Basic Elements of a fiber - optic communications system.

3. List the optical sources used for optical fiber communication.

   The optical sources used for optical fiber communication are

   - Light Emitting Diodes and
   - Solid-state lasers.

4. List the optical detectors.

   The optical detectors used for optical fiber communication are

   - Photodiodes and
   - Avalanche photodiodes.

5. State the applications of optical fibers.

a. Local and long distance telephone systems
b. TV studio-to-transmitter interconnection, eliminating microwave radio link.
c. Closed circuit TV systems used in buildings for security.
d. Secure communication systems at military bases.
e. Computer networks, wide area and local area.
f. Shipboard communications.
g. Aircraft communications.
h. Aircraft controls
i. Interconnection of measuring and monitoring instruments in plants and laboratories.
j. Data acquisition and control signal communications in industrial process control systems.
k. Nuclear plant instrumentation.
l. College campus communications.
m. Utilities(electric, gas, etc.) station communications

6. List the advantages of optical fiber systems.
    1. Wider bandwidth: they have higher information carrying capability.
    2. Lower loss: with fiber optic cables, there is less signal attenuation over long distances.
    3. Lightweight: glass or plastic cables are much lighter than copper cables and offer benefits in those areas where low weight is critical (i.e., aircraft).
    4. Small size: practical fiber optic cables are much smaller than electrical cables in diameter; therefore more can be contained in a smaller space.
    5. Strength: fiber optic cables are stronger than electrical cables and can support more weight.
    6. Security: fiber optic cables cannot be "tapped" as easily as electrical cables; they don't radiate signals that can be picked up for eavesdropping purposes. There is less need for complex and expensive encryption techniques.
    7. Interference immunity: fiber optic cables do not radiate signals as some electrical cables do and cause interference to other cables. They are also immune to pickup of interference from other sources.
    8. Greater safety: fiber optic cables don't carry electricity. Therefore, there is no shock hazard. They are also insulators so are not susceptible to lightning strikes as electrical cables are.

7. Define refractive index.

    Refractive index or index of refraction (n) is the amount of refraction and is defined as the ratio of the speed of light in air to the speed of light in the substance.

$$\text{Index of refraction (n)} = \frac{\text{speed of light in air}}{\text{Speed of light in substance}}.$$

8. Define critical angle.

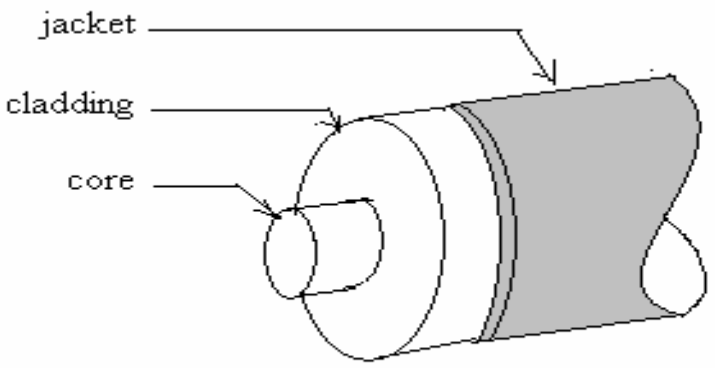
    The angle of incidence at which the refracted angle becomes 90° to the normal is said to be the critical angle.

9. Define total internal reflection.

When the light ray strikes the interface between the air and the glass, at an angle greater than the critical angle, the light ray does not pass through the interface into the glass. When this occurs the angle of reflection is equal to the angle of incidence as if a real mirror were used. This action is known as total internal reflection.

10. Describe the construction of optical fiber cable.

The portion of a fiber optic cable that carries the light is made from either glass (silica) or plastic. The fiber, which is called the core, is usually surrounded by a protective cladding. The cladding is also made of glass or plastic of low refractive index. This ensures that proper interface is achieved so that the light waves remain within the core. In addition to protecting the fiber, the cladding adds strength. A plastic jacket is put over the cladding for insulation.



Basic construction of a fiber optic cable

11. Define mode.

Mode refers to the various paths that the light rays can take in passing through the cable. There are two classifications:

- Single mode and
- Multimode.

12. What is meant by step index fiber and graded index fiber?

Step index fiber refers to the fiber, in which there is a sharply defined step in the index of refraction where the fiber core and cladding interface. It means the core has one constant refractive index N_1 while the cladding has another constant refractive index N_2.

Graded index fiber refers to the fiber, in which the refractive index of the core is not constant. Instead it varies smoothly and continuously over the diameter of the core, reaching a peak at the center and then declining as the outer edge of the core is reached.

13. What is single mode fiber and multimode fiber?

A single mode fiber is one in which, the light follows a single path through the core and a multimode fiber is one in which, the light takes many paths through the core.

14. What is meant by modal dispersion?

The stretching of the pulse due to the attenuation of the light in the cable and increase in duration of arrival times of various light rays is referred to as modal dispersion.

15. List the reasons for the losses in optical fiber cable.

The main reasons for the losses in optical fiber cable are

- Light absorption
- Scattering and
- Dispersion.

16. Define absorption.

Absorption refers to how the light waves are actually "soaked up" in the core material.

17. What is the reason for absorption?

The reason for absorption is the presence of impurities in the glass or plastic.

18. Define scattering.

Scattering refers to the light lost because of light waves entering at the wrong angle and being lost in the cladding due to refraction.

19. State the expression for attenuation in optical fiber cable.

The attenuation of a fiber optic cable is expressed in decibels per unit of length. The standard decibel formula used is

$$dB = 10 \log \frac{P_0}{P_1}$$

20. Write short notes on cable splicing and connectors.

Connectors are special mechanical assemblies that allow fiber optic cables to be connected to one another. Fiber optic connectors are the optical equivalent of electrical plugs and sockets. Fiber optic connectors can be spliced by gluing. Connectors are used at the repeater units and at the end of the cable applied to the light source or photodetector.

21. What are the advantages of lasers over LED's?

LED's covers a narrow spectrum of frequencies, less intense and are good only for short distances whereas, the Lasers are monochromatic, coherent, and highly intense and can be used over long distances.

22. What are the advantages of single mode step index fiber over multimode step index fiber?

Single mode step index fibers are of extremely small size and therefore difficult to make and very expensive. Whereas multimode step index fibers are the easiest to make and the least expensive.

23. Name the multiplexing scheme used for fiber optic communication.

The multiplexing scheme used for fiber optic communication is WDM, wavelength division multiplexing.

PART B

1) Explain different types of optical fiber cables.

- Structure of optical fiber.
- Types of optical fiber.
  - Cross Section
    - Step Index cable with diagram.
    - Graded Index cable with diagram.
  - Mode
    - Single Mode
      - Single Mode Step Index Cable.
    - Multi Mode
      - Multi Mode Step Index Cable.
      - Multi Mode Graded Index Cable.

2) Explain different optical transmitters and receivers.

- Optical Transmitters.
  - Infrared LED's.
  - Lasers.
- Optical Receivers
  - Photodiode.
  - Avalanche Photodiode.

3) Explain different fiber optic data communication system.

- Local Area Network.
  - Fiber Distributed Data Interface (FDDI).
  - Ethernet.
  - Fiber Channel.
  - Synchronous Optical Network (SONET).
- Multiplexing on Fiber Optical Cable.

UNITIV THE TELEPHONE AND APPLICATIONS

1. Define Local Loop.

The two wire twisted-pair connection between the telephone and the central office is referred to as the local loop or subscriber loop. The circuits in the telephone and the central office form a complete electric circuit, or loop.

2.What is meant by DTMF system?

In most modern telephones, a tone dialing system known as the dual-tone multi-frequency (DTMF) system is used. This dialing method uses a number of push buttons that generate pairs of audio tones that indicate the digits selected.

3.What is the frequency response of the local loop?

The frequency response of the local loop is approximately 300 to 3400 Hz. This is sufficient to pass voice frequencies that produce full intelligibility.

4.State the ringing voltage and ringing frequency.

The ringing voltage supplied by the central office is a sine wave of approximately 90 Vrms at a frequency of about 20 Hz. These are the nominal values.

5.State the function of automatic level adjustment.

All telephones contain some type of component or circuit that provides automatic voice-level adjustment so that the signal levels are approximately the same regardless of the loop lengths. In the standard telephone, this automatic loop length adjustment is handled by components called varistors.

6.What is the function of MPU in electronic telephone?

The function performed by the Micro Processor Unit is primarily that of storing telephone numbers and automatically redialing. Many advanced telephones have the capability of storing 12 commonly called numbers.

7.State the elements in MPU.

It consists of the CPU, a ROM where a control program is stored, a small amount of random access read-write memory, and I/O circuits.

8.What are the main units in a cordless telephone?

The main units in a cordless telephone are base unit and portable unit.

9.State the frequencies of cordless telephone.

The frequencies of cordless telephone are 43 to 46Hz in the transmitter and 49Hz in the receiver.

10.What is the power rating of cordless phones?

The power rating of cordless phones is 500MV.

11.Define FAX.

Facsimile or fax is an electronic system for transmitting graphical information by wire or radio. Facsimile is used to send printed material by scanning it and converting it into electronic signals that modulate a carrier to be transmitted over the telephone lines.

12.Define CCD.

Most fax machines use charged coupled devices (CCDs) for scanning. A CCD is a light sensitive semiconductor device that converts varying light amplitudes into an electrical signal.

13.Define pixel.

A CCD is actually a device that breaks up any scene or picture into individual picture elements, or pixel.

14.Define data compression.

Data compression is a digital data processing technique that looks for redundancy in the transmitted signal. The data compression is carried out by a digital signal-processing (DSP) chip.

15.Define modem.

Fax machine contains a built-in modem that is similar to a conventional data modem for computers. These modems are optimized for fax transmission and reception.

16.State FAX standards.

Standards have been developed for speed, modulation methods, and resolution by the International Telegraph and Telephone Consulative Committee, better known by its French abbreviation CCITT. The CCITT is known as the ITU-T, or International Telecommunications Union. The ITU-T fax standards are divided into four groups: Group1 Group 2, Group 3, Group 4.

17.State the scanning rate of FAX machines.

In older days, the scanning rate was 96 LPI. Nowadays in modern FAX machine the scanning rate is 200 LPI(Lines Per Inch).

18.Define cell.

The system divides the service area into many smaller areas known as cells. The typical cell covers only several square miles and contains its own receiver and lower-power transmitter.

19.Define Hand off.

During cellular telephone transmission the computer at the MTSO causes the transmission from vehicle to be switched from the weaker cell to the stronger cell. This is called a handoff.

20.What is meant by GSM system?

The GSM (Global System for Mobile Communications) is used in Europe. The GSM system uses the 890- to 915- and 935- tp 960- MHz frequency range. There are 124 25-kHz channels spaced at 200- kHz intervals.

21.State the multiplexing scheme used for GSM.

It uses time-division multiple access to put eight telephone calls on each channel.

22.What is meant by paging system?

Paging is radio communications system designed to signal individuals wherever they may be. Paging systems operate in the simplex mode, for they broadcast signals or messages to individuals who carry small battery-operated receivers.

23.Define ISDN.

Integrated Services Digital Network (ISDN) is a digital communications interface designed to replace the local analog now used in the public switched network. It supports digital voice telephones as well as fax machines, computers, video, and other digital data sources.

PART B

1. Explain the operation of a telephone circuit
   Answer: Basic Block diagram, Circuit diagram
   - Operation
   - Ringer
   - Transmitter
   - Receiver
   - Hybrid
   - Automatic level adjustment
   - Tone dialing

2. Explain the construction and operation of the electronic telephone and cordless phones with suitable diagrams

   Answer: Electronic telephones, Block diagrams
   Microprocessor control
   Line Interface
   Cordless phones, advanced cordless phones
3. Explain the operation of fax machine with suitable diagrams

   Answer: Diagrams
   Working
   Image processing
   Data compression
4. Explain the operation of cellular telephone unit

   Answer: General block diagram
   Transmitter
   Receiver
   Frequency synthesizer
   Control unit
   Logic unit
5. Explain the construction and operation of paging system

   Answer: Block diagram
   Operation
   Paging formats
   Paging receiver
6. Explain in detail about ISDN

   Answer: The ISDN interface
   Basic rate interface
   Primary rate interface
   ISDN signals, wireless local loop

UNIT-V

CELLULAR RADIO

1. What is meant by air interface?

   The combination of the mobile cellular phone and the cell-site radio equipment in a wireless communication is known as the air interface.

2. What is a base station controller?

   The site's radio equipment is operated by a base station controller (BSC). The base station controller takes care of the air interface: assigning channels and power levels, transmitting signaling tones, and so on.

3. Define blank-and burst signaling.

   Blank-and burst signaling is the process of interrupting the voice channel in cellular communication to send control information.

4. What is meant by call blocking?

   Call blocking is the failure to connect a telephone call because of lack of system capacity.

5. State the principle behind the CDPD method of data transmission.

   The CDPD provides a way to send data over the AMPS cellular radio system. The principle behind CDPD is that at any given moment it monitors the unused voice channels and uses them to transmit data.

6. What is CMAC?

   Control Mobile Attenuation Code (CMAC) is an information sent by the base station in a cellular radio system to set the power level of the mobile transmitter.

7. What is the use of Digital color code?

   A digital color code (DCC) is a signal transmitted by a cell site. It is used to identify that site to the mobile user. When the mobile detects a change in DCC without a change in frequency, it is an indication that co-channel interference is being received from another base station.

8. What is a dropped call?

   A dropped call is a telephone connection that is unintentionally terminated while in progress.

9. What is meant by ESN?

An Electronic Serial Number (ESN) is a number assigned to a cell phone by the manufacturer as a security feature. It is transmitted with the phone's telephone number to authorize a call.

10. What is a fast associated control channel?

A Fast Associated Control CHannel (FACCH) in a digital cellular system or PCS, control information that is transmitted by "stealing" bits that are normally used for voice information.

11. What is a forward channel?

A forward channel is a communication from a cell site or repeater to the mobile unit.

12. What is meant by handoff?

Handoff is the transfer of a call in progress from one cell site to another when the strength is greater in one of the adjacent cells.

13. What is an IMTS?

An Improved Mobile Telephone Service (IMTS) is a trunked system. It is capable of assigning channels automatically and it is also capable of full duplex operation.

14. What is a mobile identification number?

A Mobile Identification Number is a number that identifies a mobile phone in a cellular system; it is the mobile telephone number.

15. What is a mobile switching center?

A Mobile Switching Center (MSC) is a switching facility connecting cellular telephone base stations to each other and to the public switched telephone network.

16. Define NAM.

A Number Assignment Module (NAM) in a cellular phone is a memory location that stores the telephone number(s) to be used on the system.

17. What is a reverse channel?

A reverse channel is a communication channel from mobile station to the base station.

18. What do you mean by a 'roamer'?

A roamer is a cellular customer using a network other than the subscriber's local cellular network.

19. What is a supervisory audio tone?

A Supervisory Audio Tone (SAT) is a sine wave above the voice frequency range, transmitted on the voice channel along with the voice. It is used by the base station to detect loss of signal.

20. Define telepoint.

A telepoint is a very small cell used with some cordless phones to allow their use in public areas.

PART- B

1. Explain AMPS system
   Answer: Introduction
   Cellular carriers and frequencies
   Channel allocation
   Frequency reuse
2. Explain AMPS control system
   Answer: Introduction
   Mobile and base identification
   Turning on a phone
   Originating a call
   Receiving a call
   Hand off
3. Explain the operation of analog cell phone with suitable block diagram
   Answer: Block Diagram
   Transmitter power and frequency
   Transmitter modulator
   Mobile and portable antennas.
4. Explain in detail about cell – site equipment
   Answer: Block diagrams
   Traffic and cell splitting
   Micro cells, Pico cells and repeaters
5. How Fax and data communications are performed using cellular phone
   Answer: Cellular modems
   Cellular digital packet data
6. Explain digital cellular systems
   Answer: Advantages of digital cellular radio
   Conversion of AMPS to TDMA
   TDMA voice channel
   TDMA control channel
   Privacy and security in digital cellular radio
   Dual mode systems and phones
   Data communication with digital cellular systems.

7. Explain AMPS system
   Answer: Introduction
   Cellular carriers and frequencies
   Channel allocation
   Frequency reuse
8. Explain AMPS control system
   Answer: Introduction
   Mobile and base identification
   Turning on a phone
   Originating a call
   Receiving a call
   Hand off
9. Explain the operation of analog cell phone with suitable block diagram
   Answer: Block Diagram
   Transmitter power and frequency
   Transmitter modulator
   Mobile and portable antennas.
10. Explain in detail about cell – site equipment
    Answer: Block diagrams
    Traffic and cell splitting
    Micro cells, Pico cells and repeaters
11. How Fax and data communications are performed using cellular phone
    Answer: Cellular modems
    Cellular digital packet data
12. Explain digital cellular systems
    Answer: Advantages of digital cellular radio
    Conversion of AMPS to TDMA
    TDMA voice channel
    TDMA control channel
    Privacy and security in digital cellular radio
    Dual mode systems and phones
    Data communication with digital cellular systems.

13.Describe the function of GSM system with suitable diagrams.

Ans GSM – RF channels and time slots

Voice transmission

Frequency Hopping

Subscriber ID module

GSM Privacy and Security

14.Describe the function of IS-95 CDMA PCS system with suitable diagrams.
Channels

Ans: Forward Channel

Reverse Channel

Voice Coding

Power Control

Hand-off

CDMA Security.