SYLLABUS

EC2311 COMMUNICATION ENGINEERING 3 0 0 3

1. ANALOG COMMUNICATION 9

AM – Frequency spectrum – vector representation – power relations – generation of AM – DSB, DSB/SC, SSB, VSB AM Transmitter & Receiver; FM and PM – frequency spectrum – power relations : NBFM & WBFM, Generation of FM and DM, Amstrong method & Reactance modulations : FM & PM frequency.

2. DIGITAL COMMUNICATION 9

Pulse modulations – concepts of sampling and sampling theormes, PAM, PWM, PPM, PTM, quantization and coding : DCM, DM, slope overload error. ADM, DPCM, OOK systems – ASK, FSK, PSK, BSK, QPSK, QAM, MSK, GMSK, applications of Data communication.

3. SOURCE CODES, LINE CODES & ERROR CONTROL (Qualitative only) 9

Primary communication – entropy, properties, BSC, BEC, source coding : Shaum, Fao, Huffman coding : noiseless coding heorem, BW – SNR trade off codes: NRZ, RZ, AMI, HDBP, ABQ, MBnB codes : Efficiency of transmissions, error control codes and applications: convolutions & block codes.

4. MULTIPLE ACCESS TECHNIQUES 9

SS&MA techniques : FDMA, TDMA, CDMA, SDMA application in wire and wireless communication : Advantages (merits) :

5. SATELLITE, OPTICAL FIBER – POWERLINE, SCADA 9

Orbits : types of satellites : frequency used link establishment, MA techniques used in satellite communication, earth station, aperture actuators used in satellite – Intelsat and Insat: fibers – types: sources, detectors used, digital filters, optical link: power line carrier communications: SCADA

TOTAL : 45 PERIODS

TEXT BOOKS

1.Taub & Schiling “Principles of communication systems” Tata McGraw hill 2007

2.J.Das “Principles of digital communication” New Age International, 1986

REFERENCE BOOKS

4. Kennedy and Davis “Electronic communication systems” Tata McGraw hill, 4th edition, 1993.
2. Sklar “Digital communication fundamentals and applications“ Pearson Education, 2001
3. Bary le, Memuschmidt, digital Communication, Kluwer Publication, 2004.
4. B.P.Lathi “Modern digital and analog communication systems” Oxford University Press, 1998.

SHORT QUESTIONS AND ANSWERS

UNIT I
ANALOG COMMUNICATION

1. Define amplitude Modulation.

Amplitude Modulation is the process of changing the amplitude of a relatively high frequency carrier signal in proportion with the instantaneous value of the modulating signal.

2. Define Modulation index and percent modulation for an AM wave.

Modulation index is a term used to describe the amount of amplitude change present in an AM waveform .It is also called as coefficient of modulation. Mathematically modulation index is

$m = Em/ Ec$

Where m = Modulation coefficient

Em = Peak change in the amplitude of the output waveform voltage.

Ec = Peak amplitude of the unmodulated carrier voltage.

Percent modulation gives the percentage change in the amplitude of the output wave when the carrier is acted on by a modulating signal.

3. Define Low level Modulation.

In low level modulation, modulation takes place prior to the output element of the final stage of the transmitter. For low level AM modulator class A amplifier is used.

4. Define High level Modulation.

In high level modulators, the modulation takes place in the final element of the final stage where the carrier signal is at its maximum amplitude. For high level modulator class C amplifier is used.

5. What is the advantage of low level modulation?

An advantage of low level modulation is that less modulating signal power is required to achieve a high percentage of modulation.

6. Distinguish between low level and high level modulation.

In low level modulation, modulation takes place prior to the output element of the final stage of the transmitter.It requires less power to achieve a high percentage of modulation.

In high level modulators, the modulation takes place in the final element of the final stage where the carrier signal is at its maximum amplitude and thus ,requires a much higher amplitude modulating signal to achieve a reasonable percent modulation.

7. Define image frequency.

An image frequency is any frequency other than the selected radio frequency carrier that ,if allowed to enter a receiver and mix with the local oscillator ,will produce a cross product frequency that is equal to the intermediate frequency.

8. Define Local Oscillator tracking.

Tracking is the ability of the local oscillator in a receiver to oscillate either above or below the selected radio frequency carrier by an amount equal to the intermediate frequency throughout the entire radio frequency band.

9. Define High side injection tracking.

In high side injection tracking , the local oscillator should track above the incoming RF carrier by a fixed frequency equal to fRF +fIF .

10. **Define Low side injection tracking**.

In low side injection tracking ,the local oscillator should track below the RF carrier by a fixed frequency equal to fRF -fIF .

11. Define tracking error.How it is reduced.

The difference between the actual local oscillator frequency and the desired frequency is called tracking error.It is reduced by a technique called three point tracking.

12. Define image frequency rejection ratio.

The image frequency rejection ratio is the measure of the ability of preselector to reject the image frequency. Mathematically ,IFRR is
IFRR =(1+Q2r2)1/2
Where r= (fim/fRF)-(fRF/fim)

13. Define Heterodyning.

Heterodyne means to mix two frequencies together in a nonlinear device or to translate one frequency to another using nonlinear mixing.

14. What are the disadvantages of conventional (or) double side band full carrier system?

In conventional AM ,carrier power constitutes two thirds or more of the total transmotted power.This is a major drawback because the carrier contains no information ;the sidebands contain the information . Second ,conventional AM systems utilize twice as much bandwidth as needed with single sideband systems.

15. Define Single sideband suppressed carrier AM.

AM Single sideband suppressed carrier is a form of amplitude modulation in which the carrier is totally suppressed and one of the sidebands removed.

16. Define AM Vestigial sideband.

AM vestigial sideband is a form of amplitude modulation in which the carrier and one complete sideband are transmitted,but only part of the second sideband is transmitted.

17. What are the advantages of single sideband transmission?

The advantages of SSBSC are

1.Power conservation: Normally ,with single side band transmission ,only one sideband is transmitted and the carrier is suppressed. So less power is required to produce essentially the same quality signal.

2.Bandwidth conservation: Single sideband transmission requires half as much bandwidth as conventional AM double side band transmission.

3.Noise reduction: Because a single side band system utilizes half as much bandwidth as conventional AM,the thermal noise power is reduced to half that of a double side band system.

18. What are the disadvantages of single side band transmission?

1. Complex receivers: Single side band systems require more complex and expensive receivers than conventional AM transmission .

2. Tuning Difficulties: Single side band receivers require more complex and precise tuning than conventional AM receivers.

19. Define direct frequency modulation.

In direct frequency modulation , frequency of a constant amplitude carrier signal is directly proportional to the amplitude of the modulating signal at a rate equal to the frequency of the modulating signal.

20. Define indirect frequency Modulation.

In indirect frequency modulation ,phase of a constant amplitude carrier directly proportional to the amplitude of the modulating signal at a rate equal to the frequency of the modulating signal.

21. Define instantaneous frequency deviation.

The instantaneous frequency deviation is the instantaneous change in the frequency of the carrier and is defined as the first derivative of the instantaneous phase deviation.

22. Define frequency deviation.

Frequency deviation is the change in frequency that occurs in the carrier when it is acted on by a modulating signal frequency. Frequency deviation is typically given as a peak frequency shift in Hertz(Do).The peak to peak frequency deviation (2Df) is sometimes called carrier swing.The peak frequency deviation is simply the product of the deviation sensitivity and the peak modulating signal voltage and is expressed mathematically as Df=K1 Vm Hz

23. State Carson rule.

Carson rule states that the bandwidth required to transmit an angle modulated wave as twice the sum of the peak frequency deviation and the highest modulating signal frequency. Mathematically carson's rule is B=2(Df +fm) Hz.

24. Define Deviation ratio.

Deviation ratio is the worst case modulation index and is equal to the maximum peak frequency deviation divided by the maximum modulating signal frequency. Mathematically ,the deviation ratio is
DR= Df (max) fm(max)

25. What is multiplexing?

Multiplexing is the transmission of information from one or more source to one or more destination over the same transmission mediam.

UNIT II
DIGITAL COMMUNICATION

31. Define transmission line.

A transmission line is a metallic conductor system that is used to transfer electrical energy from one point to another. A transmission line is two or more conductors separated by an insulator, such as a pair of wires or a system of wire pairs.

32. Define balanced transmission line.

In balanced transmission line, both conductors carry current; one conductor carries the signal and the other is the return. This type of transmission is called differential or balanced signal transmission.

33. Define unbalanced transmission line.

In unbalanced transmission line, one wire is at ground potential where as the other wire is at signal potential. This type of transmission is called single ended or unbalanced signal transmission.

34. Define Open wire transmission line.

An open wire transmission line is a two wire parallel conductor. It consists simply of two parallel wires, closely spaced and separated by air. Nonconductive spacers are placed at periodic intervals for support and to keep the dielectric between the conductors constant. The dielectric is simply the air between and around the two conductors in which the TEM wave propagates.

35. What are the advantages of open wire transmission line?

a. Simple in construction
b. Radiation losses are high
c. It is susceptible to noise pickups.

36. Define twisted pair cable.

are cabled into cores. The cores are covered with various types of sheaths neighboring pairs are twisted with different pitch to reduce interference between pairs due to mutual conduction.

37. Define shielded cable transmission line.

In shielded cable transmission line, parallel two wire transmission lines are enclosed in a metallic conductive metal braid to reduce the radiation losses and interference. The metal braid is connected to ground acts as shield. The braid also prevents signal radiation from reaching the conductors.

38. Define concentric transmission line.

Coaxial or concentric conductors are used for high frequency applications to reduce losses and to isolate transmission paths. The basic coaxial cable consists of a center conductor surrounded by a concentric conductor. At high frequencies, the coaxial outer conductor provides excellent shielding against external interference.

39. Describe the electrical and physical properties of a transmission line.

The electrical properties of a transmission line are wire conductivity and insulator dielectric constant. The physical properties are wire diameter and conductor spacing.

40. List and describe the four primary constants of a transmission line.

The primary constants of a transmission line are series dc resistance, series inductance, shunt capacitance, and shunt conductance. The primary constants are uniformly distributed through out the length of the line and therefore are commonly called distributed parameters.

41. List the secondary constants of a transmission line.

Secondary constants of a transmission line are
_ Characteristic impedance.
_ Propagation constant

42. Define characteristic impedance for a transmission line.

Characteristic impedance is defined as the impedance seen looking into an infinitely long line or the impedance seen looking into a finite length of line that is terminated in a purely resistive load equal to the characteristic impedance of the line. It is also called as surge impedance.

43. Define propagation constant.

Propagation constant is used to express the attenuation (signal loss) and the phase shift per unit length of a transmission line. It is also called as propagation coefficient.

44. Define velocity factor for a transmission line.

Velocity factor (sometimes called velocity constant) is defined as the ratio of the actual velocity of propagation through free space. Mathematically the velocity factor is
Vf=vp/c
Where vf= velocity factor
Vp=actual velocity of propagation
C=velocity of propagation through free space(3X108 m/s)

45. List and describe five types of transmission line losses.

Transmission line losses are conductor loss, radiation loss, dielectric heating loss, coupling loss, and corona.

46. Describe an incident wave, reflected wave.

An ordinary transmission line is bidirectional; power can propagate equally well in both directions. Voltage that propagates from the source toward the load is called incident voltage, and the voltage that propagates from the load toward the source is called reflected voltage.

47. Define resonant line.

A transmission line with no reflected power is called a flat or resonant line.

48. Define nonresonant transmission line.

A transmission line is nonresonant if it is of finite length or if it is terminated with a resistive load equal in ohmic value to the characteristic impedance of the transmission line.

49. Define reflection coefficient.

The reflection coefficient (sometimes called the coefficient of reflection) is a vector quantity that represents the ratio of reflected voltage to incident voltage or reflected current to incident current .Mathematically ,the reflection coefficient is gamma, _ , defined by
_=Er/Ei (or) Ir/Ii
Where _=reflection coefficient (unitless)
Ei =incident voltage (volts)
Er =reflected voltage (volts)
Ir = reflected current (amps)
Ii =incident current (amps)

50. Define matched line.

When Zo=ZL, all the incident power is absorbed by the load .This is called a matched line.
Where Zo=characteristic impedance
ZL= load impedance

51. Define unmatched line.

When Zo _ ZL, some of the incident power is absorbed by the load and some is returned to the source. This is called an unmatched or mismatched line.
Where Zo=characteristic impedance
ZL= load impedance

52. Define standing wave.

In unmatched line, some of the incident power is absorbed by the load and some is returned to the source. So there are two electromagnetic waves, traveling in opposite

direction present on the line at the same time. The two traveling waves setup an interference pattern known as standing wave.

53. Define standing wave ratio.

The standing wave ratio is defined as the ratio of the maximum voltage to the minimum voltage (or) the maximum current to the minimum current of a standing wave on a transmission line.SWR is often called the voltage standing wave ratio (VSWR).

SWR= Vmax
Vmin

54. Define ground wave propagation.

A ground wave is an electromagnetic wave that travels along the surface of earth. Therefore ground waves are sometimes called surface waves. Ground waves must be vertically polarized.

55. What are the disadvantages of ground wave propagation?

1. Ground waves require relatively high transmission power.
2. Ground waves are limited to very low, low, and medium frequencies, requiring large antennas.

56. What are the advantages of ground wave propagation?

1. Ground waves are relatively unaffected by changing atmospheric conditions. 2. If the transmitted power is large enough, then ground wave propagation can be used to communicate between any two points in the world.

57. Define space wave propagation.

Space wave propagation of electromagnetic energy includes radiated energy that travels in the lower few miles of earth's atmosphere. Space waves include both direct and ground reflected waves. Direct waves travel essentially in a straight line between the transmit and receive antennas. space wave propagation with direct waves is commonly called line of sight transmission.

58.Define sky waves.

Electromagnetic waves that are directed above the horizon level are called sky waves.

58. Define critical frequency.

The critical frequency is defined as the highest frequency that can be propagated directly upward and still be returned to earth by the ionosphere.

59. Define virtual height.

Virtual height is the height above earth's surface from which a refracted wave appears to have been reflected.

60. Define maximum usable frequency.

Maximum usable frequency is the highest frequency that can be used for sky wave propagation between two specific points on earth's surface.

UNIT III

SOURCE CODES, LINE CODES & ERROR CONTROL (Qualitative only)

61. What are the advantages of digital transmission?

a. The advantage of digital transmission over analog transmission is noise immunity. Digital pulses are less susceptible than analog signals to variations caused by noise.

• Digital signals are better suited to processing and multiplexing than analog signals.

• Digital transmission systems are more noise resistant than the analog transmission systems.

• Digital systems are better suited to evaluate error performance.

62. What are the disadvantages of digital transmission?

_ The transmission of digitally encoded analog signals requires significantly more bandwidth than simply transmitting the original analog signal.

_ Analog signal must be converted to digital codes prior to transmission and converted back to analog form at the receiver, thus necessitating additional encoding and decoding circuitry.

63. Define pulse code modulation.

In pulse code modulation, analog signal is sampled and converted to fixed length, serial binary number for transmission. The binary number varies according to the amplitude of the analog signal.

64. What is the purpose of the sample and hold circuit?

The sample and hold circuit periodically samples the analog input signal and converts those samples to a multilevel PAM signal.

65. What is the Nyquist sampling rate?

Nyquist sampling rate states that, the minimum sampling rate is equal to twice the highest audio input frequency.

66. Define and state the causes of fold over distortion.

The minimum sampling rate(fs) is equal to twice the highest audio input frequency(fa).If fs is less than two times fa ,distortion will result. The distortion is Called aliasing or fold over distortion. The side frequencies from one harmonic fold over into the sideband of another harmonic. The frequency that folds over is an alias of the input signal hence ,the names “aliasing” or “fold over distortion” .

67. Define overload distortion.

If the magnitude of sample exceeds the highest quantization interval, overload distortion occurs.

68. Define quantization.

Quantization is a process of approximation or rounding off. Assigning PCM codes to absolute magnitudes is called quantizing.

69. Define dynamic range.

Dynamic range is the ratio of the largest possible magnitude to the smallest possible magnitude. Mathematically, dynamic range is
DR= Vmax
Vmin

70. Define coding efficiency.

Coding efficiency is the ratio of the minimum number of bits required to achieve a certain dynamic range to the actual number of PCM bits used. Mathematically, coding efficiency is
Coding efficiency= Minimum number of bits (including sign bit) X 100
Actual number of bits(including sign bit)

71. Define companding.

Companding is the process of compressing, then expanding. With companded systems, the higher amplitude analog signals are compressed prior to transmission, then expanded at the receiver.

72. Define slope overload. How it is reduced.

The slope of the analog signal is greater than the delta modulator can maintain, and is called slope overload. Slope overload is reduced by increasing the clock frequency and by increasing the magnitude of the minimum step size.

73. Define granular noise.How it is reduced.

When the original input signal has relatively constant amplitude, the reconstructed signal has variations that were not present in the original signal. This is called granular noise.
Granular noise can be reduced by decreasing the step size.

74. Define adaptive delta modulation.

Adaptive delta modulation is a delta modulation system where the step size of the AC is automatically varied depending on the amplitude characteristics of the analog input signal.

75. Define peak frequency deviation for FSK.

Peak frequency deviation (_f) is the difference between the carrier rest frequency and either the mark or space frequency and either the mark or space frequency.
(_f)=_fm-fs_2

76. Define modulation index for FSK.

The modulation index in FSK is defined as
h = (_f)
fa
where h= FM modulation index called the h factor in FSK
fa = fundamental frequency of the binary modulating signal
(_f) = Peak frequency deviation (hertz)

77. Define bit rate.

In digital modulation, the rate of change at the input to the modulator is called the
bit rate (fb) and has the unit of bits per second (bps).

78. Define Baud rate.

The rate of change at the output of the modulator is called baud.

79. Define QAM.

Quadrature amplitude modulation is a form of digital modulation where the digital information is contained in both the amplitude and phase of the transmitted carrier.

80. Write the relationship between the minimum bandwidth required for an FSK system and the bit rate.

The minimum bandwidth can be approximated as
B=2_f +2fb
Where B=minimum bandwidth (hertz)
_f=minimum peak frequency deviation (hertz)
Fb=bitrate

UNIT IV
MULTIPLE ACCESS TECHNIQUES

81. Define data communication codes.

Data communication codes are prescribed bit sequences used for encoding characters and symbols.

82. Define error detection.

Error detection is simply the process of monitoring the received data and determining when a transmission has occurred.

83. Define Echoplex.

Echoplex is a relatively simple type of error detection scheme that is used almost exclusively in data communications systems where human operators are used to enter the data manually from a keyboard.

84. Describe serial interface.

Serial interface is used to ensure an orderly flow of data between the line control unit and the modem.

85. Define parallel interface.

Parallel interfaces transfer data between two devices eight or more bits a time. That is one entire data word is transmitted at a time .Parallel transmission is sometimes referred to as serial by word transmission.

86. What are the advantages of parallel transmission?

The advantage of parallel transmission is data are transmitted much faster than with serial transmission because there is a transmission path for each bit of the word. In parallel interface there is no need to convert data from parallel to serial or vice versa.

87. What is the purpose of data modem?

The primary purpose of data modem is to interface computers, computer networks, and other digital terminal equipment to analog communication lines and radio terminals.

88. Classify data modems.

Data modems are generally classified in to synchronous and asynchronous data modems.

89. Define OSI.

The term open system interconnection is the name for a set of standards for communications among computers. The primary purpose of OSI standards is to serve as a structural guideline for exchanging information between computers, terminals and networks.

90. What are the advantages of bus topology?

a. The bus topology is easy to understand, install, and use for small networks.
b. The cabling cost is less as the bus topology requires the least amount of cable to connect the computers.
c. The bus topology is easy to expand by joining two cables with a BNC barrel connector.
d. In the expansion of bus topology repeaters are used to boost the signal and increase the distance.

91. What are the disadvantages of star topology?

One disadvantage of a star topology is that the network is only as reliable as the central node. When the central node fails, the entire system fails.

92. Describe LAN.

A local area network is usually a privately owned and links the devices in a single office, building or campus of up to a few kilometers in size.

93. Define LAN topology.

The topology or physical architecture of a LAN identifies how the stations are interconnected.

94. What are the seven layers of open system interconnection?

The seven layers of open system interconnection are
_ Physical layer
_ Data link layer
_ Network layer
_ Transport layer
_ Session layer
_ Presentation layer
_ Application layer

UNIT V
SATELLITE, OPTICAL FIBER – POWERLINE, SCADA

95. Define satellite.

Satellite is a celestial body that orbits around a planet.In aerospace terms, a satellite is a space vehicle launched by humans and orbits earth or another celestial body.

96. State Kepler's first law.

Kepler's first law states that a satellite will orbit a primary body following an elliptical path.

97. State Kepler's second law.

Kepler's second law states that for equal time intervals of time a satellite will sweep out equal areas in the orbital plane, focused at the bary center.

98. State Kepler's third law.

The third law states that the square of the periodic time of orbit is proportional to the cube of the mean distance between the primary and the satellite.

99. Define orbital satellite.

Orbital satellites are also called as nonsynchronous satellite.Nonsynchronous satellites rotate around earth in an elliptical or circular pattern. In a circular orbit, the speed or rotation is constant however in elliptical orbits the speed depends on the height the satellite is above the earth.

100. Define prograde orbit.

If the satellite is orbiting in the same direction as earth's rotation and at an angular velocity greater than that of earth, the orbit is called a prograde (or) posigrade orbit.

101. Define retrograde orbit.

If the satellite is orbiting in the opposite direction as the earth's rotation or in the same direction with an angular velocity less than that of earth, the orbit is called a retrograde orbit.

102. Define Geo synchronous satellite.

Geo synchronous or geo stationary satellites are those that orbit in a circular pattern with an angular velocity equal to that of Erath. Geosynchronous satellites have an orbital time of approximately 24 hours, the same as earth; thus geosynchronous satellites appear to be stationary as they remain in a fixed position in respect to a given point on earth.

103. Define apogee and perigee.

The point in an orbit which is located farthest from the earth is called apogee.
The point in an orbit which is located closest to earth is called perigee.

104. Define angle of inclination.

The angle of inclination is the angle between the earth's equatorial plane and the orbital plane of a satellite measured counterclockwise at the point in the orbit where it crosses the equatorial plane traveling from south to north.

105. Define Decending node.

The point where a polar or inclined orbit crosses the equatorial plane traveling from south to north. This point is called descending node.

106. Define ascending node.

The point where a polar or inclined orbit crosses the equatorial plane traveling from north to south is called ascending node.

107. Define line of nodes.

The line joining the ascending and descending nodes through the center of earth is called line of nodes.

108. Define angle of elevation.

Angle of elevation is the vertical angle formed between the direction of travel of an electromagnetic wave radiated from an earth station antenna pointing directly toward a satellite and the horizontal plane.

109. Define Azimuth angle.

Azimuth is the horizontal angular distance from a reference direction, either the southern or northern most point of the horizon.

110. What are the advantages of optical fiber communication?
_ Greater information capacity
_ Immunity to crosstalk

_ Immunity to static interference
_ Environmental immunity
_ Safety
_ Security

111. Define a fiber optic system.

An optical communications system is an electronic communication system that uses light as the carrier of information. Optical fiber communication systems use glass or plastic fibers to contain light waves and guide them in a manner similar to the way electromagnetic waves are guided through a waveguide.

112. Define refractive index.

The refractive index is defined as the as the ratio of the velocity of propagation of light ray in free space to the velocity of propagation of a light ray in a given material.
Mathematically, the refractive index is
n = c/_
where c = speed of light in free space
_ = speed of light in a given material

113. Define critical angle.

Critical angle is defined as the minimum angle of incidence at which a light ray may strike the interface of two media and result in an angle of refraction of 90°or greater.

114. Define single mode and multi mode propagation.

If there is only one path for light to take down the cable, it is called single mode.
If there is more than one path ,it is called multimode.

115. Define acceptance angle.

It defines the maximum angle in which external light rays may strike the air/fiber interface and still propagate down the fiber with a response that is no greater than 10 dB below the maximum value.

116. Define numerical aperture.

Numerical aperture is mathematically defined as the sine of the maximum angle a light ray entering the fiber can have in respect to the axis of the fiber and still propagate down the cable by internal reflection.

117. Define modal dispersion.

Modal dispersion or pulse spreading is caused by the difference in the propagation times of light rays that take different paths down a fiber. Modal dispersion can occur only in multimode fibers.It can be reduced by using single mode step index fibers and graded index fibers.

118. What are the advantages of heterojunction LEDs?

a. The increase in current density generates a more brilliant light spot. b. The smaller emitting area makes it easier to couple its emitted light into fiber.

c. The small effective area has a smaller capacitance, which allows the planar heterojunction LED to be used at higher speeds.

119. What are the disadvantages of injection laser diode?

_ ILDs are typically on the order of 10 times more expensive than LEDs

_ Because ILDs operate at higher powers, they typically have a much shorter life time than LEDs.

_ ILDs are more temperature dependent than LEDs.

16 mark Questions

1. Explain in detail about super heterodyne receiver.

Heterodyne means to mix two frequencies together in a nonlinear device or to translate one frequency to another using nonlinear mixing. There are five sections to a superheterodyne receiver. They are RF section,the mixer/converter section,the IF section,the audio detector section, and the amplifier section.

RF section:

The RF section consists of preselector and an amplifier stage.The primary purpose of the preselector is to provide enough initial bandlimiting to prevent a specific unwanted radio frequency,called the image frequency.

An image frequency is any frequency other than the selected radio frequency carrier that ,if allowed to enter a receiver and mix with the local oscillator ,will produce a cross product frequency that is equal to the intermediate frequency.

Mixer /converter section:

The mixer stage is a nonlinear device and its purpose is to convert radio frequencies to intermediate frequencies.

IF section:

The IF section consists of a series of IF amplifiers and bandpass filters and is often called the IF strip. The receiver gain and selectivity is achieved in IF section.

Detector Section:

The purpose of the detector section is to convert the IF signals back to the original source information.

Audio Amplifier section:

The audio section comprises several cascaded audio amplifiers and one or more speakers.

2. Explain in detail about AM modulator circuits.

The location in a transmitter where modulation occurs determines whether the circuit is a low level or a high level transmitter. In low level modulation, modulation takes place prior to the output element of the final stage of the transmitter. For low level AM modulator class A amplifier is used. In high level modulators, the modulation takes place in the final element of the final stage where the carrier signal is at its maximum amplitude. For high

level modulator class C amplifier is used. An advantage of low level modulation is that less modulating signal power is required to achieve a high percentage of modulation.

3. **Explain in detail about FM modulators.**

FM modulators are classified into two types.They are
1.Direct FM modulators
2.Indirect FM modulators

Direct FM modulator:

In direct frequency modulation, frequency of a constant amplitude carrier signal is directly proportional to the amplitude of the modulating signal at a rate equal to the frequency of the modulating signal. There are three common methods for producing direct frequency modulation: Varactor diode modulators, FM reactance modulators, and linear integrated circuit direct FM modulators.

Indirect FM modulator:

In indirect frequency modulation ,phase of a constant amplitude carrier directly proportional to the amplitude of the modulating signal at a rate equal to the frequency of the modulating signal.

4. **Explain in detail about FM demodulators.**

FM demodulators are frequency dependent circuits designed to produce an output voltage that is proportional to the instantaneous frequency.Several circuits are used for demodulating FM signals.The most common are the slope detector, foster seeley discriminator, and ratio detector are forms of tuned circuit frequency discriminators.

5. Explain in detail about AM peak detector.

The function of an AM detector is to demodulate the AM signal and recover or reproduce the original source information.The recovered signal should contain the same frequencies as the original information signal and have the same relative amplitude characteristics.

6. Explain in detail about pulse code modulation.

In pulse code modulation, analog signal is sampled and converted to fixed length, serial binary number for transmission. The binary number varies according to the amplitude of the analog signal.

7. Explain in detail about BPSK. State merits and demerits of BPSK.

In binary phase shift keying, two output phases are possible for a single carrier frequency. One output phase represents logic 1 and the other logic 0. BPSK transmitter:

8. Explain in detail about QPSK.

QPSK is an Mary encoding scheme where M=4.With QPSK four output phases are possible for a single carrier frequency. Two bits are clocked into the bit splitter. After both bits have been serially inputted, they are simultaneously parallel outputted . One bit is directed to the I channel and the other to the Q channel .The I bit modulates a carrier that is in phase with the reference oscillator and the Q bit modulates a carrier that is 90° out of phase or in quadrature with the reference carrier.

9. Explain in detail about FSK.

Frequency shift keying is a form of constant amplitude angle modulation similar to conventional frequency modulation except that the modulating signal is a binary signal that varies between two discrete voltage levels rather than a continuously changing analog waveform.

10. Explain in detail about 8 phase PSK.

Eight phase PSK is an Mary encoding technique where M=8.With an 8 PSK modulator ,there are eight possible output phases .To encode eight different phases ,the incoming bits are considered in groups of three bits ,called tribits.

11. Explain in detail about geosynchronous satellite. State its advantages and disadvantages.

Geo synchronous or geo stationary satellites are those that orbit in a circular pattern with an angular velocity equal to that of Erath. Geosynchronous satellites, have an orbital time of approximately 24 hours,the same as earth; thus geosynchronous satellites appear to be stationary as they remain in a fixed position in respect to a given point on earth.

12. Briefly describe the operation of a light emitting diode.

Light emitting diode is a pn junction diode, usually made from a semiconductor material such as aluminum gallium arsenide or gallium arsenide phosphide.LEDs emit light by spontaneous emission –light is emitted as a result of the recombination of electrons and holes. When forward biased, minority carriers are injected across the pn junction. Once across the junction, these minority carriers recombine with majority carriers and give up energy in the form of light.

13. Briefly describe the operation of an injection laser diode.

The injection laser diode is similar to LED. In fact, below a certain threshold current, an ILD acts similarly to an LED. Above the threshold current, an ILD oscillates; lasing occurs.

The disadvantages of injection laser diode are

_ ILDs are typically on the order of 10 times more expensive than LEDs

_ Because ILDs operate at higher powers, they typically have a much shorter life time than LEDs.

_ ILDs are more temperature dependent than LEDs.

14. What are the different types of data communication codes? Explain in detail.

The different types of data communication codes are

i. ASCII Code

ii. EBCDIC Code

iii. Bar Codes

15. Explain in detail about serial and parallel interface.

Serial interface is used to ensure an orderly flow of data between the line control unit and the modem. Parallel interfaces transfer data between two devices eight or more bits a time. That is one entire data word is transmitted at a time .Parallel transmission is

sometimes referred to as serial by word transmission. The advantage of parallel transmission is data are transmitted much faster than with serial transmission because there is a transmission path for each bit ofthe word. In parallel interface there is no need to convert data from parallel to serial or vice versa.

16. Explain in detail about Data modems.

The primary purpose of data modem is to interface computers, computer networks, and other digital terminal equipment to analog communication lines and radio terminals.
Data modems are generally classified in to synchronous and asynchronous data modems.
Asynchronous Modems:
Asynchronous modems are used primarily for low speed data circuits. It use ASK or FSK.
Synchronous data modems:
Synchronous data modems are used for medium and high speed data transmission and use either PSK or QAM modulation.

17. Explain in detail about ISDN.

The Integrated Services Digital Network is a proposed network to provide voice, data, video, and facsimile information within the same network. ISDN architecture:
There are three basic types of channels available with ISDN.They are
B channel: 64Kbps
D channel: 16 or 64 Kbps
H channel: 384,1536, or 1920 Kbps

18. Explain in detail about LAN.

A local area network is usually a privately owned and links the devices in a single office, building or campus of up to a few kilometers in size.
LAN topologies:
The topology or physical architecture of a LAN identifies how the stations are interconnected.
The different types of topologies are
_ Star topology
_ Bus topology_ Ring topology

19. Explain in detail about OSI.

The term open system interconnection is the name for a set of standards for communications among computers. The primary purpose of OSI standards is to serve as a structural guideline for exchanging information between computers, terminals and networks.
The seven layers of open system interconnection are
_ Physical layer
_ Data link layer
_ Network layer
_ Transport layer
_ Session layer
_ Presentation layer
_ Application layer

20. Explain in detail about Ground wave propagation.

A ground wave is an electromagnetic wave that travels along the surface of earth. Therefore ground waves are sometimes called surface waves. Ground waves must be vertically polarized.

Advantages of ground wave propagation

1. Ground waves are relatively unaffected by changing atmospheric conditions. 2. If the transmitted power is large enough, then ground wave propagation can be used to communicate between any two points in the world.

21. Explain in detail about Space wave propagation.

Space wave propagation of electromagnetic energy includes radiated energy that travels in the lower few miles of earth's atmosphere. Space waves include both direct and ground reflected waves. Direct waves travel essentially in a straight line between the transmit and receive antennas. Space wave propagation with direct waves is commonly called line of sight transmission.

22. Explain in detail about impedance matching.

There are two types of impedance matching devices .They are

1. Quarter wave length transformer
2. Stub matchiong

Quarter wave length Transformer:

When ZL=Z0 ,it acts as a isolation transformer

When ZL< Z0,it acts as a step up transformer.

When ZL>Z0, it acts as a step down transformer.

23. Describe open wire transmission line.

An open wire transmission line is a two wire parallel conductor. It consists simply of two parallel wires, closely spaced and separated by air. Nonconductive spacers are placed at periodic intervals for support and to keep the dielectric between the conductors constant. The dielectric is simply the air between and around the two conductors in which the TEM wave propagates.

Advantages of open wire transmission line

a. Simple in construction
b. Radiation losses are high
c. It is susceptible to noise pickups.

24. Explain in detail about twisted wire cable.

It is formed by twisting two conductors .Pairs are generally stranded in units and the units are cabled into cores. The cores are covered with various types of sheaths neighboring pairs are twisted with different pitch to reduce interference between pairs due to mutual conduction.

25. What are the advantages of digital transmission?

a. The advantage of digital transmission over analog transmission is noise immunity. Digital pulses are less susceptible than analog signals to svariations caused by noise.

• Digital signals are better suited to processing and multiplexing than analog signals.
• Digital transmission systems are more noise resistant than the analog transmission systems.
• Digital systems are better suited to evaluate error performance.