Communication Systems

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Q-1 **What is sampling? What is Sampling Theorem?**

Ans Sampling is defined as the process in which an analog signals are converted into digital signals. It means that a continuous time signal is converted into a discrete time signal.
Sampling Theorem is defined as The continuous time signal that can be represented in its samples and recovered back if the sampling frequency (fs) is greater than the maximum frequency of the signal (fm) that is fs >2fm.

Q-2 **Define PAM and write down its drawbacks?**

Ans Pulse Amplitude Modulation is the process by which the amplitude of the regularly spaced pulses varies according to the the amplitude of the modulating signal.
The drawbacks are:
a. Since the amplitude of the pulses varies therefore the peak power of the modulating signal is much greater.
b. The bandwidth required for transmitting is greater since the amplitude varies.

Q-3 **What is Modulation? What happens in over modulation?**

Ans Modulation is defined as the process in which some characteristics of the signal called carrier is varied according to the modulating or baseband signal. For example - Amplitude Modulation, Phase Modulation, Frequency Modulation. In case of over modulation,
The modulation index is greater than one and envelope distortion occurs.

Q-4 **What do you mean by Nyquist rate?**

Ans In case of Nyquist rate, the sampling frequency is equal to the maximum frequency of the signal and therefore the successive cycles of the spectrum does not overlap.

Q-5 **What do you mean by FM and classify FM.**

Ans Frequency Modulation can be defined as the frequency of the carrier (wc) is varied acc. to the modulating signal about an unmodulated frequency.
FM are of 2 types:
a. Narrowband FM
b. Wideband FM

Q-6 **What is under sampling?**

Ans Under sampling is also known as aliasing effect in which the sampling frequency is less than the maximum frequency of the signal and therefore the successive cycles of the spectrum overlap.

Q-7 **State the advantages of superheterodyning.**

Ans The advantages are:
a. High selectivity and sensitivity.
b. No change in Bandwidth that is bandwidth remains same all over the operating range.
c. High adjacent channel rejection.

Q-8 **What is multiplexing? Name the types of multiplexing.**

Ans Multiplexing is defined as the process in which a number of message signals are combined together to form composite signals so that they can be transmitted through the common channel.
The two types of multiplexing are:
a. Frequency Division Multiplexing: In this technique, fixed frequency bands are allotted to every user in the complete channel bandwidth. Such frequency is allotted to user on a continuous basis.
b. Time Division Multiplexing: When the pulse is present for the short time duration and most of the time there is no signal present in-between them than this free space between the two pulses can occupied by the pulses from other channels. This is known as Time Division Multiplexing.

Q-9 **What is Amplitude Modulation?**

Ans Amplitude Modulation is defined as the process in which the instantaneous value of the amplitude of the carrier is varied according to the amplitude of the modulating or base band signal.

Q-10 **How can be aliasing be avoided?**

Ans Aliasing can be avoided if:

a. Sampling frequency must be greater than the frequency of the modulating signal.
b. The frequency should be band limited to maximum frequency of the signal (fm) Htz.
c. If pre-alias filter is used.

Q-11 **What is Optical Fiber?**

Ans Optical fiber functions as a light pipe, carrying light generated by lasers and other signal transmission sources to its destination.

Q-12 **What are optical fiber parameter?**

Ans Wavelength (λ), Core radius (a), Index of Core* (η1),index of Cladding* (η2),Maximum intensity of light (Io), Numerical Aperture (NA),V-Number (V), Mode Type, Number of Modes, Spot size radius (wo), Mode Field Diameter (MFD), Power at MFD.

Q-13 **What are the regions of a OF?**

Ans An optical fiber consists of at least two distinct regions known as the core and cladding

Q-14 **What are the Methods of Optical Parameter Measurement?**

Ans Methods of Optical Parameter Measurement-the method of comparing signal levels at the OF input and output; the method of controlling the radiation intensity in the far zone ,the pulse location ,the method of measuring the light energy emitted into the surrounding Medium , the bolometric method , the calorimetric method ; the photometric method ,the backscattering method , The method of comparing signal levels at the OF.

Q-15 **To guide light what should the relationship between η1 and η2?**

Ans n1 must be slightly larger than n2 to guide light.

Q-16 **Explain single mode fiber?**

Ans Single-mode fibers have a small core size more than μ10μm which permits only one mode or ray of light to be transmitted. Single-mode fibers have low attenuation and zero dispersion at 1310 nm. This fiber is a general-purpose fiber for systems of moderate distance, transmission rates and channel count.

Q-17 **Explain multimode fiber?**

Ans Multimode fibers have larger cores that guide many modes or rays simultaneously. When one pulse of a signal is generated into a multimode fiber, the multiple modes enter the fiber core from different angles and each mode propagates at a different speed. This causes pulse broadening (modal dispersion), limiting the speed at which subsequent pulses may be generated without overlapping. Multimode fibers are generally used for short distance applications, such as within buildings.

Q-18 **What is Fiber-optic communication?**

Ans Fiber-optic communication is a method of transmitting information from one place to another by sending pulses of light through an optical fiber.

Q-19 **How fiber-optic transmission works?**

Ans The digital bit stream enters the light source. If a one bit is present, the light source pulses light in that time slot, but if there is a zero bit, there is no light pulse (or vice versa, depending on how it is set up). The absence or presence of light therefore represents the discrete ones and zeros. Light energy, like other forms of energy, attenuates as it moves over a distance, so it has to run though amplification or repeating process.

Q-20 **What is transmission medium? Give example.**

Ans Transmission medium (plural transmission media) is a material substance (solid, liquid,

gas, or plasma) which can propagate energy waves. For example, the transmission medium for sound received by the ears is usually air, but solids and liquids may also act as transmission media for sound.

Q-21 **What is Time-division multiplexing?**

Ans Time-division multiplexing (TDM) is a type of digital or (rarely) analog multiplexing in which two or more signals or bit streams are transferred apparently simultaneously as sub-channels in one communication channel, but are physically taking turns on the channel.

Q-22 **What is codec?**

Ans Codec is a device or computer program capable of encoding and/or decoding a digital data stream or signal. The word codec is a portmanteau of compressor-decompressor or, more commonly, coder-decoder.

Q-23 **Give example of CODEC in the field of media?**

Ans a digital video (using a DV codec) of a sports event needs to encode motion well but not necessarily exact colours, while a video of an art exhibit needs to perform well encoding colour and surface texture.

Q-24 **How can we classify transmission medium?**

Ans A transmission medium can be classified as a

1. Linear medium, if different waves at any particular point in the medium can be superposed,
2. Bounded medium, if it is finite in extent, otherwise unbounded medium,
3. Uniform medium or homogeneous medium, if its physical properties are unchanged at different points,
4. Isotropic medium, if its physical properties are the same in different directions.

Q-25 **How can we classify transmission media?**

Ans transmission media are classified as one of the following:

1. Guided (or bounded) - Waves are guided along a solid medium such as a transmission line.

2. Wireless (or unguided) - Transmission and reception are achieved by means of an antenna.

Q-26 **Define optical medium?**

Ans An optical medium is material through which electromagnetic waves propagate. It is a form of transmission medium. The permittivity and permeability of the medium define how electromagnetic waves propagate in it.

Q-27 **Explain excitable medium?**

Ans An excitable medium is a nonlinear dynamical system which has the capacity to propagate a wave of some description, and which cannot support the passing of another wave until a certain amount of time has passed.

Q-28 **What is Manchester code?**

Ans In telecommunication, Manchester code (also known as Phase Encoding, or PE) is a line code in which the encoding of each data bit has at least one transition and occupies the same time.

Q-29 **What are the losses in optical fiber?**

Ans Reflection losses, Fiber separation, Lateral misalignment. Angular misalignment, Core and cladding diameter mismatch, Numerical aperture (NA) mismatch, Refractive index profile difference, Poor fiber end preparation

Q-30 **Fiber-to-fiber connection loss is increased or decreased by Intrinsic coupling losses and Extrinsic coupling losses?**

Ans Fiber-to-fiber connection loss is increased by Intrinsic coupling losses and Extrinsic coupling losses.

Q-31 **Define Bending losses?**

Ans Propagation losses in an optical fiber (or other waveguide) caused by bending.

Q-32 **Explain power in OF?**

Ans The power outputs of a transmitter or the input to receiver are absolute optical power measurements, that is, we measure the actual value of the power.

Q-33 **Explain loss in OF?**

Ans Loss is a relative power measurement, the difference between the power coupled into a component like a cable or a connector and the power that is transmitted through it. This difference is what we call optical loss and defines the performance of a cable, connector, splice, etc.

Q-34 **Name the types of methods used to measure loss?**

Ans There are two methods that are used to measure loss, which we call single-ended loss and double-ended loss.

Q-35 **Explain Light scattering?**

Ans The propagation of light through the core of an optical fiber is based on total internal reflection of the light wave. Rough and irregular surfaces, even at the molecular level, can cause light rays to be reflected in random directions. This is called diffuse reflection or scattering, and it is typically characterized by wide variety of reflection angles.

Q-36 **In OF why attenuation losses occur?**

Ans Attenuation results from the incoherent scattering of light at internal surfaces and interfaces.

Q-37 **What material are used for manufacturing of optical fiber?**

Ans Glass optical fibers are almost always made from silica, but some other materials, such as fluorozirconate, fluoroaluminate, and chalcogenide glasses as well as crystalline materials like sapphire, are used for longer-wavelength infrared or other specialized applications. Silica and fluoride glasses usually have refractive indices of about 1.5, but some materials such as the chalcogenides can have indices as high as 3. Typically the index difference between core and cladding is less than one percent.

Q-38 **Why cladding is coated by a buffer?**

Ans The cladding is coated by a buffer that protects it from moisture and physical damage

Q-39 **What is LED?**

Ans Light-emitting diode (LED) is a semiconductor light source.

Q-40 **How LED is used?**

Ans LEDs are used as indicator lamps in many devices, and are increasingly used for lighting.

Q-41 **What is electroluminescence in LED?**

Ans When a light-emitting diode is forward biased (switched on), electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence.

Q-42 **What are advantages of LED over incandescent light sources?**

Ans LEDs present many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved robustness, smaller size, faster switching, and greater durability and reliability.

Q-43 **What are the applications of LED?**

Ans

1. Visual signals where light goes more or less directly from the source to the human eye, to convey a message or meaning.
2. Illumination where light is reflected from objects to give visual response of these objects.

3. Measuring and interacting with processes involving no human vision.
4. Narrow band light sensors where LEDs operate in a reverse-bias mode and respond to incident light, instead of emitting light.

Q-44 **What is Photo sensor?**

Ans Photo sensors or photo detectors are sensors of light or other electromagnetic energy.

Q-45 **What should we do for converting LED to photodiode?**

Ans LEDs reverse-biased to act as photodiodes

Q-46 **Give examples of photoconductors?**

Ans Vacuum-tube devices, semiconductor photodiodes, thermocouple semiconductor, photocondtive devices.

Q-47 **Explain PAM?**

Ans Pulse-amplitude modulation, acronym PAM.PAM, is a form of signal modulation where the message information is encoded in the amplitude of a series of signal pulses.

Q-48 **Give example PAM?**

Ans Example: A two bit modulator (PAM-4) will take two bits at a time and will map the signal amplitude to one of four possible levels, for example −3 volts, −1 volt, 1 volt, and 3 volts.

Q-49 **Where PAM is used?**

Ans Pulse-amplitude modulation is widely used in baseband transmission of digital data, with non-baseband applications having been largely superseded by pulse-code modulation, and, more recently, by pulse-position modulation.

Q-50 **What is PPM?**

Ans Pulse-position modulation (PPM) is a form of signal modulation in which M message bits are encoded by transmitting a single pulse in one of 2 the power of M possible time-shifts. This is repeated every T seconds, such that the transmitted bit rate is M/T bits per second. It is primarily useful for optical communications systems, where there tends to be little or no multipath interference.

Q-51 **Explain PWM?**

Ans Pulse-width modulation (PWM) is a commonly used technique for controlling power to inertial electrical devices, made practical by modern electronic power switches.

Q-52 **Define Duty cycle?**

Ans The term duty cycle describes the proportion of on time to the regular interval or period of time; a low duty cycle corresponds to low power, because the power is off for most of the time. Duty cycle is expressed in percent, 100% being fully on.

Q-53 **Explain principal of PWM?**

Ans Pulse-width modulation uses a rectangular pulse wave whose pulse width is modulated resulting in the variation of the average value of the waveform.

Q-54 **What is the use of Delta modulation for PWM control?**

Ans The use of delta modulation for PWM control, the output signal is integrated, and the result is compared with limits, which correspond to a reference signal offset by a constant. Every time the integral of the output signal reaches one of the limits, the PWM signal changes state.

Q-55 **What is the use of Delta sigma modulation for PWM control?**

Ans In delta-sigma modulation as a PWM control method, the output signal is subtracted from a reference signal to form an error signal. This error is integrated, and when the integral of the error exceeds the limits, the output changes state.

Q-56 **Compare PPM and M-FSK?**

Ans PPM and M-FSK systems with the same bandwidth, average power, and transmission rate of M/T bits per second have identical performance in an AWGN (Additive White Gaussian Noise) channel. However, their performance differs greatly when comparing frequency-selective and frequency-flat fading channels. Whereas frequency-selective fading produces echoes that are highly disruptive for any of the M time-shifts used to encode PPM data, it selectively disrupts only some of the M possible frequency-shifts used to encode data for M-FSK. Conversely, frequency-flat fading is more disruptive for M-FSK than PPM, as all M of the possible frequency-shifts are impaired by fading, while the short duration of the PPM pulse means that only a few of the M time-shifts are heavily impaired by fading.

Q-57 What is the main advantage of PWM?

Ans The main advantage of PWM is that power loss in the switching devices is very low. When a switch is off there is practically no current, and when it is on, there is almost no voltage drop across the switch. Power loss, being the product of voltage and current, is thus in both cases close to zero.

Q-58 What is fiber optics?

Ans the field of applied science and engineering concerned with the design and application of optical fibers is known as fiber optics

Q-59 Tell use of optical fiber?

Ans Optical fibers are widely used in fiber-optic communications, which permits transmission over longer distances and at higher bandwidths (data rates) than other forms of communication

Q-60 Define MMF and SMF?

Ans Fibers which support many propagation paths or transverse are called multi-mode fibers (MMF), while those which can only support a single mode are called single-mode fibers (SMF). Multi-mode fibers generally have a larger core diameter, and are used for short-distance communication links and for applications where high power must be transmitted. Single mode fibers are used for most communication links longer than 1,050 meters (3,440 ft).

Q-61 Explain Total internal reflection?

Ans When light traveling in a dense medium hits a boundary at a steep angle (larger than the critical angle for the boundary), the light will be completely reflected. This effect is used in optical fibers to confine light in the core. Light travels along the fiber bouncing back and forth off of the boundary. Because the light must strike the boundary with an angle greater than the critical angle, only light that enters the fiber within a certain range of angles can travel down the fiber without leaking out. This range of angles is called the acceptance cone of the fiber. The size of this acceptance cone is a function of the refractive index difference between the fibers core and cladding.

Q-62 What is light scattering?

Ans The propagation of light through the core of an optical fiber is based on total internal reflection of the light wave. Rough and irregular surfaces, even at the molecular level, can cause light rays to be reflected in random directions. This is called diffuse reflection or scattering, and it is typically characterized by wide variety of reflection angles.

Q-63 What is RS 232?

Ans In telecommunications, RS-232 (Recommended Standard 232) is a standard for serial binary single ended data and control signals connecting between a DTE (Data Terminal Equipment) and a DCE (Data Circuit terminating Equipment). It is commonly used in computer serial. The standard defines the electrical characteristics and timing of signals, the meaning of signals, and the physical size and pinout of connectors.

Q-64 **What is the role of RS 232 in modern computer?**

Ans Today, RS-232 has mostly been replaced in personal computers by USB for local communications. Compared with RS-232, USB is faster, uses lower voltages, and has connectors that are simpler to connect and use. Both standards have software support in popular operating systems. USB is designed to make it easy for device drivers to communicate with hardware.

Q-65 **What is PC-to-PC communication?**

Ans It's actually just what it says it is one computer networked to another. Someone gets on one computer and uses information on the other computer. This could be file sharing. It could be sharing a printer. It could be simply passing email back and forth.

Q-66 **Explain functions of Link designing?**

Ans Link design consists basically of two functions:

1. Calculating optical power losses occurring between the light source and the photo detector.
2. Determining bandwidth limitations on data carrying abilities imposed by the transmitter, fiber and receiver.

Q-67 **Define Radar?**

Ans Radar is an object-detection system which uses electromagnetic waves — specifically radio waves — to determine the range, altitude, direction, or speed of both moving and fixed objects such as aircraft, ships, spacecraft, guided missiles, motor vehicles, weather formations, and terrain.

Q-68 **When Practical radar was developed?**

Ans Practical radar was developed in secrecy during World War 2 by Britain and other nations.

Q-69 **What is the modern uses of radar?**

Ans The modern uses of radar are highly diverse, including air traffic control, radar astronomy, air-defence systems, antimissile systems, nautical radars to locate landmarks and other ships, aircraft anti-collision systems, ocean surveillance systems, outer-space surveillance and rendezvous systems; meteorological precipitation monitoring, altimetry and flight-control systems, guided-missile target-locating systems, and ground-penetrating radar geological observations.

Q-70 **What is the Principal of radar?**

Ans A radar system has a transmitter that emits radio waves called radar signals in predetermined directions. When these come into contact with an object they are usually reflected and/or scattered in many directions. Radar signals are reflected especially well by materials of considerable electrical conductivity—especially by most metals, by seawater, by wet land, and by wetlands. Some of these make the use of radar altimeters possible. The radar signals that are reflected back towards the transmitter are the desirable ones that make radar work. If the object is moving either closer or farther away, there is a slight change in the frequency of the radio waves, due to the Doppler effect.

Q-71 **What is clutter?**

Ans Clutter refers to radio frequency (RF) echoes returned from targets which are uninteresting to the radar operators.

Q-72 **What is MTI?**

Ans Moving target indication (MTI) is a mode of operation of a radar to discriminate a target against clutter.

Q-73 **What is Doppler Effect?**

Ans The Doppler effect (or Doppler shift), named after Austrian physicist Christian Doppler who proposed it in 1842, is the change in frequency of a wave for an observer moving

relative to the source of the wave. It is commonly heard when a vehicle sounding a siren or horn approaches, passes, and recedes from an observer. The received frequency is higher (compared to the emitted frequency) during the approach, it is identical at the instant of passing by, and it is lower during the recession.

Q-74 Give Principal of Doppler effect?

Ans When the source of the waves is moving toward the observer, each successive wave crest is emitted from a position closer to the observer than the previous wave. Therefore each wave takes slightly less time to reach the observer than the previous wave. Therefore the time between the arrivals of successive wave crests is reduced, causing an increase in the frequency. While they are traveling, the distance between successive wave fronts is reduced; so the waves bunch together. Conversely, if the source of waves is moving away from the observer, each wave is emitted from a position farther from the observer than the previous wave, so the arrival time between successive waves is increased, reducing the frequency. The distance between successive wave fronts is increased, so the waves spread out.

Q-75 What is CW radar?

Ans Continuous-wave radar system is a radar system where a known stable frequency continuous radio wave energy is transmitted and then received from any reflecting objects. The return frequencies are shifted away from the transmitted frequency based on the Doppler Effect if they are moving.

Q-76 What is the main advantage of the CW radars?

Ans The main advantage of the CW radars is that they are not pulsed and simple to manufacture. They have no minimum or maximum range (although the broadcast power level imposes a practical limit on range) and maximize power on a target because they are always broadcasting.

Q-77 Can CW radar measure range?

Ans Conventional CW radar cannot measure range because there is no basis for the measurement of the time delay.

Q-78 What is the full form of TV?

Ans Television.

Q-79 What is Cable TV?

Ans Cable television is a system of providing television to consumers via radio frequency signals transmitted to televisions through coaxial cables or Digital light pulses though fixed optical fibers located on the subscribers property, much like the over-the-air method used in traditional television broadcasting (via radio waves) in which a television antenna is required

Q-80 How Cable Television Works?

Ans The earliest cable systems were, in effect, strategically placed antennas with very long cables connecting them to subscriber's television sets. Because the signal from the antenna became weaker as it travelled through the length of cable, cable providers had to insert amplifiers at regular intervals to boost the strength of the signal and make it acceptable for viewing.

Q-81 How to Build a Cable TV System?

Ans Procedure: -

1. Select a central logical location to mount a high-bandwidth splitter or distribution block. Screw this device down to a secure spot using the drill, Philips bit and 2-inch wood screws. This spot can be a basement stud or rafter or a simple panel.
2. Determine the individual locations desired for cable entry. In most cases, cable terminations are wall plates in the individual spaces. Using the coax cutters, cut a

sufficient amount to reach from a space to the distribution location.

3. Strip off 1/4-inch of insulation from one end of the coax using the coax stripper. Place the stripper over the end of the wire, squeeze and rotate the stripper around the cable until it spins freely. Pull off the cut jacketing from the cable. Fold the shielding back against the jacket. Push the connector onto the end of the now-exposed wire as far as it will go. Place the coax crimper over the collar of the connector, squeezing the handles until they are secure.
4. Repeat the stripping and termination process for all coax cable ends designated for connection to the splitter. Screw on the connectors to the output legs in a clockwise motion, until they are fully seated.
5. Drill a hole through the baseboard into the access area where the splitter is located. The bit should penetrate through the footer and into the access area. Remove the bit from the hole.
6. Locate the small hole the 3/16-inch bit created in the footer. In the access space, take the 1-inch bit and drill straight up through the footer, immediately adjacent to the smaller hole. Drill a 2-inch hole directly above the hole made behind the baseboard, at the same height as other outlets. Repeat these steps for each room designated for coax wiring.
7. Grab the fish tape in the access area. Bring the end of the coax cable parallel to the end of the fish tape, wrapping a few tight turns of the electrical tape around both. Push the tape back through the footer and through the 2-inch hole in the wall.
8. Unwrap the tape, freeing the coax. Terminate the coax as detailed in the access room. Screw on the connector to the rear of the coax plate and screw the plate to the wall using two wood screws and the drill with a Philips bit.

Q-81 **What is broadcast television systems?**

Ans Broadcast television systems are encoding or formatting standards for the transmission and reception of analog television signals.

Q-82 **What is DTV?**

Ans Digital television (DTV) is the transmission of audio and video by discrete (digital) signals, in contrast to the analog signals used by analog TV. Countries such as the United States are replacing over-the-air broadcast analog television with digital television to allow other uses of the radio spectrum formerly used for analog TV broadcast.

Q-83 **What is Digital cable?**

Ans Digital cable is a generic term for any type of cable television distribution using digital video compression or distribution.

Q-84 **What is Cable CARD?**

Ans Cable CARD is a special-use PCMCIA (PC) card that allows consumers in the United States to view and record digital cable television channels on digital video recorders, computers and televisions without the use of other equipment such as a set top box (STB) provided by a cable company. The card may be provided by the local cable provider; usually for a nominal monthly fee.

Q-85 **Explain Private Cable Operator?**

Ans A Private Cable Operator (also known as PCO) is a private small independent cable company competing directly with Multi system operators. PCOs typically offer services to multi-family dwellings, gated communities, hotels and other small businesses. In some small municipalities the city may be a PCO.

Q-86 **What is QAM tuner?**

Ans QAM stands for quadrature amplitude modulation, the format by which digital cable channels are encoded and transmitted via cable television providers. QAM tuners can be

likened to the cable equivalent of an ATSC tuner which is required to receive over-the-air (OTA) digital channels broadcast by local television stations; many new cable-ready digital televisions support both of these standards. Although QAM uses the same 6 MHz bandwidth as ATSC, it carries about twice the data (38.47 Mbp/s @256QAM) due to the lack of error correction; however, this requires a significantly cleaner signal path, such as distribution through hybrid fiber-coax digital cable

Q-87 **What is the end component in the satellite TV system?**

Ans The end component in the entire satellite TV system is the receiver.

Q-88 **What is the job of receiver?**

Ans the receiver has four essential jobs:
It de-scrambles the encrypted signal. It takes the digital (MPEG-2) or (MPEG-4) signal and converts it into an analog format that a standard television can recognize. It extracts the individual channels from the larger satellite signal it keeps track of pay-per-view programs and periodically phones a computer at the provider s headquarters to communicate billing information.

Q-89 **What is Satellite television?**

Ans Satellite television is television delivered by the means of communications satellite and received by a satellite and setup box.

Q-90 **Explain technology used in Satellites?**

Ans Satellites used for television signals are generally in either naturally highly elliptical (with inclination of +/-63.4 degrees and orbital period of about 12 hours, also known as Molniya orbit) or geostationary orbit 37,000 km (22,300 miles) above the earth's equator.

Q-91 **What are the standards of digital TV?**

Ans In general, digital television, including that transmitted via satellites, are generally based on open standards such as MPEG and DVB-S or ISDB-S.

Q-92 **Explain Direct broadcast via satellite?**

Ans Direct broadcast satellite, (DBS) also known as Direct-To-Home can either refer to the communications satellites themselves that deliver DBS service or the actual television service. DBS systems are commonly referred to as minidish systems. DBS uses the upper portion of the Ku band, as well as portions of the Ka band.

Q-93 **Explain "Television receive-only"?**

Ans The term Television receive-only, or TVRO systems are designed to receive analog and digital satellite feeds of both television and audio from both C-band and Ku-band transponders on FSS-type satellites. The higher frequency Ku-band systems tend to be Direct To Home systems and can use a smaller dish antenna because of the higher power transmissions and greater antenna gain.

Q-94 **Explain Direct to Home television?**

Ans Many satellite TV customers in developed television markets get their programming through a direct broadcast satellite (DBS) provider. The provider selects programs and broadcasts them to subscribers as a set package. Basically, the provider's goal is to bring dozens or even hundreds of channels to the customer's television in a form that approximates the competition from Cable TV. Unlike earlier programming, the provider's broadcast is completely digital, which means it has high picture and stereo sound quality. Early satellite television services broadcast in C-band - radio in the 3.7 Gigahertz (GHz) to 4.2 GHz frequency range. Digital broadcast satellite transmits programming in the Ku frequency range (10 GHz to 14 GHz).

Q-95 **What is Satellite television?**

Ans Satellite television is television delivered by the means of communications satellite and

received by a satellite and setup box. In many areas of the world it provides a wide range of channels and services, often to areas that are not serviced by terrestrial or cable providers.

Q-96 **What are the standard used in Analog television?**

Ans Analog television distributed via satellite is usually sent scrambled or unscrambled in NTSC, PAL, or SECAM television broadcast standards. The analog signal is frequency modulated and is converted from an FM signal to what is referred to as baseband. This baseband comprises the video signal and the audio sub carrier(s). The audio sub carrier is further demodulated to provide a raw audio signal. If the signal is a digitized television signal or multiplex of signals, it is typically QPSK.

Q-97 **What is a satellite dish?**

Ans Satellite dish is a dish-shaped type of parabolic antenna designed to receive microwaves from communications satellites, which transmit data transmissions or broadcasts, such as satellite television.

Q-98 **What is the Principle of operation a satellite dish?**

Ans The parabolic shape of a dish reflects the signal to the dish's focal point. Mounted on brackets at the dish focal point is a device called a feed horn. This feed horn is essentially the front-end of a waveguide that gathers the signals at or near the focal point and conducts them to a low-noise block down converter or LNB. The LNB converts the signals from electromagnetic or radio waves to electrical signals and shifts the signals from the down linked C-band and/or Ku-band to the L-band range. Direct broadcast satellite dishes use an LNBF, which integrates the feed horn with the LNB.

Q-99 **What is a dish antenna?**

Ans A dish antenna, also known simply as a dish, is common in microwave systems. This type of antenna can be used for satellite communication and broadcast reception, space communications, radio astronomy, and radar.

Q-100 **What cable is used for satellite television reception?**

Ans For satellite television reception, coaxial cable is used.

Q-101 **What is a parabolic antenna?**

Ans A parabolic antenna is an antenna that uses a parabolic reflector, a surface with the cross-sectional shape of a parabola, to direct the radio waves. The most common form is shaped like a dish and is popularly called a dish antenna or parabolic dish.

Q-102 **What is the main advantage of a parabolic antenna?**

Ans The main advantage of a parabolic antenna is that it is highly directive; it functions analogously to a searchlight or flashlight reflector to direct the radio waves in a narrow beam, or receive radio waves from one particular direction only.

Q-103 **Name the main type's parabolic antenna?**

Ans Cylindrical, Paraboloidal or dish, Axial or front feed, Offset or off-axis feed, Cassegrain.

Q-104 **Define gain for parabolic antenna?**

Ans The directive qualities of an antenna are measured by a dimensionless parameter called its gain, which is the ratio of the power received by the antenna from a source along its beam axis to the power received by a hypothetical isotropic antenna.

Q-105 **Define gain for parabolic antenna?**

Ans The angular width of the beam radiated by high-gain antennas is measured by the half-power beam width (HPBW), which is the angular separation between the points on the antenna radiation pattern at which the power drops to one-half (-3 dB) its maximum value.

Q-106 **What is STB?**

Ans A set-top box (STB) or set-top unit (STU) is a device that connects to a television and an

external source of signal, turning the signal into content which is then displayed on the television or other display device.

Q-107 Define modulation?

Ans Modulation is a process by which some characteristics of high frequency carrier signal is varied in accordance with the instantaneous value of the modulating signal.

Q-108 What are the types of analog modulation?

Ans Amplitude modulation.
Angle Modulation
1. Frequency modulation
1. 2. Phase modulation.

Q-109 Define depth of modulation.

Ans It is defined as the ratio between message amplitude to that of carrier amplitude.
m=Em/Ec

Q-110 What are the degrees of modulation?

Ans Under modulation. m less than 1
Critical modulation m=1
Over modulation m greater then 1

Q-111 What is the need for modulation?

Ans Needs for modulation
1. Ease of transmission
2. Multiplexing
3. Reduced noise
4. Narrow bandwidth
5. Frequency assignment
1. 6. Reduce the equipment's limitation

Q-112 What are the types of AM modulators?

Ans There are two types of AM modulators. They are
1. Linear modulators
2. Nonlinear modulators

Linear modulators are classified as follows
Transistor modulator
There are three types of transistor modulator.
1. Collector modulator
2. Emitter modulator
3. Base modulator
4. Switching modulators

Non-linear modulators are classified as follows
1. Square law modulator
2. Product modulator
1. Balanced modulator

Q-113 Give the classification of modulation.

Ans There are two types of modulation. They are
A. Analog modulation
B. Digital modulation

Analog modulation is classified as follows
1. Continuous wave modulation
2. Pulse modulation

Continuous wave modulation is classified as follows
Amplitude modulation

1. Double side band suppressed carrier
2. Single side band suppressed carrier
3. Vestigial side band suppressed carrier
4. Angle modulation
5. Frequency modulation
6. Phase modulation

Pulse modulation is classified as follows

1. Pulse amplitude modulation
2. Pulse position modulation
3. Pulse duration modulation
4. Pulse code modulation

Digital modulation is classified as follows

1. Amplitude shift keying
2. Phase shift keying
3. Frequency shift keying

Q-114 What is single tone and multi tone modulation?

Ans If modulation is performed for a message signal with more than one frequency component then the modulation is called multi tone modulation. If modulation is performed for a message signal with one frequency component then the modulation is called single tone modulation.

Q-115 What are the advantages of VSB-AM?

Ans

1. It has bandwidth greater than SSB but less than DSB system.
2. Power transmission greater than DSB but less than SSB system.
3. No low frequency component lost. Hence it avoids phase distortion.

Q-116 Compare linear and non-linear modulators.

Ans Linear modulators

1. Heavy filtering is not required.
2. These modulators are used in high level modulation.
3. The carrier voltage is very much greater than modulating signal voltage.

Nonlinear modulators

1. Heavy filtering is required
2. These modulators are used in low level Modulation.
3. The modulating signal voltage is very much greater than the carrier signal voltage.

Q-117 How will you generating DSBSC-AM?

Ans There are two ways of generating DSBSC-AM such as

1. Balanced modulator
2. Ring modulators

Q-118 What are advantages of ring modulator?

Ans

1. Its output is stable.
2. It requires no external power source to activate the diodes.
3. Virtually no maintenance.
4. Long life.

Q-119 Define demodulation.

Ans Demodulation or detection is the process by which modulating voltage is recovered from the modulated signal. It is the reverse process of modulation.

Q-120 What are the types of AM detectors?

Ans

1. Nonlinear detectors
2. Linear detectors

Q-121 What are the types of linear detectors?

Ans
1. Synchronous or coherent detector.
2. Envelope or non-coherent detector.

Q-122 **Define multiplexing.**

Ans Multiplexing is defined as the process of transmitting several message signals simultaneously over a single channel.

Q-123 **Define sensitivity.**

Ans It is defined as a measure of its ability to receive weak signals.

Q-124 **Define selectivity.**

Ans Selectivity of a receiver is defined as its ability to select the desired signals among the various signals.

Q-125 **Define stability**

Ans It is the ability of the receiver to deliver a constant amount of output for a given a given period of time.

Q-126 **Define super heterodyne principle.**

Ans It can be defined as the process of operation of modulated waves to obtain similarly modulated waves of different frequency. This process uses a locally generated carrier wave, which determines the change of frequency.

Q-127 **What are the drawbacks of emitter modulator?**

Ans
1. The amplifier is operated in class A mode, thus the efficiency is low.
2. The output power is very small. Thus it is not suitable for generating high level modulation.

Q-128 **Define frequency modulation.**

Ans Frequency modulation is defined as the process by which the frequency of the carrier wave is varied in accordance with the instantaneous amplitude of the modulating or message signal.

Q-129 **Define modulation index of frequency modulation.**

Ans It is defined as the ratio of maximum frequency deviation to the modulating frequency.

Q-130 **What do you meant by multitone modulation?**

Ans Modulation done for the message signal with more than one frequency component is called multitone modulation.

Q-131 **Define phase modulation.**

Ans Phase modulation is defined as the process of changing the phase of the carrier signal in accordance with the instantaneous amplitude of the message signal.

Q-132 **What are the types of Frequency Modulation?**

Ans Based on the modulation index FM can be divided into types. They are Narrow band FM and Wide band FM. If the modulation index is greater than one then it is wide band FM and if the modulation index is less than one then it is Narrow band FM

Q-133 **What is the basic difference between an AM signal and a narrowband FM signal?**

Ans In the case of sinusoidal modulation, the basic difference between an AM signal and a narrowband FM signal is that the algebraic sign of the lower side frequency in the narrow band FM is reversed.

Q-134 **What are the two methods of producing an FM wave?**

Ans Basically there are two methods of producing an FM wave. They are,

i) Direct method

In this method the transmitter originates a wave whose frequency varies as function of the modulating source. It is used for the generation of NBFM

ii) Indirect method

In this method the transmitter originates a wave whose phase is a function of the

modulation. Normally it is used for the generation of WBFM where WBFM is generated from NBFM

Q-135 **Compare WBFM and NBFM.**

Ans WBFM

1. Modulation index is greater than 1
2. Frequency deviation 75 KHz
3. Bandwidth 15 times NBFM
4. Noise is more suppressed

NBFM

1. Modulation index less than 1
2. Frequency deviation 5 KHz
3. Bandwidth 2fm
4. Less suppressing of noise

Q-136 **Give the average power of an FM signal.**

Ans The amplitude of the frequency modulated signal is constant .The power of the FM signal is same as that of the carrier power.

$P=1/2\ Ec^2$

Q-137 **Define phase deviation.**

Ans The maximum phase deviation of the total angle from the carrier angle is called phase deviation.

Q-138 **Define frequency Deviation.**

Ans The maximum departure of the instantaneous frequency from the carrier frequency is called frequency deviation.

Q-139 **State the Carson's rule.**

Ans An approximate rule for the transmission bandwidth of an FM Signal generated by a single tone-modulating signal of frequency fm is defined as

$B = 2\Delta f(1+1/\beta)$

Q-140 **Define the deviation ratio D for non-sinusoidal modulation.**

Ans The deviation ratio D is defined as the ratio of the frequency deviation Df, which corresponds to the maximum possible amplitude of the modulation signal m(t),to the highest modulation frequency .

$D = \Delta f/fm$

Q-141 **What is the use of crystal controlled oscillator?**

Ans The crystal-controlled oscillator always produces a constant carrier frequency there by enhancing frequency stability.

Q-142 **What are the disadvantages of FM system?**

Ans

1. A much wider channel is required by FM.
2. FM transmitting and receiving equipment's tend to be more complex and hence it is expensive

Q-143 **How will you generate message from frequency-modulated signals?**

Ans First the frequency-modulated signals are converted into corresponding amplitude-modulated signal using frequency dependent circuits. Then the original signal is recovered from this AM signal.

Q-144 **What are the types of FM detectors?**

Ans Slope detector and phase discriminator.

Q-145 **What are the types of phase discriminator?**

Ans Foster seely discriminator and ratio detector.

Q-146 **What are the disadvantages of balanced slope detector?**

Ans

1. Amplitude limiting cannot be provided
2. Linearity is not sufficient
3. It is difficult to align because of three different frequency to which various tuned circuits to be tuned.
4. The tuned circuit is not purely band limited.

Q-147 Define probability.

Ans The probability of occurrence of an event A is defined as,
P(A)= number of possible favourable outcomes / Total number of equal likely outcomes

Q-148 What are mutually exclusive events?

Ans Two possible outcomes of an experiment are defined as being mutually exclusive if the occurrence of one outcome precludes the occurrence of the other.

Q-149 Define probability density function.

Ans Probability density function is defined as fx(x) is defined in terms of cumulative distribution function Fx (x) as
fx(x) = d Fx(x)/dx

Q-150 Define noise.

Ans Noise is defined as any unwanted form of energy, which tends to interfere with proper reception and reproduction of wanted signal.

Q-151 Give the classification of noise.

Ans Noise is broadly classified into two types. They are External noise and internal noise.

Q-152 What are the types of External noise?

Ans External noise can be classified into

1. Atmospheric noise
2. Extra-terrestrial noises
3. Man –made noises or industrial noises

Q-153 What are types of internal noise?

Ans Internal noise can be classified into

1. Thermal noise
2. Shot noise
3. Transit time noise
1. Miscellaneous internal noise

Q-154 What are the types of extra-terrestrial noise and write their origin?

Ans The two type of extra-terrestrial noise are solar noise and cosmic noise
Solar noise is the electrical noise emanating from the sun.
Cosmic noise is the noise received from the centre part of our galaxy, other distant galaxies and other virtual point sources.

Q-155 Define transit time of a transistor.

Ans Transit time is defined as the time taken by the electron to travel from emitter to the collector.

Q-156 Define flicker noise.

Ans Flicker noise is the one appearing in transistors operating at low audio frequencies. Flicker noise is proportional to the emitter current and junction temperature and inversely proportional to the frequency.

Q-157 State the reasons for higher noise in mixers.

Ans

1. Conversion Trans conductance of mixers is much lower than the Trans conductance of amplifiers.
2. If image frequency rejection is inadequate, the noise associated with the image frequency also gets accepted.

Q-158 **Define signal to noise ratio.**

Ans Signal to noise ratio is the ratio of signal power to the noise power at the same point in a system.

Q-159 **Define noise figure.**

Ans Nose figure F = (S/ N at the input) / (S/ N at the output)
S/N = Signal power / Noise Power

Q-160 **Explain thermal noise.**

Ans Thermal noise is the name given to the electrical noise arising from the random motion of electrons in a conductor.

Q-161 **Give the expression for noise voltage in a resistor.**

Ans The mean –square value of thermal noise voltage is given by
$V^2n = 4 K T B R$
K – Boltz man constant
R – resistance
T – obsolete temperature
B – Bandwidth

Q-162 **Explain White Noise.**

Ans Many types of noise sources are Gaussian and have flat spectral density over a wide frequency range. Such spectrum has all frequency components in equal portion, and is therefore called white noise. The power spectral density of white noise is independent of the operating frequency.

Q-163 **What is narrowband noise?**

Ans The receiver of a communication system usually includes some provision for pre-processing the received signal. The pre-processing may take the form of a narrowband filter whose bandwidth is large enough to pass modulated component of the received signal essentially undistorted but not so large as to admit excessive noise through the receiver. The noise process appearing at the output of such filter is called narrow band noise.

Q-164 **Give the expression for equivalent noise temperature in terms of hypothetical temperature.**

Ans The expression for equivalent noise temperature in terms of hypothetical temperature is

$$Te = (F- 1) T_0$$

Where, F is the noise figure and T_0 absolute temperature.

Q-165 **Give the Friss formula in terms of noise temperature.**

Ans The Friss formula in terms of noise temperature is
Te = T1 + T2 / G1 + T3 / G1 G2 + ……
G1 , G2 ,… Gain of amplifiers

Q-166 **What is called image frequency?**

Ans Image frequency is defined as the signal frequency plus twice the intermediate frequency. This has the effect of two stations being received simultaneously and hence it is undesirable.
fsi = fs + 2 fi
fsi - image frequency
It can be eliminated by providing adequate image signal selectivity between antenna and mixer input.

Q-167 **What is intermediate frequency?**

Ans Intermediate frequency (IF) is defined as the difference between the signal frequency and the oscillator frequency.
IF = fs – fo when fs > fo (or)

IF = fo –fs when fo > fs

Q-168 **Define Partition noise.**

Ans In an electron tube having one or more positive grids, this noise is caused by irratic partition of the cathode current among the positive electrodes. In a transistor, the partition noise is created from the random fluctuation in the division of current between the collector and base.

Q-169 **Give the expression for noise voltage when several sources are cascaded.**

Ans Enr = Sqrt (4 KTB (R1 + R2 + …))

Where R1 , R2… are the resistances of the noise resistors.

K – Boltz man constant

T – absolute temperature

B – Bandwidth

Q-170 **Define random variable**

Ans Random variable is defined as a rule or mapping from the original sample space to a numerical sample space subjected to certain constraints. Random variable is also defined as a function where domain is the set of outcomes es and whose range is R, is the real line.

Q-171 **Define Random process.**

Ans A Random process X (s,t) is a function that maps each element of a samples space into a time function called sample function. Random process is a collection of time functions.

Q-172 **Give the Laws of probability.**

Ans Additive law of probability

Case i

When events are mutually exclusive $(A \cap B) = \Phi$

$P(A \cup B) = P(A) + P(B)$

Case ii

When events are not mutually exclusive

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Multiplication law of probability

Case i When events are independent

$P(A \cap B) = P(A)\, P(B)$ Case ii When events are dependent

$P(A \cap B) = P(A)\, P(B/A)$

$= P(B)\, P(A/B)$

Q-173 **What is frequency translation?**

Ans Suppose that a signal is band limited to the frequency range extending from a frequency f1 to a frequency f2. The process of frequency translation is one in which the original signal is replaced with a new signal whose spectral range extends from f1’ to f2’ and which new signal bears, in recoverable form the same information as was borne by the original signal.

Q-174 **What are two situations identified in frequency translations?**

Ans The two situations identified in frequency translation are

i Up conversion

In this case the translated carrier frequency is greater than the incoming carrier frequency

ii Down conversion

In this case the translated carrier frequency is smaller than the incoming carrier frequency. Thus, a narrowband FM signal requires essentially the same transmission bandwidth as the AM signal.

Q-175 **Define Tracking.**

Ans Tracking is the process of correctly tuning a number of tunable circuits in a receiver.

Q-176 **What is TRF receiver?**

Ans Tuned Radio Frequency is also called straight receiver. Here the receiver operates in straight forward manner without frequency conversion.

Q-177 **What are the advantages of superheterodyne receiver over TRF?**

Ans The advantages of superheterodyne receiver over TRF are high selectivity, improved sensitivity throughout the carrier frequency band. It eliminates image frequency.

Q-178 **What is the figure of merit of DSBSC system?**

Ans The figure of merit of DSBSC signal is unity

Q-179 **Compare the noise performance of an AM and FM system?**

Ans The figure of merit of AM system is 1/3 when the modulation is 100 percent and that of FM is$(3/2)mf^2$ .The use of FM offers improved noise performance over AM when $(3/2)mf^2 > 1/3.mf$ –modulation index in FM.

Q-180 **What is Capture effect?**

Ans When the interference signal and FM input are of equal strength, the receiver fluctuates back and forth between them .This phenomenon is known as the capture effect.

Q-181 **What is threshold effect?**

Ans As the input noise power is increased the carrier to noise ratio is decreased the receiver breaks and as the carrier to noise ratio is reduced further crackling sound is heard and the output SNR cannot be predicted by the equation. This phenomenon is known as threshold effect.

Q-182 **How is threshold reduction achieved in FM system?**

Ans Threshold reduction is achieved in FM system by using an FM demodulator with negative feedback or by using a phase locked loop demodulator.

Q-183 **What is Pre-emphasis?**

Ans The premodulation filtering in the transistor, to raise the power spectral density of the base band signal in its upper-frequency range is called pre emphasis (or pre distortion).
Pre emphasis is particularly effective in FM systems which are used for transmission of audio signals.

Q-184 **Define de-emphasis.**

Ans The filtering at the receiver to undo the signal pre-emphasis and to suppress noise is called de-emphasis.

Q-185 **Define Sampling theorem.**

Ans A band limited signal of finite energy, which has no frequency components higher than fm Hertz may be completely recovered from a knowledge of its samples taken at the rate of 2fm samples per second.

Q-186 **What do you infer from the receiver output of a coherent detector?**

Ans The output equation y(t)=1/2Cacm(t) +1/2nI(t) indicates that the message signal and in-phase noise component of the filtered noise appear additively at the receiver output. The quadrature component of the narrow band noise is completely rejected by the coherent detector.

Q-187 **When is the figure of merit of SSBSC system 1?**

Ans For the same average transmitted signal power and the same average noise power in the message bandwidth, an SSB receiver will have exactly the same output signal to noise ratio as a DSB-SC receiver when both receivers use coherent detection for the recovery of the message signal.

Q-188 **Compare the noise performance of AM receiver with that of DSB-SC receiver.**

Ans The figure of merit of DSB-SC or SSB-SC receiver using coherent detection is always unity, the figure of merit of AM receiver using envelope detection is always less than unity. Therefore noise performance of AM receiver is always inferior to that of DSBSC

due to the wastage of power for transmitting the carrier.

Q-189 What is the figure of merit of a AM system with 100 percent modulation?

Ans The figure of merit of a AM system with 100 percent modulation is 1/3.This means that other factors being equal an AM system must transmit three times as much average power as a suppressed system in order to achieve the same quality of noise performance.

Q-190 What are the characteristics of a receiver?

Ans The characteristics of a receiver are sensitivity, selectivity, fidelity, signal to noise ratio.

Q-191 Why is equivalent noise temperature used for noise measurement?

Ans For low noise devices the noise figure is close to unity, which makes the comparison difficult and hence it is preferable to use equivalent noise temperature.

Q-192 What is the function of amplitude limiter in FM system?

Ans The function of amplitude limiter in FM system is used to remove the amplitude variations by clipping the modulated wave at the filter output almost to the zero axis .The resultant wave is rounded off by another BPF that is an integral part of the limiter thereby suppressing the harmonics of the carrier frequency.

Q-193 What are components in a frequency discriminator?

Ans Frequency discriminator has got two components .Slope detector or differentiator with a purely imaginary frequency response that varies linearly with frequency. It produces output where the amplitude and frequency vary with the message signal. An envelope detector that recover the amplitude variations and produces message signal.

Q-194 What is a post detection filter?

Ans The post detection filter named as "base-band low pass filter" has a bandwidth that is just large enough to accommodate the highest frequency component of the message signal.

Q-195 Define lossless channel.

Ans The channel described by a channel matrix with only one nonzero element in each column is called a lossless channel. In the lossless channel no sources information is lost in transmission.

Q-196 Define Deterministic channel

Ans A channel described by a channel matrix with only one nonzero element in each row is called a deterministic channel and this element must be unity.

Q-197 Define noiseless channel.

Ans A channel is called noiseless if it is both lossless and deterministic. The channel matrix has only one element in each row and in each column and this element is unity. The input and output alphabets are of the same size.

Q-198 Explain Shannon-Fano coding.

Ans An efficient code can be obtained by the following simple procedure, known as Shannon-Fano algorithm.

1. List the source symbols in order of decreasing probability.
2. Partition the set into two sets that are as close to equiprobable as possible, and sign 0 to the upper set and 1 to the lower set.
3. Continue this process, each time partitioning the sets with as nearly equal probabilities as possible until further partitioning is not possible.

Q-199 What are the types of Correlation?

Ans The types of Correlation are Cross Correlation and Auto Correlation

Q-200 What is the difference between Correlation and Convolution?

Ans

1. In Correlation physical time 't' is dummy variable and it disappears after solution of an integral. But in convolution 'i' is a dummy variable.
2. Convolution is a function of delay parameter 't' but convolution is a function of '

t'.

3. Convolution is commutative but correlation is non-com mutative.

Q-201 Define Signal.

Ans A signal is defined as any physical quantity carrying information that varies with time. The value of signal may be real or complex. The types of signal are continuous signal and discrete time signal.

Q-202 Define entropy.

Ans Entropy is the measure of the average information content per second. It is given by the expression

$H(X)= \sum I\ P(xi)\log 2P(xi)$ bits/sample.

Q-203 Define mutual information.

Ans Mutual information I(X,Y) of a channel is defined by
I(X,Y)=H(X)-H(X/Y) bits/symbol
H(X)- entropy of the source
H(X/Y)- conditional entropy of Y.

Q-204 State the properties of mutual information.

Ans

1. I(X,Y)=I(Y,X)
2. I(X,Y)>=0
3. I(X,Y)=H(Y)-H(Y/X)
4. I(X,Y)=H(X)+H(Y)-H(X,Y).

Q-205 Give the relation between the different entropies.

Ans H(X,Y)=H(X)+H(Y/X) =H(Y)+H(X/Y)
H(X)- entropy of the source (Y/X),H(X/Y)-conditional entropy
H(Y)-entropy of destination
H(X,Y)- Joint entropy of the source and destination

Q-206 Define information rate.

Ans If the time rate at which source X emits symbols is r symbols per second. The information rate R of the source is given by
R=r H(X) bits/second
H(X)- entropy of the source

Q-207 What is data compaction?

Ans For efficient signal transmission the redundant information must be removed from the signal prior to transmission .This information with no loss of information is ordinarily performed on a signal in digital form and is referred to as data compaction or lossless data compression.

Q-208 State the property of entropy.

Ans 1.0 Less than H(X) less than $\log_2 K$, is the radix of the alphabet X of the source.

Q-209 What is differential entropy?

Ans The average amount of information per sample value of x(t) is measured by
$H(X) = -\int fx(x)\log fx(x)dx$ bit/sample
H(X) –differential entropy of X.

Q-210 What is the channel capacity of a discrete signal?

Ans The channel capacity of a discrete signal C= max I(X,Y) P(xi)
I(X,Y)-mutual information.

Q-211 What is source coding and entropy coding?

Ans A conversion of the output of a DMS into a sequence of binary symbols is called source coding. The design of a variable length code such that its average cod word length approaches the entropy of the DMS is often referred to as entropy coding.

Q-212 **State Shannon Hartley theorem.**

Ans The capacity 'C' of an additive Gaussian noise channel is C=B log2 (1+S/N) B= channel bandwidth, S/N=signal to noise ratio.

Q-213 **What is the entropy of a binary memory-less source?**

Ans The entropy of a binary memory-less source
H(X)=-p0 log2p0-(1-p0)log2(1-p0)
p0-probability of symbol '0',
p1=(1- p0) =probability of transmitting symbol '1'

Q-214 **How is the efficiency of the coding technique measured?**

Ans Efficiency of the code =H(X)/L
L= ∑p(xi)li average code word length .li=length of the code word.

Q-215 **What happens when the number of coding alphabet increases?**

Ans When the number of coding alphabet increases the efficiency of the coding technique decreases.

Q-216 **What is channel diagram and channel matrix?**

Ans The transition probability diagram of the channel is called the channel diagram and its matrix representation is called the channel matrix.

Q-217 **What is information theory?**

Ans Information theory deals with the mathematical modelling and analysis of a communication system rather than with physical sources and physical channels

Q-218 **What is the channel capacity of a BSC and BEC?**

Ans For BSC the channel capacity C=1+plog2 p + (1-p) log2 (1-p).
For BEC the channel capacity C=(1-p)