Electronics & Communication

1. The 'doping' concentration in the base region of a BJT is:

A) Much higher than the emitter and collector.

B) The same as the emitter.

C) Much lower than the emitter and collector.

D) The same as the collector.

Answer: C) Much lower than the emitter and collector.

Explanation: The base is made very thin and is lightly doped to minimize the recombination of charge carriers, allowing most of them to pass from the emitter to the collector.

2. A Schottky diode is a type of diode that has a:

A) p-n junction.

B) metal-semiconductor junction.

C) p-i-n junction.

D) Zener junction.

Answer: B) metal-semiconductor junction.

Explanation: Schottky diodes have a very low forward voltage drop and a very fast switching speed because they are majority carrier devices and have minimal charge storage.

3. The 'form factor' of a waveform is the ratio of its:

A) RMS value to its average value.

B) Peak value to its RMS value.

C) Average value to its RMS value.

D) RMS value to its peak value.

Answer: A) RMS value to its average value.

Explanation: Form factor is a measure of the shape of a waveform. For a sine wave, the form factor is approximately 1.11.

4. The electric field lines and equipotential lines are always:

A) Parallel to each other.

B) At a 45-degree angle to each other.

C) Perpendicular to each other.

D) In the same direction.

Answer: C) Perpendicular to each other.

Explanation: An equipotential line connects points of the same electric potential. No work is done moving a charge along such a line, which means the force (and thus the electric field) must be perpendicular to the direction of motion.

5. A Pirani gauge is an instrument used to measure:

A) High pressure.

B) Low pressure (vacuum).

C) Fluid flow rate.

D) Temperature.

Answer: B) Low pressure (vacuum).

Explanation: A Pirani gauge measures pressure by relating it to the thermal conductivity of the surrounding gas. The rate at which a heated filament loses heat depends on the pressure of the gas.

6. The DIAC is a semiconductor device that is primarily used to:

A) Amplify signals.

B) Regulate voltage.

C) Trigger a TRIAC.

D) Generate light.

Answer: C) Trigger a TRIAC.

Explanation: A DIAC is a bidirectional trigger diode. It remains in a non-conducting state until the voltage across it reaches a specific breakover voltage, at which point it conducts and provides a sharp pulse of current, perfect for triggering the gate of a TRIAC in AC phase control circuits.

7. In a Class A amplifier, the transistor conducts for:

A) The full 360 degrees of the input cycle.

B) 180 degrees of the input cycle.

C) Less than 180 degrees of the input cycle.

D) Exactly 90 degrees of the input cycle.

Answer: A) The full 360 degrees of the input cycle.

Explanation: The Q-point (operating point) of a Class A amplifier is biased in the center of the load line, ensuring the transistor is always on and amplifying the entire input signal. This provides the best linearity but the lowest efficiency.

8. The process of converting a digital signal to an analog signal is done by a:

A) DAC (Digital-to-Analog Converter).

B) ADC (Analog-to-Digital Converter).

C) Modem.

D) Comparator.

Answer: A) DAC (Digital-to-Analog Converter).

Explanation: A DAC takes a digital code as input and produces a corresponding discrete analog voltage or current level at its output.

9. In a control system, 'settling time' is the time it takes for the response to:

A) Reach its peak value.

B) Reach its final steady-state value.

C) Rise from 10% to 90% of its final value.

D) Remain within a certain percentage (e.g., 2% or 5%) of its final value.

Answer: D) Remain within a certain percentage (e.g., 2% or 5%) of its final value.

Explanation: Settling time is a measure of how long it takes for the transient oscillations of a system's response to die down and settle near the final value.

10. In Amplitude Modulation (AM), the 'modulation index' describes the:

A) Ratio of the carrier frequency to the modulating frequency.

B) Ratio of the modulating signal amplitude to the carrier signal amplitude.

C) Total bandwidth of the modulated signal.

D) Power of the sidebands.

Answer: B) The ratio of the modulating signal amplitude to the carrier signal amplitude.

Explanation: The modulation index (m) determines the extent of amplitude variation. For AM, it should be kept less than or equal to 1 to avoid distortion (overmodulation).

11. The 'capture effect' is a phenomenon associated with which type of modulation?

A) AM.

B) FM.

C) PCM.

D) SSB.

Answer: B) FM.

Explanation: The capture effect is the tendency for an FM receiver to lock onto the stronger of two signals on the same frequency and suppress the weaker one. This is a key advantage of FM in rejecting interference.

12. A waveguide acts as a:

A) Low-pass filter.

B) High-pass filter.

C) Band-pass filter.

D) Band-stop filter.

Answer: B) High-pass filter.

Explanation: A waveguide will only propagate electromagnetic waves above a certain frequency, known as the 'cutoff frequency'. Frequencies below this are attenuated and do not travel down the guide.

13. In satellite communication, the 'downlink' refers to the communication path from the:

A) Satellite to the ground station.

B) Ground station to the satellite.

C) Satellite to another satellite.

D) Ground station to another ground station.

Answer: A) Satellite to the ground station.

Explanation: The 'uplink' is the transmission from the ground to the satellite, while the 'downlink' is the transmission from the satellite back down to Earth.

14. In the 8085 microprocessor, the 'ALE' (Address Latch Enable) signal is used to:

A) Reset the processor.

B) Indicate an I/O operation.

C) Demultiplex the address and data bus.

D) Acknowledge an interrupt.

Answer: C) Demultiplex the address and data bus.

Explanation: The 8085 uses a multiplexed bus (AD0-AD7) that carries both the lower 8 bits of the address and the 8 bits of data. The ALE signal is used to latch the address into an external register at the beginning of a machine cycle, freeing the bus to carry data later.

15. A 'linear' system is one that obeys the principles of:

A) Causality and stability.

B) Homogeneity and superposition.

C) Time-invariance and memory.

D) Latching and triggering.

Answer: B) Homogeneity and superposition.

Explanation: Homogeneity (scaling) means that if the input is scaled, the output is scaled by the same amount. Superposition means that the response to a sum of inputs is the sum of the responses to each individual input.

16. A 'choke' is a common name for a component used to block high frequencies while passing low frequencies. This component is an:

A) Inductor.

B) Capacitor.

C) Resistor.

D) Transformer.

Answer: A) Inductor.

Explanation: An inductor's impedance ($X_L = 2\pi fL$) increases with frequency. Therefore, it presents a high impedance to high-frequency signals, effectively 'choking' them off, while offering low impedance to DC and low-frequency AC.

17. In a full-wave rectifier circuit, the fundamental frequency of the ripple voltage is:

A) The same as the input AC frequency.

B) Half the input AC frequency.

C) Twice the input AC frequency.

D) Four times the input AC frequency.

Answer: C) Twice the input AC frequency.

Explanation: A full-wave rectifier inverts the negative half-cycles of the AC input, resulting in two output pulses for every one input cycle. Therefore, the ripple frequency is doubled.

18. 'Millman's theorem' is used to find the:

A) Equivalent resistance in a series-parallel circuit.

B) Common voltage across a number of parallel branches.

C) Total power dissipated in a circuit.

D) Thevenin equivalent of a circuit.

Answer: B) The common voltage across a number of parallel branches.

Explanation: Millman's theorem provides a convenient formula for calculating the voltage at a common node when several branches, each containing a voltage source and a series impedance, are connected in parallel.

19. 'Polarization' of an electromagnetic wave describes the:

A) Direction of the magnetic field vector.

B) Orientation of the electric field vector's oscillation over time.

C) Speed of the wave in a medium.

D) Power density of the wave.

Answer: B) The orientation of the electric field vector's oscillation over time.

Explanation: An EM wave can be linearly polarized (E-field oscillates along a straight line), circularly polarized (E-field vector rotates in a circle), or elliptically polarized.

20. A 'bolometer' is an instrument used for detecting and measuring:

A) Sound intensity.

B) Magnetic flux.

C) Radiant energy, especially infrared radiation.

D) Atmospheric pressure.

Answer: C) Radiant energy, especially infrared radiation.

Explanation: A bolometer works by absorbing incident radiation, which causes its temperature to rise. This temperature change results in a measurable change in its electrical resistance.

21. In an 'uninterruptible power supply' (UPS), the component that converts the battery's DC power to AC power for the load is the:

A) Rectifier.

B) Inverter.

C) Chopper.

D) Cycloconverter.

Answer: B) Inverter.

Explanation: The rectifier charges the battery from the AC mains, and the inverter takes over during a power failure, converting the DC voltage from the battery back into a stable AC voltage to power the connected equipment.

22. In an op-amp circuit, 'virtual ground' means that the:

A) Output terminal is grounded.

B) Inverting input terminal is at approximately ground potential.

C) Power supply is at ground potential.

D) Non-inverting input is grounded.

Answer: B) The inverting input terminal is at approximately ground potential.

Explanation: Due to the op-amp's extremely high open-loop gain, when used in a negative feedback configuration (like an inverting amplifier with the non-inverting input grounded), the op-amp will do whatever it can to make the voltage difference between its inputs zero. This forces the inverting input to the same potential as the non-inverting input, which is ground.

23. Which of the following is an example of a sequential logic circuit?

A) Multiplexer.

B) Decoder.

C) Counter.

D) Full Adder.

Answer: C) Counter.

Explanation: A sequential circuit's output depends not only on the present inputs but also on the past sequence of inputs, meaning it has memory. Counters and flip-flops are sequential circuits. Multiplexers, decoders, and adders are combinational circuits.

24. A 'root locus' plot shows how the _____ of a closed-loop system change as a parameter (usually gain) is varied.

A) Poles.

B) Zeros.

C) Frequency response.

D) Bandwidth.

Answer: A) Poles.

Explanation: The root locus is a graphical method for analyzing the stability and transient response of a control system. The location of the closed-loop poles determines the system's behavior, and the plot traces their movement from the open-loop poles to the open-loop zeros as the system gain increases from 0 to infinity.

25. The digital modulation scheme where the frequency of the carrier is shifted to represent binary data is:

A) ASK (Amplitude Shift Keying).

B) PSK (Phase Shift Keying).

C) FSK (Frequency Shift Keying).

D) QAM (Quadrature Amplitude Modulation).

Answer: C) FSK (Frequency Shift Keying).

Explanation: In its simplest form, FSK uses two different frequencies to represent a binary 1 (mark frequency) and a binary 0 (space frequency).

26. The 'double-sideband suppressed carrier' (DSB-SC) modulation scheme is more efficient than standard AM because:

A) It uses a lower carrier frequency.

B) It has a smaller bandwidth.

C) It transmits no power in the carrier.

D) It is a digital technique.

Answer: C) It transmits no power in the carrier.

Explanation: In standard AM, the carrier contains no information and consumes the majority of the transmitted power. By suppressing the carrier, DSB-SC saves significant power, although it requires a more complex receiver to demodulate.

27. A 'duplexer' is a device that allows:

A) A single antenna to be used for both transmitting and receiving simultaneously.

B) Two signals to be combined into one channel.

C) A signal to be split into two paths.

D) The amplification of both transmitted and received signals.

Answer: A) A single antenna to be used for both transmitting and receiving simultaneously.

Explanation: A duplexer is a three-port device, typically a set of filters, that isolates the high-power transmitter from the sensitive receiver, preventing the transmitter from damaging the receiver while they share an antenna, as in a cellular phone or radar system.

28. The 'Clarke orbit' is another name for which type of satellite orbit?

A) Low Earth Orbit (LEO).

B) Polar Orbit.

C) Geostationary Orbit (GEO).

D) Molniya Orbit.

Answer: C) Geostationary Orbit (GEO).

Explanation: The concept of a geostationary communications satellite was first proposed by the science fiction writer Arthur C. Clarke, and so the orbit is sometimes named after him.

29. A 'machine cycle' in a microprocessor is the time required to:

A) Execute one instruction.

B) Perform a single memory or I/O access.

C) Complete one clock period.

D) Reset the entire system.

Answer: B) Perform a single memory or I/O access.

Explanation: An instruction cycle (the time to execute one instruction) is made up of one or more machine cycles. A machine cycle, in turn, is made up of several clock periods (T-states).

30. The 'Parseval's theorem' for signals relates the:

A) Energy of a signal in the time domain to its energy in the frequency domain.

B) Time duration of a signal to its bandwidth.

C) Average value of a signal to its RMS value.

D) Convolution of two signals to the multiplication of their spectra.

Answer: A) The energy of a signal in the time domain to its energy in the frequency domain.

Explanation: Parseval's theorem is a statement of the conservation of energy. It states that the total energy calculated by integrating the squared magnitude of the signal in the time domain is equal to the total energy calculated by integrating the squared magnitude of its Fourier transform (spectrum) in the frequency domain.

31. A 'light-dependent resistor' (LDR) is a component whose resistance:

A) Increases with light intensity.

B) Decreases with light intensity.

C) Is independent of light.

D) Changes with applied voltage.

Answer: B) Decreases with light intensity.

Explanation: An LDR, or photoresistor, is made of a high-resistance semiconductor. When light photons fall on it, they excite electrons into the conduction band, increasing the number of free charge carriers and thus decreasing its resistance.

32. The 'base' region of a BJT is made very thin to:

A) Reduce the collector current.

B) Increase the emitter current.

C) Allow most charge carriers from the emitter to pass through to the collector.

D) Increase the input impedance.

Answer: C) Allow most charge carriers from theemitter to pass through to the collector.

Explanation: Making the base thin reduces the chance that minority carriers injected from the emitter will recombine with majority carriers in the base. This ensures a high transport factor and thus a high current gain (beta).

33. A 'bilateral' network element is one whose:

A) V-I characteristics are the same for current flowing in either direction.

B) V-I characteristics are different for current flowing in either direction.

C) Characteristics change with time.

D) Characteristics are independent of temperature.

Answer: A) V-I characteristics are the same for current flowing in either direction.

Explanation: Resistors, capacitors, and inductors are bilateral elements. Diodes and transistors are unilateral because their behavior is highly dependent on the direction of current flow and voltage polarity.

34. A 'cavity resonator' in microwave engineering is analogous to a:

A) Series RLC circuit at low frequencies.

B) Parallel LC tank circuit at low frequencies.

C) Low-pass RC filter.

D) High-pass RL filter.

Answer: B) Parallel LC tank circuit at low frequencies.

Explanation: A cavity resonator is a hollow, conductive box that can store electromagnetic energy. It resonates at specific frequencies, behaving like a very high-Q parallel resonant circuit, making it useful for filtering and in oscillator circuits.

35. The 'settling time' of a DAC is the time it takes for the:

A) Output to change from one level to another.

B) Digital input to be accepted.

C) Output to settle within a specified error band of its final value.

D) Power supply to stabilize.

Answer: C) The output to settle within a specified error band of its final value.

Explanation: After a digital input changes, the analog output may overshoot and ring before settling to its final, stable value. The settling time is a key measure of a DAC's speed.

36. An IGBT (Insulated-Gate Bipolar Transistor) combines the key advantages of which two devices?

A) SCR and TRIAC.

B) BJT and MOSFET.

C) JFET and Diode.

D) Zener Diode and LED.

Answer: B) BJT and MOSFET.

Explanation: An IGBT has the high input impedance and voltage-controlled nature of a MOSFET (easy to drive) combined with the high current handling and low saturation voltage capability of a BJT (efficient power switching).

37. A 'current mirror' circuit is used to:

A) Reverse the direction of current flow.

B) Produce a constant output voltage.

C) Produce an output current that is a copy of an input current.

D) Measure the current in a circuit.

Answer: C) Produce an output current that is a copy of an input current.

Explanation: Current mirrors are widely used in integrated circuits to bias amplifiers and to act as active loads, providing a stable and controllable current source.

38. The 'fan-out' of a logic gate is the:

A) Number of inputs it can accept.

B) Maximum number of standard logic gate inputs it can reliably drive.

C) Propagation delay of the gate.

D) Power consumed by the gate.

Answer: B) The maximum number of standard logic gate inputs it can reliably drive.

Explanation: Each gate input requires a certain amount of current. Fan-out is limited by the driving gate's ability to source or sink the total current required by the connected inputs while maintaining correct logic voltage levels.

39. The state-space representation is a method used to model:

A) Digital logic circuits.

B) High-frequency amplifiers.

C) Dynamic systems, often in control theory.

D) Communication channels.

Answer: C) Dynamic systems, often in control theory.

Explanation: State-space representation uses a set of first-order differential equations (the state equations) to describe a system's internal dynamics. It is a powerful technique, especially for analyzing multi-input, multi-output (MIMO) systems.

40. 'Tropospheric scatter' is a method of communication that relies on:

A) Bouncing signals off the ionosphere.

B) Signals being scattered by irregularities in the troposphere.

C) Line-of-sight transmission.

D) Communication via satellite.

Answer: B) Signals being scattered by irregularities in the troposphere.

Explanation: This technique allows for beyond-the-horizon communication at UHF and microwave frequencies. A powerful beam is aimed at the troposphere, and a small fraction of the signal is scattered forward to a sensitive receiver.

41. In a color television receiver, the 'chrominance' signal carries the:

A) Brightness information.

B) Sound information.

C) Color information (hue and saturation).

D) Synchronization information.

Answer: C) The color information (hue and saturation).

Explanation: A color TV signal is composite, consisting of the luminance signal (Y) for brightness, and the chrominance signal (C) for color. This ensured backward compatibility with black-and-white TVs, which just used the Y signal.

42. A 'balun' is a type of transformer used to:

A) Increase voltage.

B) Decrease current.

C) Connect a balanced transmission line to an unbalanced load.

D) Filter out unwanted frequencies.

Answer: C) Connect a balanced transmission line to an unbalanced load.

Explanation: Balun stands for BALanced to UNbalanced. It is used, for example, to connect a balanced antenna (like a dipole) to an unbalanced transmission line (like a coaxial cable).

43. In a GPS receiver, a minimum of how many satellites must be in view to get a 3D position fix (latitude, longitude, and altitude)?

A) 2.

B) 3.

C) 4.

D) 5.

Answer: C) 4.

Explanation: Three satellites are needed to triangulate a position on the Earth's surface. A fourth satellite is required to solve for the clock error in the receiver, which is necessary for an accurate position and altitude calculation.

44. A 'vectored interrupt' is an interrupt that:

A) Cannot be disabled by software.

B) Is generated by a software instruction.

C) Provides the address of its own service routine to the processor.

D) Has the lowest priority.

Answer: C) The provides the address of its own service routine to the processor.

Explanation: With a vectored interrupt, the interrupting device itself tells the CPU where to find the appropriate interrupt service routine (ISR). This is faster than a non-vectored system where the CPU has to poll all devices to find out which one generated the interrupt.

45. The 'Gibbs phenomenon' in Fourier analysis refers to the:

A) Over-shooting and ringing that occurs near a discontinuity when a signal is reconstructed.

B) The relationship between the time and frequency domains.

C) The aliasing effect during sampling.

D) The orthogonality of sine and cosine functions.

Answer: A) The over-shooting and ringing that occurs near a discontinuity when a signal is reconstructed.

Explanation: When using a finite number of sinusoids to approximate a signal with a jump discontinuity (like a square wave), the approximation will always have a small overshoot at the edge that doesn't disappear, even as more harmonics are added.

46. 'Magnetostriction' is the property of some ferromagnetic materials to:

A) Change their electrical resistance in a magnetic field.

B) Generate a voltage when stressed.

C) Change their physical shape when subjected to a magnetic field.

D) Retain their magnetism after the field is removed.

Answer: C) The change their physical shape when subjected to a magnetic field.

Explanation: This effect is used in applications like ultrasonic transducers and actuators. The inverse effect, where a change in shape produces a change in magnetization, also occurs.

47. The 'pinch-off' voltage in a JFET is the voltage at which the:

A) Drain current becomes zero.

B) Transistor is destroyed.

C) Gate-source junction breaks down.

D) Drain current becomes nearly constant as VDS increases.

Answer: D) The drain current becomes nearly constant as VDS increases.

Explanation: At pinch-off, the two depletion regions in the channel nearly touch, and the channel is "pinched off." Further increases in the drain-source voltage (VDS) do not cause a significant increase in drain current (ID), and the JFET enters the saturation region, acting as a constant current source.

48. A 'series-pass regulator' is a type of:

A) Linear voltage regulator.

B) Switching voltage regulator.

C) Shunt voltage regulator.

D) Current regulator.

Answer: A) A linear voltage regulator.

Explanation: This is a common and simple regulator design where a control element, such as a BJT or MOSFET, is placed in series with the load. The control element acts as a variable resistor, dropping the excess voltage to maintain a constant output voltage.

49. The 'Smith chart' is a graphical tool used in RF engineering primarily for:

A) Analyzing stability in control systems.

B) Simplifying Boolean algebra.

C) Solving transmission line and impedance matching problems.

D) Designing digital filters.

Answer: C) The solving transmission line and impedance matching problems.

Explanation: The Smith chart is a polar plot that maps the entire right-half of the complex impedance plane into a circle. It allows for rapid graphical calculation of parameters like SWR, reflection coefficient, and the effects of adding matching components.

50. A 'transducer' is a device that:

A) Amplifies electronic signals.

B) Converts energy from one form to another.

C) Regulates voltage.

D) Stores electrical charge.

Answer: B) The converts energy from one form to another.

Explanation: Transducers are at the heart of all measurement and instrumentation systems. Examples include a microphone (sound to electrical), a loudspeaker (electrical to sound), and a thermocouple (heat to electrical).

51. An 'opto-triac' (or phototriac) is used to:

A) Provide an optically isolated way to trigger a high-power TRIAC.

B) Generate laser light.

C) Measure the power of an optical signal.

D) Act as a very fast optical switch.

Answer: A) The provide an optically isolated way to trigger a high-power TRIAC.

Explanation: It combines an LED and a light-activated TRIAC in one package. A low-voltage control signal can turn on the LED, which in turn triggers the internal phototriac. This provides a safe, isolated interface between a low-power control circuit (like a microcontroller) and a high-power AC load.

52. The 'dynamic range' of a system, such as an amplifier or receiver, is the ratio of the:

A) Bandwidth to the center frequency.

B) Maximum possible output to the minimum possible output.

C) Maximum undistorted signal level to the minimum detectable signal level (noise floor).

D) Input impedance to the output impedance.

Answer: C) The maximum undistorted signal level to the minimum detectable signal level (noise floor).

Explanation: Dynamic range, usually expressed in dB, defines the range of signal amplitudes that a system can process effectively, from the quietest to the loudest, without significant distortion or being lost in noise.

53. In digital logic, a 'don't care' condition means that:

A) The input condition will never occur.

B) The output can be either high or low for a given input, as it is not critical.

C) The logic gate is not functioning.

D) The input is floating.

Answer: B) The output can be either high or low for a given input, as it is not critical.

Explanation: "Don't care" conditions arise from input combinations that are either invalid or whose output state doesn't matter. They can be very useful in logic simplification, as they can be assigned a value of either 0 or 1 to create larger groupings in a K-map, leading to a simpler final circuit.

54. The 'damping ratio' (zeta, ζ) in a second-order control system determines the:

A) Final steady-state value of the response.

B) Speed of the response.

C) Nature of the transient response (e.g., underdamped, overdamped).

D) Frequency of oscillation.

Answer: C) The nature of the transient response (e.g., underdamped, overdamped).

Explanation: A damping ratio of $\zeta < 1$ results in an underdamped (oscillatory) response. $\zeta = 1$ is critically damped (fastest response without overshoot). $\zeta > 1$ is overdamped (slow and sluggish response).

55. The 'Code Division Multiple Access' (CDMA) technique allows multiple users to share a channel by:

A) Assigning them different time slots.

B) Assigning them different frequency bands.

C) Assigning them unique spreading codes.

D) Assigning them different polarization.

Answer: C) The assigning them unique spreading codes.

Explanation: In CDMA, each user's signal is multiplied by a unique pseudo-random code that spreads it over a wide bandwidth. The receiver uses the same code to despread and recover the intended signal, while all other users' signals appear as noise and are rejected.

56. The 'beat frequency oscillator' (BFO) in a receiver is required to demodulate which type of signal?

A) FM.

B) AM (standard).

C) CW (Morse code) and SSB.

D) PCM.

Answer: C) The CW (Morse code) and SSB.

Explanation: Continuous Wave (CW) and Single-Sideband (SSB) signals have their carriers suppressed. The BFO provides a locally generated carrier in the receiver that is mixed with the incoming signal to produce an audible tone (for CW) or to restore the suppressed carrier and make the voice intelligible (for SSB).

57. A 'patch antenna' is a type of antenna that is:

A) Very large and used for low frequencies.

B) Made from a long wire.

C) Low-profile and can be mounted on a flat surface.

D) Omnidirectional.

Answer: C) The low-profile and can be mounted on a flat surface.

Explanation: Microstrip patch antennas consist of a metallic patch on a dielectric substrate backed by a ground plane. They are lightweight, inexpensive to manufacture, and can be easily integrated into devices like mobile phones, GPS receivers, and Wi-Fi routers.

58. The 'ionosphere' is a layer of the Earth's atmosphere that is important for radio communication because it can:

A) Absorb all radio waves.

B) Refract high-frequency (HF) radio waves, enabling long-distance communication.

C) Scatter microwave signals.

D) Block signals from satellites.

Answer: B) The refract high-frequency (HF) radio waves, enabling long-distance communication.

Explanation: The ionosphere, ionized by solar radiation, acts like a mirror for radio waves in the HF band (roughly 3-30 MHz), allowing signals to be bounced around the curve of the Earth for intercontinental "skywave" communication.

59. A 'flag register' in a microprocessor contains:

A) The main data being processed.

B) The memory address of the next instruction.

C) Status bits that indicate the result of arithmetic and logic operations.

D) The address of the top of the stack.

Answer: C) The status bits that indicate the result of arithmetic and logic operations.

Explanation: The flag register contains individual bits that are set or cleared based on the outcome of the last ALU operation. These flags include the Zero flag, Carry flag, Sign flag, Parity flag, etc., and are used for conditional branching in programs.

60. 'Aliasing' in a sampled data system occurs when the:

A) Sampling rate is too high.

B) Signal contains no high frequencies.

C) Sampling rate is less than twice the highest frequency in the signal.

D) Quantization is too coarse.

Answer: C) The sampling rate is less than twice the highest frequency in the signal.

Explanation: When the sampling rate is too low (violating the Nyquist theorem), high-frequency components in the original signal "fold down" and masquerade as lower frequencies in the sampled data, causing irreversible distortion.