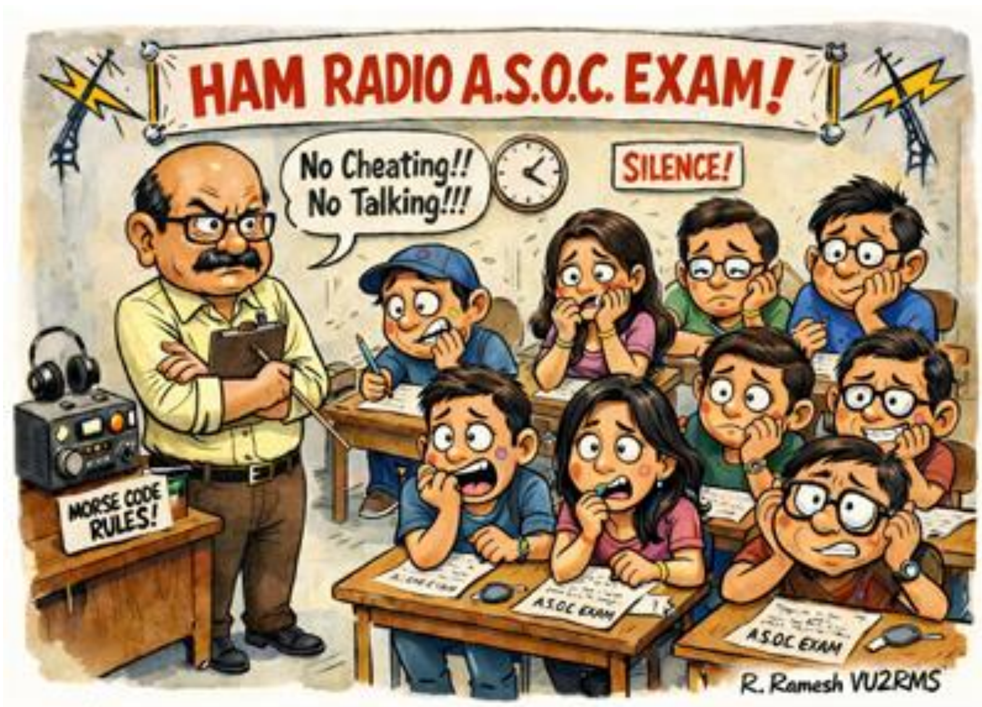
Suggested answers for the randomly chosen Multiple-choice questions for the ASOC exams (Section A - Electronics).

Model online exams in my web site

www.rajana.in/jxm/index.html



don't worry, exam would be easy·····(T&C)*

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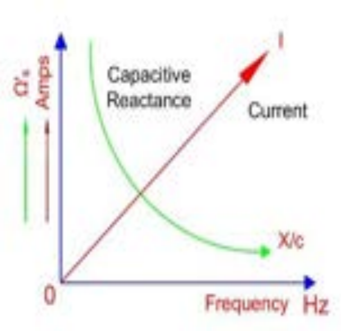
Rajan VU2JXM

Suggested answers for the randomly chosen Multiple-choice questions for the ASOC exams (electronics section).

The detailed answers are given, and the questions should be read with multiple choices for easy understanding. Refer (www.rajana.in/jxm/index.html) model questions.

1. The reactance of a capacitor increases when the frequency is

The reactance of a capacitor ,increases when the frequency is **decreased**. Because capacitive reactance is inversely proportional to frequency, lower frequencies result in higher opposition (reactance) to the current flow, while higher frequencies reduce the reactance.



Inverse Relationship: As frequency goes down, reactance goes up.

2. **One kilowatt hour of electrical energy is the same as**

A kilowatt (kW) is a unit of power equal to exactly **1,000 watts** (W). It measures the rate at which electricity is used or produced. One kilowatt is equivalent to approximately 1.34 horsepower.

If a 1 kW device runs for 1 hour, it consumes 1 kilowatt-hour (kWh) of energy.

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3. Which type of filter allows a band of frequencies to pass?

A **band-pass filter** (BPF) is the type of filter that allows a specific range, or band, of frequencies to pass through while attenuating (blocking) frequencies outside of this range. It is widely used in radio communications, signal processing, and audio applications to select a desired signal frequency.

Comparison to Other Filters:

- **Low-pass filter:** Allows only frequencies *below* a certain cutoff to pass.
- **High-pass filter:** Allows only frequencies *above* a certain cutoff to pass.
- **Band-stop (Notch) filter:** Blocks a specific band of frequencies, passing those outside that range.

4. One coulomb passing a point in one second is one..... Ampere.

A current of **1** A is flowing in a circuit if a charge of **1 coulomb passes** any **point** in the circuit every **second.**

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5. The side band system adopted for television transmission is

The sideband system adopted for television transmission is **Vestigial Sideband Modulation (VSB)**. This technique acts as a compromise between Single Sideband (SSB) and Double Sideband (DSB) modulation, allowing for efficient spectrum usage by transmitting one full sideband and only a portion (vestige) of the other, which is essential for preserving low-frequency video information while reducing bandwidth.

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6. The measure of how difficult it is for electrons to flow in an object is called the _____resistance.

Resistance is the opposition to the flow of electric current (electrons) in a material. It is measured in **ohms**

Materials with low resistance are called **conductors** (e.g., copper), while those with high resistance are **insulators** (e.g., rubber).

It is calculated using Ohm's Law: (Resistance = Voltage / Current). R=V/I

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7. If you increase the voltage across a resistor what happens to the current....

Increasing the voltage across a resistor causes the electric current to **increase proportionally**, assuming the resistance remains constant. According to Ohm's Law, voltage and current have a direct relationship, meaning higher voltage pushes more charge through the resistor per unit of time.

- **Direct Relationship:** If you double the voltage, the current doubles.

Limitation: If the voltage is increased too high, excessive heat may damage the resistor or change its resistance value.

For example, in a 10 ohm resistor, a 5V supply produces 0.5A (5/10). Increasing the voltage to 10V

increases the current to 1A (10/10)

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8. What is the unit of electric charge?

The SI unit of electric charge is the **coulomb (C)**, defined as the amount of charge transported by a 1-ampere current in 1 second ($1C = 1A \times 1s$). It represents approximately 6.242×10^{18}electrons or protons.

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9. If the current in a circuit equals 0 A , then it is likely that the ……

If the current in a circuit equals 0A,then, it is likely that the **circuit is open**. An open circuit means there is a break in the path (such as a disconnected wire, a blown fuse, or an open switch), preventing current from flowing. It could also indicate an extremely high resistance or no voltage source.

- **Key Reasons:**
    - **Open Circuit:** The path for current is broken.
    - **Infinite Resistance:** An open circuit acts as an insulator.
    - **No Voltage:** A lack of potential difference (V=0) means no current can flow.

In contrast, a closed circuit allows current to flow, while a **short circuit** typically leads to high current, not zero current.

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10. Which component is used to smooth rectifier output?

A **capacitor** (often called a filter capacitor or smoothing capacitor) is the primary component used to smooth the pulsating DC output of a rectifier. Connected in parallel with the load, it charges at voltage peaks and discharges during dips, reducing ripple. Inductors or combinations (LC/Pi filters) can also be used.

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11. what is the side band system adopted for television transmission?

The sideband system adopted for television transmission (both analog and many digital systems) is the **Vestigial Sideband (VSB) modulation** system. VSB transmits one full sideband and a small vestige (part) of the other, balancing bandwidth efficiency with simple demodulation. It reduces the transmission bandwidth from 9 MHz (for standard AM) to 6 MHz.

Why VSB: Video signals have a large bandwidth and significant low-frequency content. VSB reduces the bandwidth required while allowing for simple, cheap envelope detection at the receiver.

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12. When the turns ratio of a transformer is 20 and the primary ac voltage is 12 V then secondary voltage is equal to

When the turns ratio of a transformer is **20** and the primary AC voltage is **12 V**, the secondary voltage is **240 V**

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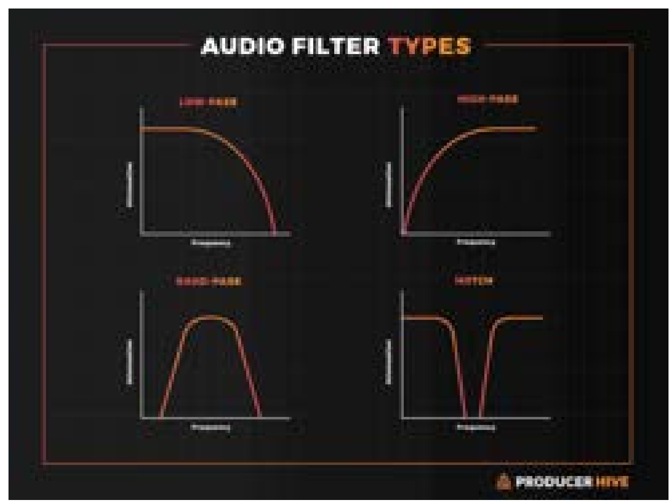
13. Which type of filter allows a band of frequencies to pass?

A **band-pass filter** is an electronic circuit or device that allows signals within a specific, designated range of frequencies to pass through while attenuating (blocking) frequencies outside of this band. It operates between a lower cutoff frequency (fl) and an upper cutoff frequency (fh)).

Key Details About Band-Pass Filters:



- **Function:** It combines the properties of both low-pass and high-pass filters to isolate a particular frequency range.
- **Types:** They can be **passive** (using resistors, capacitors, and inductors) or **active** (using amplifiers/op-amps).
- **Applications:** Commonly used in wireless transmitters and receivers to select specific frequencies, as well as in audio engineering.
- **Distinction:** Unlike a **band-stop filter** (which rejects a specific range), a band-pass filter permits only that specific range.

---

14. Receiver sensitivity governed by…… (RF)

Receiver sensitivity is fundamentally governed by the ability of a system to distinguish a weak, desired signal from the background noise floor. It is primarily determined by the **noise floor** (generated by temperature, bandwidth, and internal electronics) and the **minimum required Signal-to-Noise Ratio (SNR)** for reliable detection.

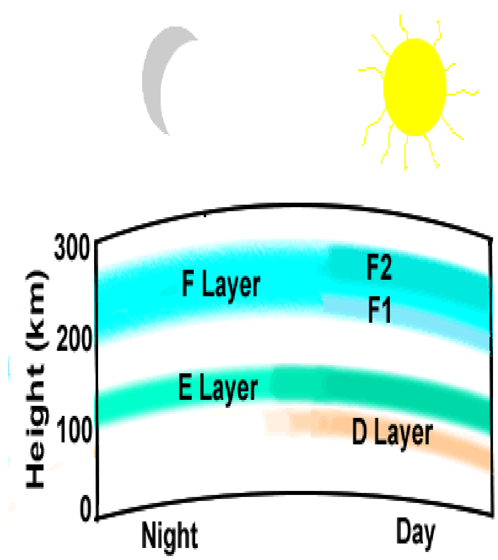
15. BJT microwave limitation depends on what?

Fundamental Physical Limitations

- **Base Transit Time (tb) :** The time required for charge carriers to travel across the base region is the main limit on the cutoff frequency (fT). A thinner base reduces this time, increasing the maximum operating frequency.
- **Carrier Velocity Limitations:** The maximum speed at which electrons can travel (saturation drift velocity) dictates the speed of the device.
- **Avalanche Breakdown:** The maximum electric field (Em) the material can handle before breakdown sets a constraint on the maximum voltage (Vm)) and consequently the power-frequency product.

16. **The main HF Day reflection layer is**

The main High Frequency (HF) daytime reflection layer is the **F layer**, specifically the **F2 layer**. During the day, the ionosphere becomes highly ionized, causing the F region to split into the **F1** and **F2** layers.



Key Daytime Characteristics:

- **Best Reflection:** F2 layer is the primary reflector, providing the highest usable frequencies.
- **Absorption:** The D layer absorbs signals below 8 MHz, which often limits low-frequency, long-distance communication during the day.
- **Higher Frequencies:** Higher HF frequencies (10–20 MHz or more) are preferred during the day because they can penetrate the D and E layers to reach the F2 layer.

17. The measure of how difficult it is for electrons to flow in an object is called the ____

The measure of how difficult it is for electrons to flow in an object is called the **resistance**.

- **Definition:** Electrical resistance is the opposition or hindrance to the flow of electric charge (current) through a material.
- **Unit:** It is measured in **ohms**.
- **Key Factors:** Resistance depends on the material's nature, its length, its cross-sectional area (thickness), and temperature.

Materials with high resistance, like rubber, prevent current from flowing, while materials with low resistance, like copper, allow electrons to move easily.

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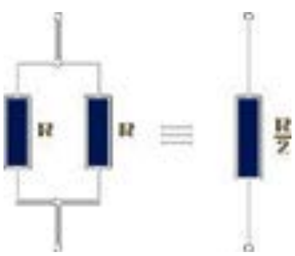
18. What is the total resistance of four 1 k parallel-connected resistors?

The total resistance of four **1 kΩ** resistors connected in parallel is 250**Ω (or 0.25 kΩ).**

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \; .... + \frac{1}{R_n} \text{ etc}$$

Here, the reciprocal (1/R) value of the individual resistances are all added together instead of the resistances themselves with the inverse of the algebraic sum giving the equivalent resistance as shown.



If the two resistances or impedances in parallel are equal and of the same value, then the total or equivalent resistance, R_T is equal to half the value of one resistor. That is equal to R/2 and for three equal resistors in parallel, R/3, etc.

19. The AGC circuit is to

The Automatic Gain Control (AGC) circuit is designed to automatically adjust an amplifier's gain, maintaining a constant, stable output signal amplitude despite wide variations in input signal strength.

Constant Output Level: Maintains a consistent, stable output signal level (e.g., volume or signal amplitude) regardless of the input signal strength.

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20. Modulation frequency relation is

Modulation frequency features capture low-frequency modulation information in audio signals. A modulated signal contains at least two frequencies: a high carrier frequency and a comparatively low modulation frequency.

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21. If a small value of capacitance is connected in parallel with a large value the combined capacitance will be

When a small value of capacitance is connected in parallel with a large value, the combined capacitance will be slightly higher than the large capacitance value alone.

The total capacitance (C total) is the sum of the individual capacitances (C1+C2+etc)), effectively increasing the total charge storage capacity and surface area.

Formula: C total = Clarge + Csmall

Result: The total capacitance is always greater than the largest individual capacitor.

Example: A capacitor 100mf in parallel with a capacitor1mf results in 101mf

---

22. The BFO in a superhet receiver operates on a frequency nearest to that of its

The BFO (Beat Frequency Oscillator) in a superheterodyne receiver operates on a frequency nearest to that of its **Intermediate Frequency (IF).**

- **Why:** In superheterodyne receivers, the incoming radio signal is converted to a fixed intermediate frequency (commonly 455 kHz in AM radios or around 1.7 MHz in communication receivers).
- **Purpose:** The BFO introduces a signal near the IF to allow for the demodulation of CW (Morse code) or SSB (Single Sideband) signals, which do not have a carrier in the same way standard AM signals do.
- **Mechanism:** The BFO mixes with the IF signal to create a beat frequency (difference) that is within the audio range, making the transmission audible.

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23. Is UHF signals often more effective from inside buildings than VHF signals?

Yes, UHF (Ultra High Frequency) signals are generally more effective than VHF (Very High Frequency) inside buildings. Due to their shorter wavelengths, UHF signals better penetrate construction materials like concrete, brick, and steel, and they navigate around obstacles, making them ideal for indoor, urban, or industrial environments.

Key Reasons UHF Excels Indoors:

- **Better Penetration:** Shorter UHF waves pass through smaller gaps in building structures compared to longer VHF waves.
- **Reduced Obstruction Interference:** UHF is less affected by steel, concrete, and heavy machinery, making them ideal for manufacturing sites, warehouses, and high-rise buildings.
- **Superior Reflection:** Inside complex, reflective environments (like ships or large buildings), UHF signals use reflection to their advantage to maintain connectivity.

VHF vs. UHF Comparison

- **UHF (450–512 MHz):** Superior for indoor/urban settings, shorter range.
- **VHF (30–300 MHz):** Superior for outdoor, long-range, or open spaces, but struggles to penetrate buildings.

For most indoor, multi-level, or congested urban applications, UHF is the superior choice for reliable communication.

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24. Common Emitter amplifier output phase is

The output of a common emitter (CE) amplifier is **180° out of phase** with the input signal. This means the amplifier acts as an inverter; when the input voltage increases, the output voltage decreases, and vice versa

Key Details:

- **Phase Shift:** 180 degrees (pi radians).
- **Inversion:** The signal is inverted, meaning the positive half-cycle of the input becomes a negative half-cycle at the output.
- **Configuration:** The input is applied to the base, while the output is taken from the collector.

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25. What causes tropospheric ducting?

Tropospheric ducting is caused by atmospheric temperature inversions—where a layer of warm air sits over cool air—which acts as a waveguide, trapping and bending radio waves (VHF/UHF) back toward the Earth. This phenomenon usually occurs under stable, high-pressure weather systems, often at night or over water.

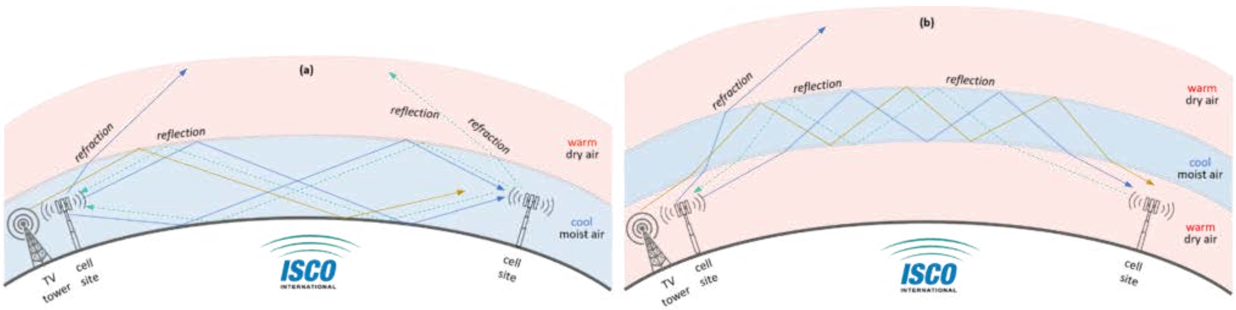

Figure: (a) Duct formed by cool air below warm air. (b) Duct formed by cool air trapped between two layers of warm air.

- **Temperature Inversions:** Instead of the normal cooling with height, warmer air traps cooler, denser air near the surface.
- **Weather Conditions:** Often caused by high-pressure systems, nocturnal cooling, or warm air moving over a cooler surface.
- **Impact:** These atmospheric ducts can cause radio, TV, and cellular signals to travel hundreds of miles beyond their normal range.

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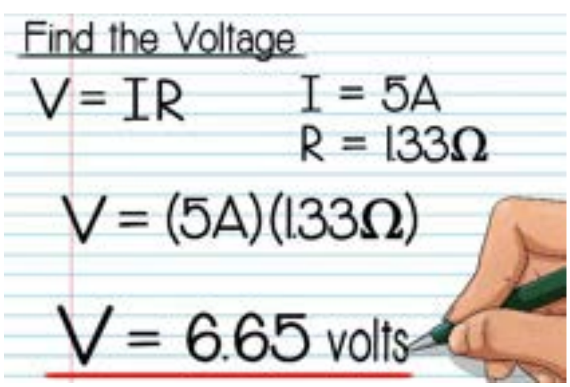
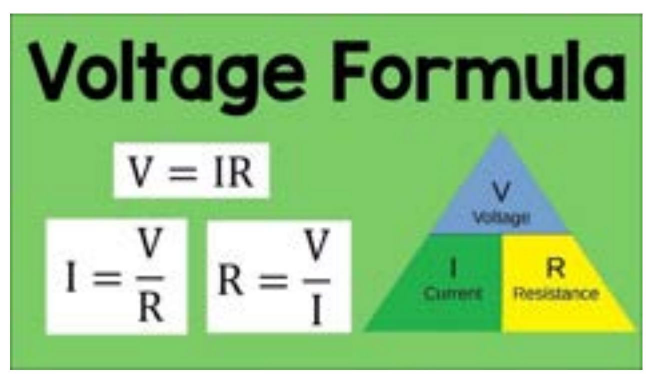
26. **What formula is used to calculate voltage in a circuit?**





The primary formula to calculate voltage (V) in a circuit is Ohm's Law: V=I x R. , where I is current in amperes and R is resistance in ohms.

Here are the key formulas based on known values:

- **Ohm's Law (V=I x R):** Used when current (I) and resistance (R) are known.
- **Power Formula (V= P / I) :** Used when power (P) and current (I) are known.

27. What is the total resistance of four 1 k parallel-connected resistors?

The problem provides the resistance of each individual resistor (R) and the number of resistors (n) connected in parallel:

For parallel circuits where all resistors have the same resistance, the total (equivalent) resistance

can be calculated using the simplified formula: Rtotal = R/n

substituting the values 1000ohms / 4 = 250ohms

28. Which of the following types of emission has the narrowest bandwidth?

10m , 1m, 0.1m, 1cm

The correct option is ✅ **10m**.

In the context of standard amateur radio emission classifications, **10m** (HF band) typically utilizes **Single Sideband (SSB)** or **CW (Morse Code)**, which have significantly narrower bandwidths compared to the wideband signals used in higher frequency microwave or millimeter-wave bands like **1cm**.

❌ **1m** (VHF range) and **0.1m** (UHF/Microwave range) are often used for Wide-FM (Frequency Modulation) or digital television, which require bandwidths of **10–15 kHz** or several **MHz**, respectively.

❌ **1cm** (Millimetre-wave range) is used for extremely high-frequency transmissions where bandwidths can span hundreds of **MHz** or even **GHz** to facilitate high-speed data transfer (like 5G/6G or satellite links).

29. If you increase the voltage across a resistor what happens to the current

In a receiver which stage rectifies the IF signal?

1. **If you increase the voltage across a resistor, the current will increase.**
   According to Ohm's Law (I= V/R), assuming the resistance (R) remains constant, the current (I) is directly proportional to the voltage (V). If you double the voltage, you will double the current.
2. **In a receiver, the Detector (or Demodulator) stage rectifies the IF signal.**
   The detector, often using a crystal diode, extracts the original modulation (audio or

data) from the amplified Intermediate Frequency (IF) signal by removing the unwanted carrier wave.

Summary Table

- **Voltage Increase:** Current increases (I is directly proportional to V).
- **IF Rectification Stage:** Detector / Demodulator

30. How much power is being applied in a circuit when the applied voltage is 13.8 volts DC and current is 10A

To find the power in a DC circuit, you must identify the applied voltage and the current flowing through the circuit. Based on the query:

- Voltage (V) = 13.8V
- Current (I) = 10A

Apply the DC power formula P = V x I = 13.8 x 10 = 138W

Answer: The power being applied in the circuit is 138 Watts.

31. Why is electrical energy usually transmitted at high voltage?

To minimize the power loss due to the resistance, the power transmission is node at higher voltage values so that the current is small and hence the power loss is small, owing to the resistance in the wire.

32. What is the resistance of a circuit that draws 4A from a 12-volt source?

Ohms Law: V = I x R or R = V/I where Voltage = 12V and Current (I) 4ohms

Apply the formula R = V/I 12/4 = 3 ohms

33. When a portable radio is playing the current in the radio is 0.3 A. If the resistance of the radio is 30.0 Ohm what is the voltage supplied by the radio battery?

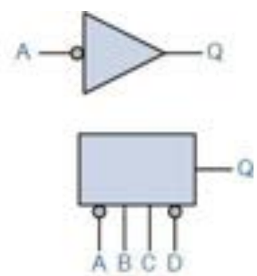
To find the voltage, we use **Ohm's Law**, which defines the relationship between voltage (V), current (I), and resistance (R). The formula is: V = I*R

From the problem, we have the following values: Current (I) =0.3A and Resistance (R) = 30ohms

Then, V = 0.3 x 30 = 9

The voltage supplied by the radio battery is 9Volts

34. Which logic gate inverts the input?



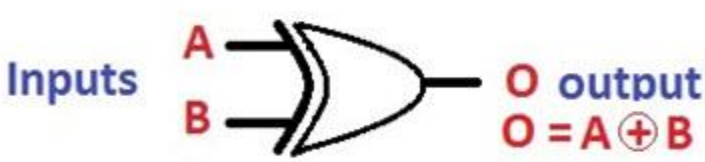
The NOT gate, commonly known as an inverter, is the logic gate that inverts the input. It takes a single input and produces the opposite logical state: a high input (1) results in a low output (0), and a low input (0) results in a high output (1)

Key Details about the NOT Gate:

- **Function:** Performs logical negation, transforming a bit to its opposite.
- **Symbol:** A triangle with a small bubble (inversion bubble) on the output side.
- **Inputs/Outputs:** It is a single-input, single-output gate.
- **Alternative Implementation:** While dedicated NOT gates exist, an inverter can be created by connecting all inputs of a NAND or NOR gate together.
- **Application:** Used extensively in digital circuits to reverse signals, manage data flow, and form more complex logic operations.

  Other gates, such as **NAND** and **NOR**, also involve inversion, but they are technically inverted AND/OR gates, not basic input-inverters.

35. Which logic gate outputs true when any input is true?



Symbol

Inputs		Output
A	B	O
0	0	0
0	1	1
1	0	1
1	1	0

Truth table

The **OR gate** outputs true (1) if at least one or all of its inputs are true (1). It is a fundamental logic gate where the output is only false (0) if all inputs are false.

Key Details regarding the OR Gate:

- **Behavior:** The output is "high" (true) if any input is "high".
- **Formula:** Y = A+B (for a 2-input gate).
- **Truth Table: see above**

While the XOR (Exclusive OR) gate also outputs true, it only does so if the number of true inputs is odd (specifically, if *only* one input is true, but not both). The standard OR gate is the one that triggers on *any* true input, including both.

36. Which logic gate outputs true only when both inputs are true?

The **AND gate** is the logic gate that outputs true (1) only when both of its inputs are true (1). If any input is false (0), the output is false. It functions like a serial circuit where both switches must be closed for the device to operate.

2 - input AND gate

A	B	Output
0	0	0
0	1	0
1	0	0
1	1	1

Key Details about the AND Gate

Logical Operation: Performs logical multiplication (Y = AxB)

Alternative Definition: If all inputs are "high" (1), the output is "high"

While other gates like the XNOR gate output 1 when inputs are the same, the AND gate is specifically defined by requiring both inputs to be high to produce a true output.

37. Kirchoff's current law is applicable only to Junction in a network

Gustav Kirchhoff's Current Law is one of the fundamental laws used for circuit analysis. His current law states that for a parallel path **the total current entering a circuits junction is exactly equal to the total current leaving the same junction.** This is because it has no other place to go as no charge is lost.

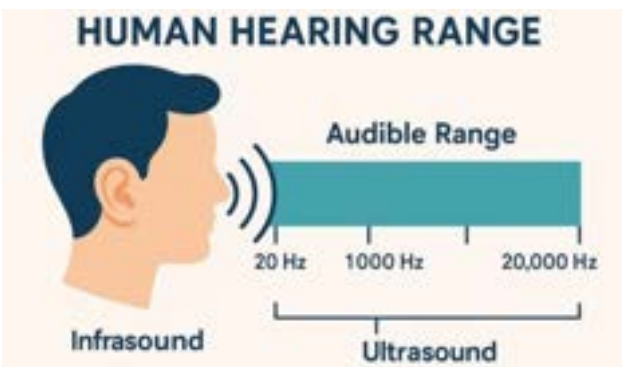
38. What are the effects of moving a closed wire loop through a magnetic field?

Moving a closed wire loop through a magnetic field induces an electromotive force (EMF) and a corresponding electric current, provided the magnetic flux through the loop changes. This phenomenon, known as Faraday's law of induction, generates a current that creates its own magnetic field opposing the change in the original field.

Key Effects and Principles:

- **Induced Current/EMF:** As the loop enters or exits the magnetic field (changing the flux), a current flows.
- **No Effect in Uniform Field:** If the entire loop moves within a uniform magnetic field without changing its orientation or area, the magnetic flux remains constant, resulting in zero induced EMF and current.
- **Direction of Current:** The direction of the induced current (determined by the right-hand rule) depends on the direction of motion.
- **Mechanical to Electrical Energy:** This process is the fundamental principle behind electric generators.

39. Which frequency range is audible to humans?



The standard human hearing frequency range is 20 Hz to 20,000 Hz (20 kHz). While this is the theoretical limit, the average adult often only hears up to 15–17 kHz, with high-frequency sensitivity declining with age. The range is most sensitive between 2,000 Hz and 5,000 Hz

Key Details on Human Hearing:

- **Infrasound (<20 Hz):** Sounds too low for humans to hear, though they may be felt as vibrations.
- **Ultrasound (>20,000 Hz):** Sounds too high for humans to hear, used by animals like bats and dolphins.
- **Sensitivity:** Human ears are most sensitive to frequencies in the 2–5 kHz range, which covers most speech...

- **Safe Loudness Level:** The safe hearing range for intensity is up to 85 decibels (dB).
- **Age-Related Decline:** The ability to hear high frequencies often diminishes as part of the normal aging process.

40. **What is the name of a device that combines several semiconductors and other components into one package?**

An Integrated Circuit (IC), commonly known as a chip, is a device that combines several semiconductors (transistors, diodes) and other components (resistors, capacitors) into a single, compact package. These microchips are built on a single piece of substrate—typically silicon—and are used to streamline complex electronics, reducing size and increasing efficiency.

41. Mutual induction is dependent on

Mutual inductance (M)) depends primarily on the geometric configuration and physical properties of the coil system, including the number of turns in each coil (N1,N2), their cross-sectional area, their distance and orientation relative to each other, and the magnetic permeability of the core material. It is independent of the current flowing.

42. **Which of the following circuits combines a speech signal and an RF carrier?**

In radio communications, a **modulator** is the specific circuit responsible for combining an information signal (such as speech or audio) with a high-frequency **RF carrier**. This process, called **modulation**, alters the characteristics of the carrier wave—such as its amplitude, frequency, or phase—to encode the information for wireless transmission.

43. **One kilowatt hour of electrical energy is the same as**

A kilowatt (kW) is a unit of power equal to exactly 1,000 watts (W). It measures the rate at which electricity is used or produced. One kilowatt is equivalent to approximately 1.34horsepower. If a 1 kW device runs for 1 hour, it consumes 1 kilowatt-hour (kWh) of energy.

The energy that derived from the flow of electric charge is called electrical energy.

The SI unit of electrical energy is JOULE

1Kilowatt hour = 36 x 105 joules

44. **Which type of current changes direction periodically?**

An electric current that periodically reverses direction and changes its magnitude continuously with time is called **Alternating Current (AC)**. Unlike direct current (DC), which flows in one direction, AC typically follows a sinusoidal waveform, reversing polarity at regular intervals.

45. **The term used to designate electrical pressure is**

Electric pressure is primarily called **voltage**. It refers to the electrical potential difference or electromotive force (emf) that drives the flow of charge (current) through a circuit, like how water pressure pushes water through a pipe. It is also known as electric tension.

46**. What is an electromagnet?**

An electromagnet is a type of temporary magnet where a magnetic field is produced by the flow of electric current, usually through a coil of wire wrapped around a ferromagnetic core like iron. Unlike permanent magnets, they can be turned on and off, and their strength can be adjusted by changing the current.

47. **The tendency of AC current flowing through a surface of a solid conductor**

The tendency of AC current to flow near the surface of a solid conductor rather than uniformly throughout its cross-section is known as the **skin effect**. It causes higher current density on the outer layer, increases AC resistance, and is more pronounced at higher frequencies or with larger conductor diameters

48. In a receiver which stage rectifies the IF signal?

In a superheterodyne receiver, the stage that rectifies the Intermediate Frequency (IF) signal is the **Detector** (also commonly referred to as the **Demodulator** or the **Second Detector**).

49. Which of the following circuits would require the least amount of filtering?

A **bridge rectifier** (which is a type of full-wave rectifier) requires the least amount of filtering because its output ripple frequency is twice that of a half-wave rectifier.

Why other options are incorrect

- ❌ **half wave rectifier**: This circuit requires the **most** filtering. It only utilizes one half of the AC cycle, leaving large gaps where the output voltage drops to zero. To bridge these long gaps, a much larger filter capacitor is needed to maintain a steady voltage, making it the least efficient in terms of smoothing.
- ❌ **full wave rectifier**: While a center-tapped full-wave rectifier is significantly better than a half-wave rectifier and requires less filtering, a **bridge rectifier** is often cited as the superior choice in practical applications because it achieves the same low ripple while utilizing the transformer more efficiently and providing a higher average output voltage.

50. The voltage where current may start to flow in a reverse-biased pn junction is called the ....

The voltage where current may start to flow in a reverse-biased pn junction is called the **breakdown voltage**. It is the critical voltage at which the electric field causes a sharp increase in reverse current due to avalanche or Zener breakdown.

Key Details:

- **Definition:** The point where a reverse-biased diode moves from a high-resistance, low-current state to a low-resistance, high-current state.
- **Mechanism:** Typically caused by **avalanche breakdown** or **Zener breakdown**, which creates a rapid increase in minority carriers.
- **Consequence:** Exceeding this voltage can lead to device failure, unless the device is designed for it, such as a **Zener diode**.
- **Other names:** Also referred to as peak inverse voltage (PIV) or reverse breakdown voltage.

51. Best VHF antenna? Yagi vs Log periodic

The best VHF antenna depends on your needs: choose a **Yagi-Uda** for high gain, long-distance, single-frequency (e.g., weak FM/DXing) reception, or a **Log-Periodic (LPDA)** for wideband coverage across multiple VHF channels/frequencies (e.g., tv reception) with consistent performance. Yagis offer more gain but are narrower.

For maximum signal strength on a single frequency, choose a **Yagi**. For covering the entire VHF television band (e.g., channels 7-13) with one antenna, choose a **Log-Periodic**.

52. Best VHF antenna? Yagi vs Di pole

The best VHF antenna depends on your needs: **Yagi antennas offer high gain and directionality for long-distance/point-to-point,** while **dipoles** provide simple, omnidirectional, or bidirectional, low-cost coverage.

Yagis (4-8+ dB gain) **excel at reducing noise and boosting signals**, while dipoles are ideal for general-purpose, omnidirectional, or portable use.

53. Typical IF value for AM superheterodyne receivers is

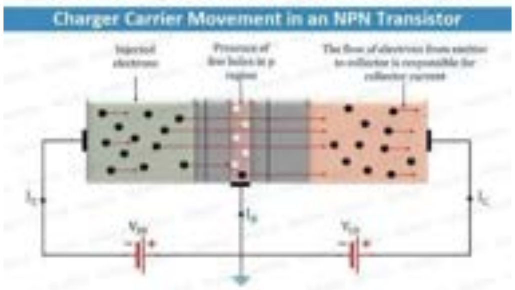
The typical Intermediate Frequency (IF) value for AM superheterodyne receivers is 455 kHz. For FM receivers, the standard IF value is typically 10.7 MHz. These frequencies are commonly used to provide consistent gain and selectivity in radio communications.

Key Details:

- **AM Receiver Standard:** 455 kHz is the most common, though values can range from 430 kHz to 25 MHz.
- **FM Receiver Standard:** 10.7 MHz is the standard IF.
- **Purpose:** The IF allows the receiver to filter and amplify signals at a fixed, lower frequency regardless of the station's frequency.

54. The doping concentrations of Emitter- Base and Collector in a NPN transistor is

In an NPN transistor, the doping concentrations of the emitter, base, and collector are arranged to optimize charge transport. The **emitter is heavily doped** (n++) to inject electrons, the **base is lightly doped** (p+) and very thin to minimize recombination, and the **collector is moderately doped** (n).



The relative doping levels are: **Emitter > Collector > Base**.

- **Emitter (n++):** Heavily doped to provide a large number of majority carriers (electrons) for injection into the base.
- **Base (p+):** Very lightly doped and extremely thin to ensure most injected electrons pass through to the collector without recombining.
- **Collector (n):** Moderately doped, higher than the base but lower than the emitter.
- This structure ensures efficient transistor action, allowing the base current to control a much larger collector-emitter current.

55. The power conversion efficiency of a full wave rectifier is

The maximum theoretical power conversion efficiency (n) of a full-wave rectifier is approximately 81.2% which is double that of a half-wave rectifier. It represents the maximum ratio of DC output power to AC input power, meaning 81.2% of input AC power is converted to DC, with the remainder lost as heat.

Key details regarding efficiency:

- Formula: The efficiency is calculated as n = P dc/ P ac = 8/ pi square = 81.06%.
- Advantage: Due to utilizing both the positive and negative half-cycles of the AC input, it is much more efficient than the 40.6% efficiency of a half-wave rectifier.
- Components: The 81.2% efficiency holds for both center-tapped and bridge-type full-wave rectifiers.
- Filters: To reduce the ripple (AC components) in the output and improve practical efficiency, filters such as capacitors or inductors are often used.

56. what is the circuit that enables the radio receiver output to remain cut off when carrier is absent ?

The circuit that enables a radio receiver to cut off its output (silence the speaker) when a carrier signal is absent is known as a Squelch Circuit.

Key Aspects of the Squelch Circuit:

- Purpose: To eliminate the loud, annoying background noise or "static" heard when a receiver is not tuned to a valid station or during gaps between transmissions.
- Function: It acts as a specialized noise gate or a "controllable receiver input switch" that only allows audio to pass through to the speaker when a sufficiently strong carrier signal is detected.

57. The circuit that reduces ripples from the output of a rectifier is

A filter circuit (or simply a filter), such as a capacitor filter, inductor filter, or RC filter, is used to reduce ripples from the output of a rectifier. These circuits are placed after the rectifier to convert the pulsating DC output into a smoother, more constant DC voltage by shunting AC components to ground or blocking them.

58. The transformers are rated in

Transformers are rated in kilovolt-amperes (kVA) or mega-volt-amperes (MVA). They are rated in apparent power (kVA) rather than real power (kW) because their capacity limits, specifically core and copper losses, depend on voltage and current (total apparent power) and are independent of the load's power factor.

59. Which of these components is made of three layers of semiconductor material?

The correct component is B. Transistor.

A transistor, specifically a Bipolar Junction Transistor (BJT), is constructed using three layers of semiconductor material. These layers are arranged in a "sandwich" configuration, either as NPN (a P-type layer between two N-type layers) or PNP (an N-type layer between two P-type layers).

60. What circuit is used to process signals from the RF amplifier and local oscillator and send the result to the IF filter in a super-heterodyne receiver?

The mixer (or converter) circuit is used to process signals from the RF amplifier and local oscillator, producing an Intermediate Frequency (IF) signal that is then sent to the IF filter. It combines the two input frequencies, typically performing down-conversion to translate the radio signal to a fixed IF, allowing for consistent filtering and amplification.

61. What type of bias is required for an LED to emit light?

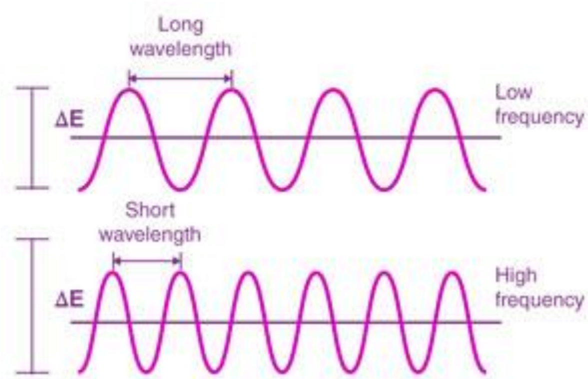
An LED requires forward bias to emit light. In this configuration, the positive terminal (anode) is connected to the p-type material and the negative terminal (cathode) to the n-type material, which lowers the potential barrier, allowing electrons and holes to recombine at the junction and release photons.

62. How fast does a radio wave travel through free space?

Radio waves travel through free space (a vacuum) at the speed of light, which is approximately 300,000,000 metres per second

- As a form of electromagnetic radiation, radio waves move at the universal constant c. The exact and approximate values for this speed is
- Exact Value: 299,792,458 metres per second.
- Metric (Approximate) 3 x 10 to the power of 8 or300,000kilometer per second

63. How does the wavelength relate to frequency?



Wavelength (lambda) and frequency (f) are inversely proportional to each other for a constant wave speed (v), meaning as frequency increases, wavelength decreases, and vice versa.

They are related by the fundamental formula: v = f x lambda. A higher frequency implies shorter, more frequent waves, while lower frequency means longer, less frequent waves.

64. How many milliamperes is 1.5 amperes?

1.5 ampere = 1500 miliapere

65. A coaxial feed-line is constructed from

A coaxial cable consists of a central, solid or stranded, conducting core wire (usually copper) surrounded by an insulating dielectric layer, a metallic shield (outer braid), and an outer protective plastic sheath. These components share a common axis, providing high-frequency signal transmission with minimal interference.

66. Which of the following does not change in a transformer? Current, voltage, frequency.

In an ordinary transformer, the **frequency** of the electrical signal remains constant as it is transferred from the primary winding to the secondary winding. The transformer operates on the principle of electromagnetic induction; the alternating magnetic flux generated in the core oscillates at the exact same rate as the input supply, thus inducing an output voltage with an identical frequency.

Why other options are incorrect

- ❌ **Current**: The current changes inversely with the voltage. For example, in a step-up transformer, while the voltage increases, the current decreases to maintain the power balance.
- ❌ **Voltage**: The primary purpose of a transformer is to change the voltage level. A **step-up** transformer increases voltage, while a **step-down** transformer decreases it, based on the ratio of wire turns between the coils.

67. Why is a transformer core laminated?

The core of a transformer is laminated—composed of thin, insulated steel sheets rather than a solid block—to significantly reduce energy losses caused by **eddy currents**. These induced, circular currents generate heat and waste power, but laminations disrupt their path, limiting their magnitude and increasing efficiency.

68. What are the effects of moving a closed wire loop through a magnetic field?

Moving a closed wire loop through a magnetic field induces an electromotive force (EMF) and a corresponding electric current, a phenomenon known as electromagnetic induction. This occurs due to a change in magnetic flux through the loop, creating a Lorentz force on charges that can create resistance to motion.

- Induced Current and EMF: An emf is induced in the loop when the magnetic flux through it changes, such as when entering, leaving, or rotating within a magnetic field.
- Energy Conversion: Kinetic energy used to move the loop is converted into electrical energy
- Lenz's Law Effects: The induced current generates its own magnetic field that opposes the change in the external magnetic flux. This often manifests as a magnetic force acting against the direction of motion.
- Directional Dependence: Reversing the direction of motion or reversing the magnetic field direction reverses the polarity of the induced EMF and the direction of the current**.**

69. What is the Skip distance

The skip distance is the distance over the Earth's surface between the point where a radio signal is transmitted, and the point where it is received having travelled to the ionosphere, and been refracted back by the ionosphere.

The signals leave the antenna and travel away from it, eventually reaching the ionosphere. Normally they will leave the earth at an angle called the angle of radiation. Whether it is low, i.e. almost parallel to the Earth, or high, i.e. at a high angle upwards, they will reach the ionosphere at some point.

70. What is the circuit that enables the radio receiver output to remain cut off when carrier is absent?

The circuit that enables a radio receiver's output to remain cut off (silenced) when a carrier signal is absent is called a Squelch Circuit.

Squelch acts as a controllable switch, typically in the audio amplifier stage, that blocks background noise (white noise/static) when no radio frequency (RF) signal is detected.

71. The category of Pulse Modulation that comes under digital system is

Pulse Code Modulation (PCM) is the primary type of pulse modulation that falls under digital systems, as it converts analog signals into a binary sequence of 1s and 0s via sampling, quantization, and encoding. Unlike PAM, PWM, or PPM (which are analog), PCM provides high noise immunity for digital transmission.

Key aspects of PCM include:

- **Digital Representation:** Converts continuous-time, continuous-amplitude signals into discrete-time, discrete-amplitude digital signals.
- **Process:** The signal is sampled, quantized to the nearest value, and then coded.
- **Applications:** Widely used in digital telephony, compact discs, and digital audio
- **Related Techniques:** Differential Pulse Code Modulation (DPCM) and Delta Modulation (DM) are also considered digital pulse modulation methods.

Pulse Amplitude Modulation (PAM) is a technique where message information is encoded in the amplitude of a series of signal pulses, with pulse amplitudes varying proportionally to the instantaneous **amplitude of an analog signal.** Used in both analog and digital communication, it acts as a precursor to PCM and high-speed data transmission like PAM4.

72. What is A1A emission

In A1A emission, the frequency of the carrier is **not** modulated; instead, the **amplitude** of the carrier is keyed on and off, commonly known as Continuous Wave (CW) or Morse code. It represents amplitude-modulated, unmodulated carrier telegraphy.

- A1A Definition: A = Double-sideband amplitude modulation, 1 = Single channel containing quantized or digital information without a modulating subcarrier, A = Telegraphy for aural reception.

73. The elements in the tank circuit of a Colpitts oscillator are

The tank circuit of a Colpitts oscillator consists of **one inductor (L)** in parallel with a pair of **series-connected capacitors (c1 AND c2)**. The junction between the two capacitors is typically grounded or connected to a common emitter/source, providing a voltage divider for feedback.

Key components include:

- **Two Capacitors (C1andC2)** Connected in series to form a capacitive voltage divider.
- **One Inductor (L)** Connected in parallel with the series combination of capacitors.

74. What is the purpose of the dummy load

A dummy load is a device used to simulate an electrical load—typically an antenna in RF systems or a speaker in audio systems—for testing, calibration, and adjustment purposes without causing interference or damage. It converts electrical energy into heat, allowing equipment to be tested at full power without transmitting radio waves or producing sound.

- Protection: Prevents damage to transmitter output circuits by providing a matched load (usually 50 ohms) when no antenna is connected.
- Testing and Tuning: Allows for accurate adjustment, alignment, and power measurement of radio transmitters or audio amplifiers.
- Interference Prevention: Enables troubleshooting without radiating signals that could disrupt other radio users.
- RF/Ham Radio: Used to replace antennas during transmitter testing to avoid QRM (interference).

Typically, a dummy load consists of a non-inductive resistor attached to a heat sink or immersed in oil to manage high power levels.

75. what is the use of S meter in ham radio?

An S-meter (Signal Strength Meter) in ham radio is an analog or digital gauge that measures the relative strength of an incoming radio signal. It is primarily used to provide a, technically based Signal Strength (S) report—ranging from S1 to S9+—to other operators, helping to assess station performance, antenna effectiveness, and propagation.

- **Signal Reporting (RST System):** The "S" in the RST (Readability, Strength, Tone) system is derived from this meter, typically ranging from S1 (barely perceptible) to S9 (extremely strong).
- **Technical Benchmarking:** It serves as a tool to measure how much power is reaching the receiver, with 1 S-unit on HF typically representing a 6 dB change in power.
- **Above S9:** Signals stronger than S9 are reported in decibels, such as "S9+20dB," which means 20 dB stronger than S9.

76. The image frequency of a super heterodyne receiver is...

The image frequency of a superheterodyne receiver is **not rejected by the tuned IF circuits**.

- **The Cause:** The image frequency (f_{img}) is an unwanted signal that, when mixed with the local oscillator (f_{LO}), produces the exact same intermediate frequency (f_{IF}) as the desired signal (f_S). Because it produces the correct , the IF amplifier stage cannot distinguish between the desired signal and the image signal.
- **The Failed Rejection:** Since the image frequency is converted to the same IF as the desired signal, **the tuned IF circuits cannot reject it**.
- **The Solution:** The image frequency must be rejected **before** the mixing stage, typically by the RF amplifier/pre-selector, which is tuned to the desired station.

Therefore, the image frequency is a problem arising because it is **not rejected by the IF tuned circuits.**

77. In a center tap full wave rectifier 100V is the peak voltage between the center tap and one end of the secondary. The maximum voltage across the reverse biased diode is.....

In a center-tap full-wave rectifier, the maximum voltage across the reverse-biased diode (known as the Peak Inverse Voltage or (PIV) is **200 V,** the correct answer based on the peak voltage provided.

- **Circuit Behavior:** In this configuration, the secondary winding is divided into two equal halves by the center tap. When one diode is forward-biased (conducting), the other is reverse-biased (non-conducting).
- **Voltage Summation:** The reverse-biased diode sees the sum of the peak voltage from its own half of the secondary and the peak voltage appearing across the load (which comes from the conducting half). This results in a total reverse voltage of 2Vm

Comparison with Other Values:

141.4V usually represents the peak voltage(Vp) if 100V were the

RMS voltage (100 x √2 =141.4 v), but the question specifies that 100v is already the peak voltage.

220 V is a common RMS line voltage but does not follow from the specific peak input provided in this problem.

78. A BJT is said to be operating in the saturation region if

A BJT (Bipolar Junction Transistor) is said to be operating in the **saturation region** when **both the base-emitter (BE) junction and the base-collector (BC) junction are forward-biased**.

Key Characteristics of Saturation Region:

- **Junction Biasing:**
  - Base-Emitter Junction: **Forward Biased**
  - Base-Collector Junction: **Forward Biased**

79. The polarization of an electrmagnetic wave is defined by the direction of

The polarization of an electromagnetic (EM) wave is defined by the direction of the electric(E) vector.

While an EM wave consists of both oscillating electric (E) and magnetic (H) fields, conventional physics and engineering define the polarization state based on the direction along which the **electric field** oscillates as the wave propagates.

Key Points:

- **Definition:** Polarization represents the orientation of the E-field vector.
- **Transverse Wave:** EM waves are transverse, meaning both E and H oscillate perpendicular to the direction of wave travel.

80. **Two resistors are in parallel Resistor A carries twice the current of Resistor B implies that**

When two resistors are connected in **parallel**, the voltage (V) across them is the same. According to Ohm's Law (I = V/R)), current is inversely proportional to resistance.

Since Resistor A carries more current, it must have less resistance—specifically, half the resistance of B.

Example: If Resistor B is 10Ω and Resistor A is 5Ω (half), and voltage is 10V, then:

- *Current A (10/5 = 2A)*
- *Current B (10/10=1A) : 2A is twice 1A*

81. **The highest frequency that is reflected by an ionosphere layer is**

The maximum (highest) frequency that is reflected by an ionospheric layer—when the wave is directed straight up (vertically)—is called the **Critical Frequency**

- **Definition:** The maximum frequency for which a vertically transmitted wave is reflected back to Earth by an ionospheric layer.
- **Beyond Critical:** Frequencies higher than the critical frequency penetrate the layer and escape into space rather than reflecting back.
- **Context:** For oblique incidence (angled transmission, like in radio communication), the maximum reflected frequency is higher, known as the **Maximum Usable Frequency (MUF)**.
- **Range:** The critical frequency typically ranges from 3 MHz to 10 MHz, but can be higher, especially for the F2 layer.

82. A signal (fm) is amplitude modulated with a carrier (fc) then the frequency of the lower side band is

The frequency of the lower sideband (LSB) in amplitude modulation is (fc-fm) (carrier frequency minus modulation signal frequency).

Detailed Explanation

When a carrier signal (f_c) is **amplitude modulated** (AM) by a baseband signal (message signal, f_m), the resulting modulated wave consists of three main frequency components:

1. **Carrier Frequency (f_c)**
2. **Upper Sideband (USB):** $f_c + f_m$
3. **Lower Sideband (LSB):** $f_c - f_m$

Even if the input signal is labeled "f_m", it is treated as the modulating frequency in the AM process.

- **Result:** $f_c - f_m$

83. The SI unit of resistivity is

The SI unit of resistivity is the **ohm-meter** (denoted as **Ω-m**)

It measures how strongly a material opposes the flow of electric current.

84. The mutual inductance (M) between two coils of self-inductance L1 and L2 is expressed as

The mutual inductance (M) between two coils of self-inductance L1 and L2 is expressed as:

M=K/√L1L2 , where,

M is the Mutual Inductance. L1, L2 are the Self-Inductances of the two coils.

- **General Case: For partial coupling, M is always less than or equal to √ L1L2.**
- **Units: The unit of mutual inductance (M) is the Henry (H).**

85. In a radio receiver the selectivity will be governed by?

In a radio receiver, selectivity is primarily governed by the tuned circuits and filters. In superheterodyne receivers, this is crucially determined by the **Intermediate Frequency (IF) amplifier stage,** which provides the sharp, narrow frequency response needed to select the desired station while rejecting adjacent interfering signals.

These components, which determine the receiver's ability to isolate a desired frequency and reject adjacent ones, are characterized by their Quality Factor (Q) and bandwidth.

- **IF Amplifier Stage: The most significant contribution to selectivity, particularly in superheterodyne receivers, comes from the fixed, high-Q tuned circuits in the IF section.**

86. In a full wave rectifier, the current in each of the diode flows for

In a full-wave rectifier, the current in each of the diodes flows for Half cycle of the input signal.

Here is why:

- Positive Half Cycle: One diode (D1) becomes forward-biased and conducts, while the other (D2) is reverse-biased (OFF).
- Negative Half Cycle: The polarity reverses, allowing the second diode(D2) to become forward-biased and conduct, while the first (D1)) is reverse-biased (OFF).
- Since each diode only conducts during its respective half of the input AC cycle, each diode conducts for **half a cycle** (180° conduction angle).

87. An inductor opposes

An inductor opposes **an increase in current flow** by creating a self-induced magnetic field that generates a back electromotive force (EMF) in the opposite direction, according to Lenz's Law. This "electrical inertia" prevents sudden changes in current, gradually storing energy in the magnetic field rather than allowing an instant spike. Unlike a resistor that limits total current, an inductor specifically opposes the *rate of change* of current.

88. For a signal band limited to W Hz thebandwidth of its SSB modulated signal is

For a signal band-limited to W Hz, the bandwidth of its SSB (Single Sideband) modulated signal is W Hz

- Explanation: In Amplitude Modulation, a signal of bandwidth W produces a Double Sideband (DSB) signal with a bandwidth of 2W. SSB modulation suppresses the carrier and one of the sidebands, transmitting only one sideband. Since the single sideband contains the full information, the resulting transmission bandwidth is equal to the original maximum frequency component, W.
- Formula: BWssb = W
- Example: For a 3 kHz voice signal (0–3 kHz), the SSB bandwidth is 3 kHz.

89. Which block of the super heterodyne receiver is known as “first detector”

The block in a superheterodyne receiver known as the **first detector** is the **mixer** (often paired with the local oscillator).

- **Function:** The mixer stage combines the incoming radio frequency (RF) signal with a signal from the local oscillator to produce a lower intermediate frequency (IF).
- **Reason for Name:** It is called the first detector because it "detects" or creates the difference frequency (IF) from the high RF input.
- **Context:** In older terminology, particularly with vacuum tubes, the mixer tube was explicitly called the first detector. The final demodulator that recovers the audio signal is known as the *second detector*

Note: In modern electronics, the term mixer is more common, but in technical literature, the first detector refers specifically to the converter stage.

90.In a pure capacitor the phase relation between the current and voltage is

In a pure capacitor, the current **leads the voltage** by a phase angle of 90° (or π/2 **radians**).

Here are the key details regarding this phase relationship:

- **Leading/Lagging:** The current (i) reaches its peak value before the voltage (v) reaches its peak.
- **Phase Angle:** $\Delta\Phi = 90° = \pi/2$ **radians**
- **Mnemonic:** Use **ICE** (In a Capacitive circuit, Current leads Electromotive force/voltage).
- As a result, the power factor in a purely capacitive circuit is zero.

91. Ohm's law not applicable to

Ohm's law (V=IR) is primarily not applicable to **non-linear** and **unilateral** electrical components, known as **non-ohmic devices**, where the current is not directly proportional to the voltage.

Here are the main examples where Ohm's law does not apply:

- **Diodes (PN Junction Diodes, Zener Diodes, LEDs):** Current flows only in one direction (unilateral) and is not proportional to the voltage applied.
- **Transistors (BJTs, MOSFETs):** These are active, non-linear components.
- **Thermistor:** Resistance changes significantly with temperature changes.

Gaseous Conductors

- **Gas Discharge Tubes (Neon Lamps):** Ionization of gas creates a non-linear relationship between voltage and current.
- **Electric Arcs:** Often exhibit "negative resistance," where current increases as voltage decreases.

Non-Metallic Conductors

- **Silicon Carbide (SiC):** A solid non-metallic conductor that does not follow a linear V-I relationship.

Non-linear Conductors

- **Electrolytes:** The resistance changes based on chemical changes and polarization.
- **Vacuum Tubes/Valves:** The current through vacuum devices is not proportional to voltage.

92. The break down mechanism in a lightly doped p-n junction under reverse biased condition is called

The breakdown mechanism in a lightly doped p-n junction under reverse biased condition is called **Avalanche breakdown**.

Key Characteristics of Avalanche Breakdown:

- **Light Doping:** Because the junction is lightly doped, the depletion region is wide.
- **High Voltage:** It requires a higher reverse voltage (typically > 6V) to achieve a strong electric field across the wide depletion region.
- **Impact Ionization:** Minority carriers gain enough kinetic energy from the high electric field to collide with lattice atoms, breaking covalent bonds and creating new electron-hole pairs.
- **Carrier Multiplication:** These new carriers also get accelerated, causing more collisions in a chain reaction known as the **avalanche effect**, leading to a sudden, sharp increase in reverse current.

93. When modulation of AM wave is decreased

When the modulation index (m or μ) of an Amplitude Modulated (AM) wave is decreased (i.e., decreased towards zero, known as under-modulation), the primary effect is a **reduction in the power of the sidebands relative to the carrier power, leading to a weaker, quieter received signal**.

94. For a satellite communication the frequency should be

For satellite communication, the signal frequency must be **greater than the ionosphere's critical frequency**, not less. Frequencies above the critical frequency are necessary to penetrate the ionosphere (typically > 30 MHz, often in the GHz range) and reach space, rather than being reflected back to Earth, which is required for effective satellite communication.

- **Critical Frequency Defined:** The highest frequency that can be reflected by the ionosphere for a vertical incidence sky wave.
- **Why Satellite Needs High Frequency:** To bypass the ionosphere without reflection.
- **Ionosphere Interaction:** Frequencies lower than the critical frequency are reflected, restricting them to ground-based skywave (shortwave) communication.
- Therefore, the statement that satellite frequency should be less than the critical frequency must be higher.

95. When a transistor is used as switch its ON/OFF terminals are

When a transistor acts as a switch, its ON/OFF states are controlled by the **base-emitter (B-E) junction voltage**, which regulates current flow between the **collector (C)** and **emitter (E)** terminals. The B-E junction acts as the control input: a forward-biased B-E junction turns the transistor ON (saturation), while zero or reverse bias turns it OFF (cut-off). The switch operates between the cut-off (fully open) and saturation (fully closed) regions, commonly using the common emitter configuration.

96. Higher Q of a series circuit

A higher Quality Factor (Q) in a series RLC circuit indicates a sharper resonance peak, narrower bandwidth and higher selectivity, meaning it acts as a more precise band-pass filter. It signifies low energy dissipation relative to stored energy ($Q = 1/R \sqrt{L/C}$) achieved by minimizing resistance (R) or increasing the (L/C) ratio.

Key Characteristics of Higher Q Series Circuits:

- **Narrower Bandwidth:** The resonance peak is sharper, allowing a very narrow range of frequencies to pass while rejecting others, crucial for radio tuning.
- **Lower Resistance (R):** A higher Q is directly proportional to a lower resistance,
- **Longer Ring-down Time:** The circuit stores energy longer, taking more time to dampen after the source is removed

97. The DC current through each diode in a bridge rectifier equals

The DC current (average current) through each diode in a single-phase full-wave bridge rectifier equals **half the DC load current**

1. **Bridge Operation:** In a bridge rectifier, four diodes are used. In any single half-cycle of the AC input, two diodes are forward-biased (conducting) and two are reverse-biased (blocking).

2. **Current Path:** During the positive half-cycle, current flows through two diodes in series (e.g., D1and D3) to the load. During the negative half-cycle, current flows through the other two diodes (D2 and D4) in series to the load.
3. **Distribution:** Because the load current (I dc)) is supplied by two diodes in series, and each pair conducts for only half the total time, each individual diode conducts the full load current during its turn, but is idle during the other half-cycle.

98. A series of RL filter circuit with an output across the inductor will result in what type of filtering

A series RL filter circuit with the output taken across the inductor acts as a **high-pass filter**. It allows high-frequency signals to pass while attenuating (blocking) low-frequency signals. The inductor's impedance rises with frequency allowing more voltage to drop across it at higher frequencies.

Applications: Often used for blocking lower-frequency interference (like 50/60 Hz hum) or passing AC signals while blocking DC.

Note: If the output were taken across the resistor instead, it would act as a low-pass filter.

***99.* Negative feedback in an amplifier**

Negative feedback reduces an amplifier's overall voltage gain by feeding a portion of the output signal back in opposition to the input signal. While reducing gain, this method significantly improves amplifier stability, increases bandwidth, lowers distortion and noise, and makes the gain less sensitive to component variations.

Key Effects of Negative Feedback:

Reduced Gain: The closed-loop gain becomes lower than the open-loop gain

Increased Stability: The amplifier's performance depends more on the stable feedback network rather than the variable internal active components.

- **Improved Linearity:** It significantly lowers non-linear distortion, producing a cleaner output.

- **Increased Bandwidth:** The operational frequency range is widened.
- **Impedance Modification:** Negative feedback can increase or decrease input/output impedance depending on the configuration (series or shunt)

100. A Zener diode has sharp breakdown at low reverse voltage

Yes, that is correct. A Zener diode is specifically designed to have a **sharp, well-defined breakdown at a low reverse voltage** (typically below 5-6 volts).

Here is why and how this happens:

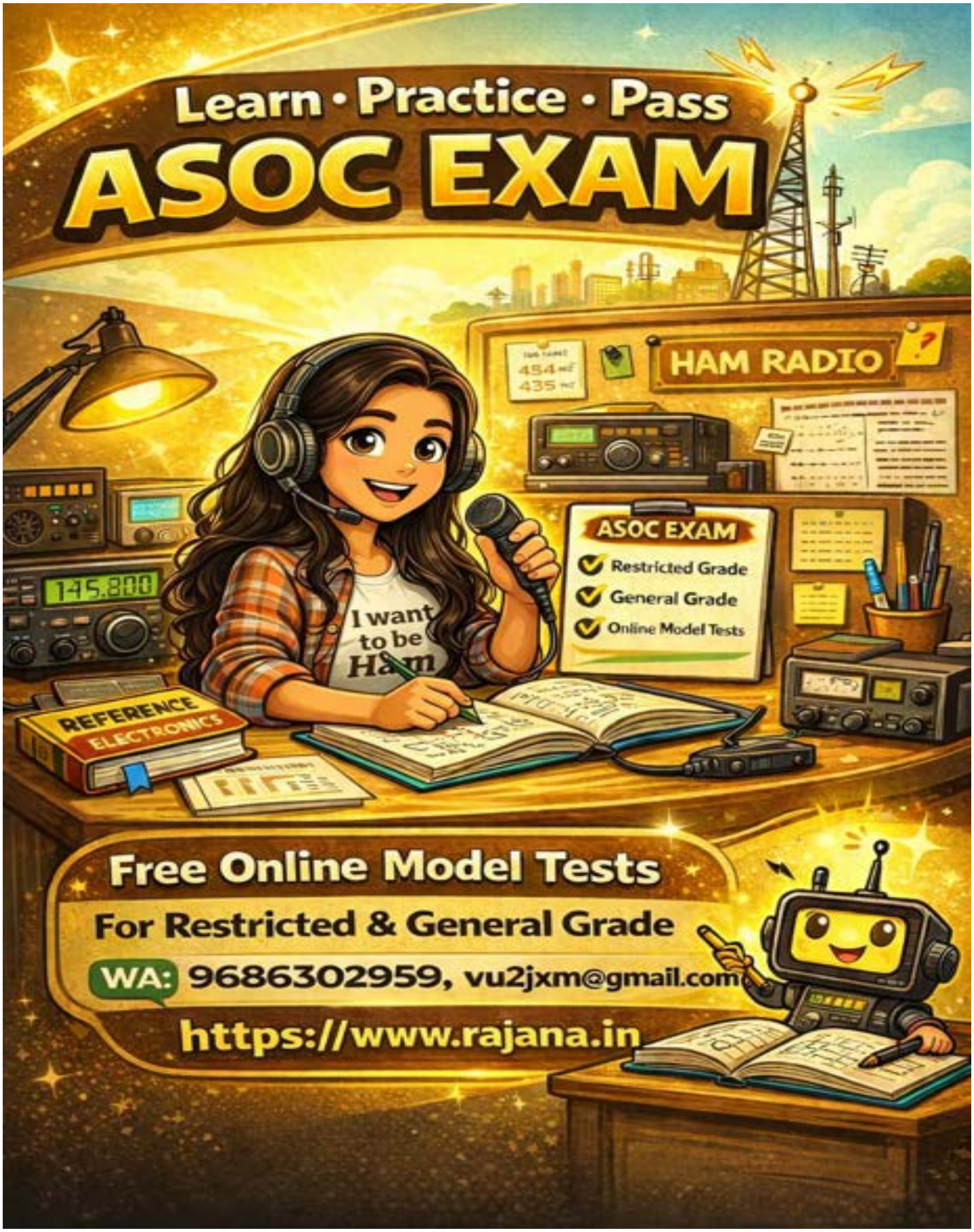
- **Zener Effect:** In low-voltage diodes (usually <5V), the breakdown is caused by the Zener effect. The heavily doped P-N junction creates a very thin depletion region. A relatively low reverse voltage produces an incredibly strong electric field, which pulls electrons directly out of their covalent bonds, leading to a sudden, high reverse current.
- **Sharp Breakdown:** Because this effect happens uniformly and suddenly across the junction, the current-voltage (I-V) curve shows a very steep, nearly vertical breakdown characteristic.
- **Application:** This makes Zener diodes ideal for **low-voltage regulation** and **voltage clamping** (protecting sensitive components from spikes) because the voltage stays constant even if the current varies significantly.

Note: For higher voltages (above =6V), the breakdown mechanism changes to Avalanche breakdown, which is less "sharp" than the Zener effect.

101. The characteristic impedance of free space is ____ ohms

The characteristic impedance of free space (also known as the intrinsic impedance of free space, is approximately 377Ω

It is defined by the ratio of the magnitudes of the electric field (E) to the magnetic field (H) of an electromagnetic wave traveling through a vacuum. It is very commonly approximated as120πΩ or 377Ω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