

# Electromagnetic Interview Questions

## Q1. What do you mean by electromagnetic?

**Electromagnetic** describes the magnetic and electric forces and the effect of electric current. Electromagnetic waves are generated due to the vibration produced between magnetic field and electric field. EM waves composed of electric waves and magnetic waves which are perpendicular to each other

## Q2. What causes electromagnetic?

The name 'Electromagnetic' comes from the word '**Electricity**' and '**Magnetic**'. When both the electric field and magnetic field come in contact, electromagnetic waves are produced. Both of the fields (Electric field and magnetic field) are parallel to each other and also parallel to the direction of the EM wave.

## Q3. What is an electromagnet object?

A type of magnet in which the magnetic field is generated because of electric current is called an electromagnet. These electromagnets are formed of wire wound into a coil. When current flows through the wire it generates a magnetic field in the center of the coil. Current passes through the magnetic core made from a ferrimagnetic or ferromagnetic material generate a powerful magnet.

It has a great advantage over a permanent magnet as it is very easy to control the magnetic field simply by controlling the flow of the current. The main limitation is that it requires electric current in comparison with the permanent magnet which does not need any.

## Q4. How an electromagnetic field is created?

If the charge is static, then only electric field is produced whereas moving charge produces both electric field and magnetic field. You can also produce electric fields by changing magnetic fields. The motion of electric charge produces a space where electric field and magnetic field can be observed and this space is called electromagnetic field.

## Q5. What is electromagnetic induction?

**Michael Faraday** discovered the Electromagnetic Induction in **1831**. Electromagnetic induction defined as the current produced due to the Electromotive force (voltage production) due to change of magnetic field. Faraday realized that it is possible to induce electromotive force simply by moving permanent magnets in and out of a coil.

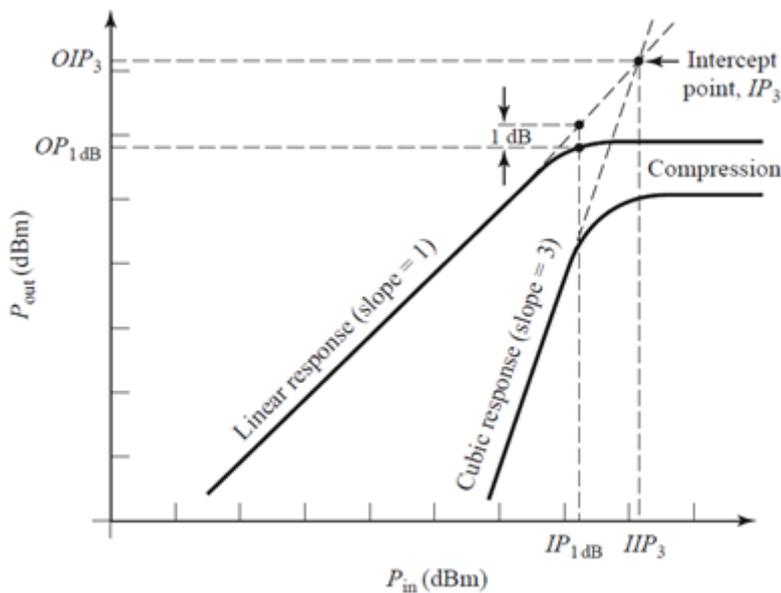
## Q6. What do you know about Rayleigh scattering?

Rayleigh scattering phenomenon was discovered by **Lord Rayleigh** which states that the sunlight or electromagnetic induction are scattered by the particles which are smaller than the wavelength of the radiation. The amount of scattering is inversely power to the fourth power of the wavelength for frequencies below than resonance frequency.

### Q7. What is IP3 of an amplifier?

Third order intercept point which is referred to as IP3 tells about the nonlinear system. Third order intercept point is an ideal point which tells that the two curves will become parallel (after the device reaches to 1dB compression point) and they will never intersect each other.

Third order intercept is an imaginary point where the curve of power for fundamental and third order component meet.



*Third order intercept point for Nonlinear devices*

### Q8. What are degenerative modes?

Two modes with the same propagation constant but different field configuration is called degenerative modes.

### Q9. List some advantages of using optical fibres?

Optical fibers use light pulses to convey information. It is faster than a traditional electric system which uses electric pulses.

There are some Advantages :

1. **Electromagnetic Interference (EMI):** As optical fiber uses light to transmit the information rather than electrons, it does not radiate EM. So, this make optical fiber very important in many applications
2. **Telecommunication and gaming firms:**  
? As the optical fiber remove the cross talk between the telecommunication lines, it is widely used in telecommunication equipment nowadays  
? Many institutions and gaming manufacturers use the optical fiber for the security as it is not possible to tap into a fiber cable without detection.
3. **High Bandwidth:** Another major advantage of using optical fiber is that it has a high bandwidth in opposition to transmission media. It not only provides longer transmission but also the speed is relatively high. That is the reason why many telecommunications use optical fiber for all undersea long-haul telecommunications.
4. **Remove ground loop error:** Fiber isolates two different voltage potentials and insulates in high-voltage areas. For example, it will eliminate errors due to ground-loop potential differences and is ideal for data transmission in areas subject to frequent electrical storms, and presents no hazard to the field installer.  
Optical fiber is perfect for using in those areas which are more prone to electrical storms as it eliminates the errors that occur because of ground-loop potential differences.
5. **Weight:** Coaxial cables are heavier than the plastic fibre cable. If we compare the transmission of a 500 megabits of data per unit time a coaxial wire is 800 per cent heavier than the fibre cable.

#### Q10. What are supermagnetic materials?

#### Q11. What is drift velocity?

Particles like electrons move in all directions in the absence of any electric field. They started drifting randomly in one direction when they were subjected to an electric field. The net velocity attained by these electrons is called drift velocity.

#### Q12. Explain right hand rule?

Right hand thumb rule is used to deduce the direction of the magnetic force. As we know,  $F = qv \times b$

Where **F** represents the magnetic force; **q** represent charge; **v** is velocity of charge particle and **b** is magnetic field.

The direction of the magnetic force is always at the right angle to the plane formed by **v** and **b** which is determined with the help of right thumb rule.

**To find the direction of F using the Thumb rule:** Point the thumb of the right hand in the direction of **v**. Point forefinger in direction of **B**. Direction perpendicular to the palm gives **F**.

#### Q13. What is magnetic flux?

Magnetic flux which is denoted by  $\phi$  is defined as the amount of total magnetic field pass through a specific area.

Let us consider an area of  $A$  and angle  $\theta$  between the magnetic field  $B$  and normal to the surface.

Then the magnetic flux is:  $\phi = BA \cos \theta$ .

#### **Q14. List some applications of electromagnetism.**

Electromagnetism plays an important role in various applications from daily use to research work which are mentioned below: -

##### **1. Household appliances:**

- Ballasts are used in the lamps which work based on electromagnetic principle.
  - Electromagnet also plays a role in blowers, electric fans and cooling systems like refrigerators, A.C. These equipment uses motors which work on the principle of electromagnetism.
  - Induction cookers, mixers and grinders, bread toaster, microwave ovens all these kitchen appliances use electromagnetic.
  - The electromagnetic principle is also used in entertainment systems like Television, stereo, or radio system. In these, an electromagnet is used in loudspeakers to create sound waves.
- **Medical uses:** There are many medical appliances which use electromagnetism to diagnose diseases like Cancer. Examples of some appliances are magnetic resonance imaging (MRI) and hyperthermia treatments for cancer.
  - **Communication System:** Electromagnetic waves are used for communication nowadays. Information is delivered from the sender to receiver in a blink of an eye with the help of electromagnetic waves.
  - **Magnetic Levitation Trains:** As science and technology are improving at a vast rate, electromagnetism is coming into the forward and improving the traditional way of a job. A perfect example of this can be seen in high-speed trains which use a powerful electromagnet to develop the speed. These trains use the EMS and EDS to float over a guideway
  - **Industries Appliances:**
    - In industries, the major source of all the power source and driving system is generators and motors where they convert mechanical energy to electrical energy.
    - Many sensors and actuating devices used in industries also work on the principle of electromagnetism.

#### **Q15. What is a commutator?**

Commutation is the process to generate constant torque in one direction by switching the magnetic field in the armature windings. Commutator is also known as a **split-ring commutator**. The split rings are made of phosphorus bronze connected to the armature core. The voltage produced in the armature is alternating and the commutator converts it to DC. Commutators can also convert the DC to AC depending on the needs.

#### **Q16. What is phenomenon of Electromagnetic Induction?**

**Electromagnetic induction** is the process in which current is produced in a coil due to the relative motion between a magnet and the coil. It is used in various applications and electric components like transformers,

inductors, electric motors and generators.

### Q17. What are Air core coils?

Air core coil is an inductor that does not use a magnetic core made of a ferromagnetic material to gain its inductance. The coils wind over the nonmagnetic materials like plastic, ceramic and those that have air inside the windings.

### Q18. What are the four Maxwell's equations?

Maxwell's equations describe electromagnetism. His theories are set of four law which are mentioned below:

- **Gauss's law:** First one is Gauss's law which states that Electric charges generate an electric field. The electric flux across any closed surface is directly proportional to the charge enclosed in the area.
- **Gauss's law for magnetism:** This law states that there are no magnetic monopoles. The value of the magnetic flux across a closed surface is zero.
- **Faraday's law:** It states that changing magnetic fields generate an electric field.
- **Ampère's law:** This law states that the steady currents and time-varying electric fields generate a magnetic field.

### Q19. What are Conductors and Insulators?

#### **Conductor:**

Conductors are those materials which allow the flow of electrons from one particle to another without any restriction. A conducting material allows the transfer of charge throughout the surface of the body. You can check a conductor by giving charge at specific location to conductor. In conductors, charge spreads throughout the body. This distribution of charge occurs because of the following electron. Conductor can even transfer its charge to the other object

#### **Insulator:**

In contrast to conductors, insulators are the materials that fully block the flow of electrons which as a result does not allow the flow of charge. Insulators can be detected as the charge will remain at a specific location where the charge is supplied. It does not distribute the charge throughout the body.

### Q20. What are Irrotational and Solenoidal Vector Fields?

In an **Irrotational vector field**, curl is always equal to zero everywhere. The irrotational vector field will be conservative or equal to the gradient of a function when the domain is connected without any discontinuities.

**Solenoid vector field** is also known as incompressible vector field in which the value of divergence is equal to zero everywhere. According to the Kelvin–Stokes theorem, a flux integral in this field always depends on the boundary and the value of closed flux integral is always a zero.

### Q21. Explian Harmonic Wave?

### Q22. What is Electric Polarization?

**Electric polarization** is defined as the shift of electric charge in the opposite direction within a dielectric or in an insulator. This is caused by an external electric field.

### Q23. What are Multielectron Atoms?

Multielectron atoms are those atoms which have more than one electron. Examples of multielectron atoms are Helium (He), Lithium (Li) and Oxygen(O). Hydrogen is the only atom which has one electron in their orbitals in ground state.

### Q24. What is Ultraviolet light?

**Ultraviolet** is a form of electromagnetic radiation in which wavelengths range from 10nm to 400nm. Ultraviolet rays cannot be seen with naked eyes like visible light. The wavelength of the UV is shorter than the visible light and longer than X- rays. Sun is the ultimate source of UV rays. There are many types of UV rays like UV-A, UV-B and UV-C. Not only sun there are many other sources which release UV rays for example., electric arcs, some specialized lights such as black lights, tanning lights and mercury-vapor lamps. UV-B rays are very harmful for the DNA, skin and eyes. UV rays allow many chemical reactions to occur and there are many substances which glow or fluorescence in presence of UV.

### Q25. What is wavelength?

**Wavelength** is the distance between two adjacent trough or crest.in the adjacent cycle of a waveform. It is defined as the spatial period of a periodic wave. Units of wavelength are: - millimeters(mm), centimeters(cm) and meters(m).