Microwave Engineering Questions and Answers – Antenna Basics

This set of Microwave Engineering Multiple Choice Questions & Answers (MCQs) focuses on "Antenna Basics".

1. The basic requirements of transmitting antennas are:
a) High efficiency
b) Low side lobes
c) Large signal to noise ratio
d) Lone of the mentioned
View Answer

Answer: a
Explanation: The basic requirements of a transmitting antenna are high gain and efficiency while requirements of receiving antennas are low side lobes and large signal to noise to ratio.

2. __________is a device that converts electrons to photons or vice-versa.
a) Antenna
b) Electron gun
c) Photon amplifier
d) Microwave tube
View Answer

Answer: a
Explanation: Antenna is a device that converts electrons into photons or vice versa. A transmitting antenna converts electrons into photons while a receiving antenna converts photons into electrons.

3. The basic equation of radiation that is applied to any antenna irrespective of the type of the antenna is:

a) iL= Qv

b) iQ = Lv

c) i/L=Q/v

d) None of the mentioned

View Answer

Answer: a

Explanation: Basic equation of radiation is given by iL=Qv. i is the time change in current, l is the length of the current element, q is the charge v is the acceleration of the charge.

4. When the separation between two lines that carry the TEM wave approaches λ the wave tends to be radiated.

a) True

b) False

View Answer

Answer: a

Explanation: When the separation between two lines that chary the TEM wave approaches λ the wave tends to be radiated so that the opened – out line act as an antenna which lunches a free space wave.

5. The number of patterns radiation pattern required to specify the characteristic are :

a) Three

b) Four

c) Two

d) Five

View Answer

Answer: a

Explanation: The three patterns required are, θ component of the electric field as the function of the angles as θ and φ, the φ component of the electric field as the function of the angles θ and φ, the phase of these fields as a functions of the angle φ and θ .

6. The beam width of the antenna pattern measured at half power points is called:

a) Half power beam width

b) Full null beam width

c) Beam width

d) None of the mentioned

View Answer

Answer: a

Explanation: The beam width of an antenna measure at half of the maximum power received by an antenna or the 3 dB beam width of the antenna is termed as half null beam width.

7. An antenna has a field pattern of E (θ) = cos2 θ, θ varies between 0 and 900. Half power beam width of the antenna is:

a) 33^0

b) 66^0

c) 1200^0

d) None of the mentioned

View Answer

Answer: b

Explanation: Half power beam width of the antenna is obtained by equating the field pattern of the antenna to 0.707 (half power point) and finding θ. 2θ gives the value of beam width. Solving the given problem in the same flow, half power beam width of the antenna is 66^0.

8. An antenna has a field pattern E (θ) =cos θ. cos 2θ. The first null beam width of the antenna is:

a) 45^0

b) 90^0

c) 180^0

d) 120^0

View Answer

Answer: b

Explanation: Half power beam width of the antenna is obtained by equating the field pattern of the antenna to 0.707 (half power point) and finding θ. 2θ gives the value of beam width. Twice the half power beam width gives the first null beam width. With the same steps applied, the half power beam width of the antenna is 450. First null beam width is 90^0.

9. The solid area through which all the power radiated by the antenna is:

a) Beam area

b) Effective area

c) Aperture area

d) Beam efficiency

View Answer

Answer: a

Explanation: The beam area is the solid angle through which all of the power radiated by the antenna would stream if P (θ, φ) maintained its maximum value over beam area and zero elsewhere. This value is approximately equal to the angles subtended by the half power points of the main lobe in the two principal planes.

10. Power radiated from an antenna per unit solid angle is called radiation intensity.

a) True

b) False

View Answer

Answer: a

Explanation: Power radiated from an antenna per unit solid angle is called radiation intensity. Unit of radiation intensity is watts per steridian or per square degree.

Microwave Engineering Questions and Answers – Antenna Basics-2

This set of Microwave Engineering Questions and Answers for Entrance exams focuses on "Antenna Basics-2".

1. As the beam area of an antenna decreases, the directivity of the antenna:
a) Increases
b) Decreases
c) Remains unchanged
d) Depends on the type of the antenna
View Answer

Answer: a
Explanation: Beam area of an antenna and the directivity of the antenna are inversely proportional. As the beam area is reduced, the directivity increases, meaning smaller the radiating area of the transmitting antenna, more directed is the emitted energy.

2. If an antenna radiates over half a sphere, directivity of the antenna is:
a) Two
b) Four
c) Three
d) One
View Answer

Answer: a
Explanation: Since the antenna radiates over half the sphere, beam area of the antenna is 2π, directivity of the antenna is given by 4π/ beam area. Substituting for beam area, the directivity of the antenna is two.

3. The half power beam width of an antenna in both θ and φ are 400 each. Then the gain of the antenna is:
a) 23
b) 25
c) 14

d) 27

View Answer

Answer: b

Explanation: Approximate gain of an antenna is given by the expression 40000/ (HPBW) 2. Substituting the given values in the above expression, the gain of the antenna is 25. In dB scale the gain of the antenna is 14 dB.

4. The number N of radio transmitters or point sources of radiation distributed uniformly over the sky which an antenna can resolve is given by:

a) $4\pi/ \Omega A$

b) $2\pi/ \Omega A$

c) $\pi/ \Omega A$

d) None of the mentioned

View Answer

Answer: a

Explanation: Resolution may be defined as equal to half the beam width between first nulls. In the above expression the resolution N is given as $4\pi/ \Omega A$.. Here ΩA is the beam area.

5. Ideally, the number of point sources an antenna can resolve is numerically equal to:

a) Gain of the antenna

b) Directivity

c) Beam efficiency

d) Beam area

View Answer

Answer: b

Explanation: The number of point source an antenna can resolve is given by $4\pi/ \Omega A$ Directivity of an antenna is mathematically given by the relation $4\pi/ \Omega A$. Numerically resolution and directivity are equal.

6. Effective aperture is a parameter of the antenna that gives the physical aperture of the antenna.

a) True

b) False

View Answer

Answer: b

Explanation: Effective aperture defines the amount of the total aperture of the antenna that is utilized for radiation of energy. Higher the effective aperture of an antenna, more is the aperture efficiency.

7. Effective aperture in terms of beam area and operating wavelength is given by the relation:

a) $\lambda^2 / \Omega A$

b) $\Omega A / \lambda^2$

c) $\lambda^2 \times \Omega A$

d) No such relationship exists

View Answer

Answer: a

Explanation: Effective aperture is given as $\lambda^2 / \Omega A$. Here ΩA is the beam area. If the beam area is specified in terms of the operating wavelength λ, then effective are of the antenna can be made operating wavelength independent.

8._________of an antenna is defined as the ratio of the induced voltage to the incident electric field.

a) Effective height

b) Gain

c) Directivity

d) Loss

View Answer

Answer: a

Explanation: At the receiving end, effective height of an antenna is defined as the ratio of the induced voltage to the incident electric field. Otherwise, if the effective length of the receiving antenna is known and if the induced voltage is measured, then the field strength can be determined.

9. The directivity of an antenna in terms of the aperture efficiency and operating wavelength is given by:

a) $4\pi Ae/\lambda^2$

b) $2\pi Ae/\lambda^2$

c) $\pi Ae/\lambda^2$

d) None of the mentioned

View Answer

Answer: a

Explanation: The directivity of an antenna in terms of aperture efficiency is given by $4\pi Ae/\lambda^2$. Here Ae is the aperture efficiency. λ is the operating frequency. With an increase in the effective aperture area of an antenna, directivity of the antenna can be increased making the radiated beam narrower.

10. A radio link has 15 W transmitter connected to an antenna of 2.5 m^2 effective aperture at 5 GHz. The receiving antenna has an effective aperture of 0.5 m^2 and is located at a 15 Km line of sight distance from transmitting antenna. Assuming lossless, matched antennas, the power delivered to the receiver is:

a) 20 µW

b) 15 µm

c) 23 µm

d) 25 µm

View Answer

Answer: c

Explanation: The power delivered to the receiving antenna is Pt (A1 A2/ $r^2\lambda^2$). Substituting the given values in the above equation, the power at the receiver is 23 µm.

Microwave Engineering Questions and Answers – Antenna Family

This set of Microwave Engineering Multiple Choice Questions & Answers (MCQs) focuses on "Antenna Family".

1. The members of the antenna family which are made of wires of certain value in terms of operating wavelength are called:
a) Loop antennas
b) Wire antennas
c) Dipole antenna
d) Slot antennas
View Answer

Answer: c
Explanation: Wires of half wavelength are termed as dipoles. Their radiation resistance is about 73 Ω. If only half of this length is used, then it is called quarter-wave monopole with a radiation resistance of 36.5 Ω.

2. The antenna in which location of the feed determines the direction of the lobe are:
a) Wire antenna
b) Loop antenna
c) Helical antenna
d) Horn antenna
View Answer

Answer: a
Explanation: In a wire antenna, the location of the feed determines the direction of the lobe and the orientation of the wire determines the polarization. These wires can be thick or thin. Thickness of the wire determines the radiation resistance of the antenna.

3. Based on the size of the loops, loop antennas are classified as small and large loops. This is the only classification of loop antenna.

a) True

b) False

View Answer

Answer: b

Explanation: Loop antennas are classified based on various antenna parameters. To name a few, small and large loops, circular and square loops, loops having single or multi turns, loops with turns wound using a single wire or multiple wires.

4. Antenna that does not belong to the horn antenna family among the following are:

a) Pyramidal horn

b) Conical horn

c) bi-conical horn

d) None of the mentioned

View Answer

Answer: d

Explanation: All of the above mentioned antennas belong to the horn antenna family. Horn antennas may be made of pointed or rounded waveguides. The waveguides may contain disc at an end or some dielectric.

5. Patch antennas are the antennas of small size and are made of:

a) Strip line

b) Microstrip lines

c) Coaxial cables

d) Rectangular waveguide

View Answer

Answer: b

Explanation: Patch antennas are microstrip antennas that can be of any shape. Patch antennas can be aperture-coupled fed or proximity fed. For obtaining circular polarization, a patch may also be doubly fed.

6. Reflector antennas are widely used to modify radiation patterns of radiating elements.

a) True

b) False

View Answer

Answer: a

Explanation: Reflector antennas are used to modify radiation patterns of radiating elements. Reflector antennas are classified into two categories. They are passive reflectors and active reflectors. Based on the type of the radiating element and the modification in the radiation pattern required, accordingly either active or passive reflectors are chosen.

7. The pattern of the reflector in a reflector antenna is called:

a) Primary pattern

b) Secondary pattern

c) Reflector pattern

d) None of the mentioned

View Answer

Answer: b

Explanation: In a reflector antenna, the feed pattern is called primary pattern and the pattern of the reflector is called secondary pattern. These antennas are widely employed in RADARs and other types of point to point communication links.

8. _______antennas have gain less than reflector antennas but have more lenient tolerance on surfaces.

a) Helical antennas

b) Lens antennas

c) Array antennas

d) Slot antennas

View Answer

Answer: b

Explanation: Lens antennas are complex in nature but are able to scale wider angles. In comparison to reflectors, their gain is 1 or 2 dB less, but these have more lenient tolerance on surfaces. These have less rearward reflection, relatively low loss and can be easily shaped to the desired contours.

9. Lens antennas are classified into two types. One being fast antenna, the other one is:

a) Slow antenna

b) Delay antenna

c) Dynamic antenna

d) None of the mentioned

View Answer

Answer: b

Explanation: In delay lenses, the electrical path length is increased or the wave is retarded by the lens medium. Dielectric lenses and H-plane metal lenses fall in this category.

10. The antennas which offer high operational bandwidth and the antenna parameters are maintained over a wide range of antennas are called:

a) Wide band antennas

b) Array antennas

c) Parabolic antennas

d) None of the mentioned

View Answer

Answer: a

Explanation: In this class of antennas, constancy of impedance and radiation characteristics is maintained over a wide range of frequencies. To be wide band or frequency independent, antennas should expand or contract in proportion to the wavelength.

11. High directivity required in RADAR communication is satisfied using this type of antennas:

a) Wide band antennas

b) Antenna arrays

c) Slot antennas

d) Patch antennas

View Answer

Answer: b

Explanation: Higher directivity is the requirement in point to point communication. This can be achieved by increasing the size of the antennas in terms of electrical length. When much high directivity is required, antenna arrays are used.

12. The terminal impedance of a dipole antenna is 710 Ω. The terminal impedance of the slot antenna given the intrinsic impedance of air is 377 Ω is:

a) 100 Ω

b) 50 Ω

c) 25 Ω

d) None of the mentioned

View Answer

Answer: b

Explanation: The terminal impedance Z_S of the slot is given by the relation $Z_0^2 / 4Z_d$) Z_o is the intrinsic impedance of the medium and Z_D is the terminal impedance of the dipole. Substituting the given values in the above equation, the terminal impedance of sot is 50 Ω.

13. If the length of aperture in a pyramidal horn antenna is 10cm and δ for the design is 0.25. Then, the flaring angle of the pyramidal horn is:

a) 30^0

b) 25.4^0

c) 45^0

d) 60^0

View Answer

Answer: b

Explanation: The flaring angle of pyramidal horn is given by $2\cos^{-1}(L/L+\delta)$. Substituting the values of L and δ, flaring angle is 25.4^0.

14. If the directivity of a square corner receiving antenna is 20 and operating at a wavelength of 0.25m, the effective aperture of a square corner antenna is:

a) 0.4 m^2

b) 0.2 m^2

c) 0.1 m^2

d) None of the mentioned

View Answer

Answer: a

Explanation: Given the directivity of the antenna, effective aperture of the antenna is given by $D\lambda^2/4\pi$. substituting the given values of the variables; the effective aperture of the antenna is 0.4 m^2.

Microwave Engineering Questions and Answers – Antenna Radiation

This set of Microwave Engineering Multiple Choice Questions & Answers (MCQs) focuses on "Antenna Radiation".

1. An antenna source that radiates energy uniformly in all the directions is called:

a) Isotropic source

b) Anisotropic source

c) Point source

d) None of the mentioned

View Answer

Answer: a

Explanation: Isotropic source radiates energy in all the direction uniformly. For such a source, the radial component Sr of the pointing vector is independent of θ and φ. The three dimensional power pattern of n isotropic source is a sphere.

2. Antennas that radiate energy only in a specified are called anisotropic antennas.

a) True

b) False

View Answer

Answer: a

Explanation: All physically realizable, simplest antennas also have directional properties. That is, they radiate energy in one direction than in any other direction. Such sources are called anisotropic point sources.

3. The expression for pointing vector of an isotropic point source at a distance „r‟ from the source is given by:

a) $P/ 4\pi R^2$

b) $P/4\pi$

c) $P/ 4\pi R$

d) $P\times 4\pi R^2$

View Answer

Answer: a

Explanation: The pointing field vector for an isotropic source is given by the expression $P/ 4\pi R^2$.P is the total power radiated y the source. As the distance of the point from the source increases, the magnitude of pointing vector decreases.

4. A source has a cosine radiation-intensity pattern given by $U=U_M \cos(\theta)$. The directivity of this source is:

a) 2

b) 4

c) 6

d) 8

View Answer

Answer: b

Explanation: To find the directivity of the given source, the power radiated by the given source is found out by the method of integration. Taking the ratio of the power radiated by the given source to the power radiated by an isotropic source gives the directivity. Following the above steps, the directivity of the given source is 4.

5. A source has a cosine power pattern that is bidirectional. Given that the directivity of a unidirectional source with cosine power pattern has a directivity of 4, then the directivity of the unidirectional source is:

a) 1

b) 2

c) 4

d) 8

View Answer

Answer: b

Explanation: Given the directivity of unidirectional power pattern, the directivity of bidirectional power pattern is half of it. Hence the directivity of the source is 2.

6. A source has a radiation intensity pattern given by $U=U_M \sin\theta$. The directivity of the source with this power pattern is:

a) 1

b) 1.27

c) 2.4

d) 3.4

View Answer

Answer: b

Explanation: To find the directivity of the given source, the power radiated by the given source is found out by the method of integration. Taking the ratio of the power radiated by the given source to the power radiated by an isotropic source gives the directivity. Following the above steps, the directivity of the given source is 1.27.

7. A source has a sine squared radiation intensity power pattern. The directivity of the given source is:

a) 1.5

b) 3

c) 2.5

d) 3.5

View Answer

Answer: a

Explanation: To find the directivity of the given source, the power radiated by the given source is found out by the method of integration. Taking the ratio of the power radiated by the given source to the power radiated by an isotropic source gives the directivity. Following the above steps, the directivity of the given source is 1.5.

8. A source with a unidirectional cosine squared radiation intensity pattern is given by $U_M cos^2 (\theta)$. The directivity of the given source is:

a) 6

b) 8

c) 2

d) 7

View Answer

Answer: a

Explanation: To find the directivity of the given source, the power radiated by the given source is found out by the method of integration. Taking the ratio of the power radiated by the given source to the power radiated by anisotropic source gives the directivity. Following the above steps, the directivity of the given source is 6.

9. Considering distance as a parameter, two types of field zones can be defined around an antenna.

a) True

b) False

View Answer

Answer: a

Explanation: Considering distance as a parameter, two types of field zones can be defined around an antenna) .The field near the antenna is called near field or Fresnel region and the other region is the far field that is also called as Fraunhofer region.

10. If the field strength at receiving antenna is 1 μV/m, and the effective aperture area is 0.4 m^2 and the intrinsic impedance of the medium is 377 Ω, then the power received by the antenna is:

a) 1.06 pW

b) 1.06 fW

c) 2 μW

d) None of the mentioned

View Answer

Answer: b

Explanation: The received power by the antenna is given by E^2Ae/Z_o. Substituting the known values in the above equation, the power received is 1.06×10^{-15} watts.

Avionics Questions and Answers – Types of Antenna – 1

This set of Avionics Multiple Choice Questions & Answers (MCQs) focuses on “Types of Antenna – 1”.

1. A dipole antenna is also called as?

a) Marconi antenna

b) Yagi antenna

c) Bidirectional antenna

d) Hertz antenna
View Answer

Answer: d
Explanation: One of the most widely used antenna types is the half-wave dipole antenna. This antenna is also formally known as the Hertz antenna after Heinrich Hertz, who first demonstrated the existence of electromagnetic waves.

2. The impedance at the center of the antenna is known as?
a) Characteristic impedance
b) Radiation resistance
c) Transmission impedance
d) Recovery resistance
View Answer

Answer: b
Explanation: The transmission line is connected at the center. The dipole has an impedance of 73 V at its center, which is the radiation resistance. At the resonant frequency, the antenna appears to be a pure resistance of 73 V.

3. What happens when the radiation resistance of the antenna matches the characteristic impedance of the transmission line?
a) No transmission occurs
b) No reception occurs
c) SWR is maximum
d) SWR is minimum
View Answer

Answer: d
Explanation: When the radiation resistance of the antenna matches the characteristic impedance of the transmission line, the SWR is minimum and maximum power reaches the antenna. This allows maximum power to be transmitted.

4. The type of dipole antenna that has a higher band width is called as?

a) Conical antenna

b) Yagi antenna

c) Helical antenna

d) Marconi antenna

View Answer

Answer: a

Explanation: A common way to increase bandwidth in the antenna is to use a version of the dipole antenna known as the conical antenna. The overall length of the antenna is 0.73λ or 0.73(984)/f = 718.32/f. This is longer than the traditional one-half wavelength of a dipole antenna, but the physical shape changes the necessary dimensions for resonance.

5. The radiation pattern of a half-wave dipole has the shape of a _______

a) Doughnut

b) Sphere

c) Hemisphere

d) Circular

View Answer

Answer: a

Explanation: The radiation pattern of any antenna is the shape of the electromagnetic energy radiated from or received by that antenna. Typically that radiation is concentrated in a pattern that has a recognizable geometric shape. The radiation pattern of a half-wave dipole has the shape of a doughnut.

6. What is the beam width for a half wave dipole antenna?

a) 90°

b) 180°

c) 50°

d) 250°

View Answer

Answer: a

Explanation: The beam width is measured between the points on the radiation curve that are 3 dB down from the maximum amplitude of the curve. The maximum amplitude of the pattern occurs at 0° and 180°. The 3-dB down points are 70.7 percent of the maximum. The angle formed with two lines extending from the center of the curve to these 3-dB points is the beam width. The beam width is 90°. The smaller the beam width angle, the more directional the antenna.

7. What does the beam width of an antenna tell us?

a) Signal strength

b) Signal power

c) Directivity

d) Degradation

View Answer

Answer: c

Explanation: The measure of an antenna‟ s directivity is beam width, the angle of the radiation pattern over which a transmitter‟ s energy is directed or received. Beam width is measured on an antenna‟ s radiation pattern.

8. What is the power radiated by the antenna with gain called as?

a) Critical power

b) Transverse power

c) Effective radiated power

d) Transmitted power

View Answer

Answer: c

Explanation: The power radiated by an antenna with directivity and therefore gain is called the effective radiated power (ERP). The ERP is calculated by multiplying the transmitter power fed to the antenna Pt by the power gain A_p of the antenna.

9. What is the radiation pattern of an isotropic radiator?

a) Doughnut

b) Sphere

c) Hemisphere

d) Circular

View Answer

Answer: b

Explanation: An isotropic radiator is a theoretical point source of electromagnetic energy. The E and H fields radiate out in all directions from the point source, and at any given distance from the point source, the fields form a sphere.

10. What is the impedance of the folded dipole antenna?

a) 50Ω

b) 100Ω

c) 300Ω

d) 20Ω

View Answer

Answer: c

Explanation: A popular variation of the half-wave dipole is the folded dipole. Like the standard dipole, it is one-half wavelength long. However, it consists of two parallel conductors connected at the ends with one side open at the center for connection to the transmission line. The impedance of this popular antenna is 300 V, making it an excellent match for the widely available 300-V twin lead.

11. Which of the following antennas produce a vertical radiation pattern?

a) Dipole antenna

b) Yagi antenna

c) Marconi antenna

d) Hertz antenna

View Answer

Answer: c

Explanation: The same effect as dipole antenna can be achieved with a one-quarter wavelength antenna or Marconi antenna. A vertical dipole with the doughnut-shaped radiation pattern, in which one-half of the pattern is below the surface of the earth. This is called a vertical radiation pattern.

Avionics Questions and Answers – Types of Antenna – 2

This set of Avionics MCQs focuses on “Types of Antenna – 2”.

1. What is the use of loading coil?
a) Correcting resonance to a desired frequency
b) Increasing the antenna gain
c) Sideband suppression
d) Increasing the range of the antenna
View Answer

Answer: a
Explanation: When a vertical antenna is made less than one-quarter wavelength, the practical effect is a decreased inductance. The antenna no longer resonates at the desired operating frequency, but at a higher frequency. To compensate for this, a series inductor, called a loading coil, is connected in series with the antenna coil. The loading coil brings the antenna back into resonance at the desired frequency.

2. Why is top hat added to antennas?
a) To increase capacitance
b) Increasing the antenna gain
c) Sideband suppression
d) Increasing the range of the antenna
View Answer

Answer: a

Explanation: A top hat is a structure that increases the capacitance to surrounding items, bringing the antenna back into resonance. Obviously, such an arrangement is too top-heavy and inconvenient for portable and mobile antennas. However, it is sometimes used in larger fixed antennas at lower frequencies.

3. In a parasitic array antenna, the conductors that are not connected to the transmission line is called as?

a) Driven element

b) Parasitic elements

c) Extra elements

d) Array elements

View Answer

Answer: b

Explanation: A parasitic array consists of a basic antenna connected to a transmission line plus one or more additional conductors that are not connected to the transmission line. These extra conductors are referred to as parasitic elements, and the antenna itself is referred to as the driven element.

4. In a parasitic array the elements are shorted if they are connected to a conducting beam.

a) True

b) False

View Answer

Answer: b

Explanation: The boom does not have to be an insulator. Because there is a voltage null at the center of a one-half wavelength conductor at the resonant frequency, there is no potential difference between the elements and so they can all be connected to a conducting boom with no undesirable effect. In other words, the elements are not "shorted together."

5. Parasitic element that is typically about 5 percent longer than the half-wave dipole-driven element is called________

a) Array element

b) Director element

c) Reflector element

d) Driven element

View Answer

Answer: c

Explanation: The reflector, a parasitic element that is typically about 5 percent longer than the half-wave dipole-driven element, is spaced from the driven element by a distance of 0.15λ to 0.25λ. When the signal radiated from the dipole reaches the reflector, it induces a voltage into the reflector and the reflector produces some radiation of its own creating a highly focused beam in the direction of the driven element.

6. Why is the boom of the yagi antenna connected to a metal mast and electrical ground?

a) Better signal directivity

b) Increased bandwidth

c) Lightning protection

d) To avoid short circuiting

View Answer

Answer: c

Explanation: The centers of the parasitic elements are neutral electrically; these elements can be connected directly to the boom. For the best lightning protection, the boom can then be connected to a metal mast and electrical ground.

7. Which of the following is not one of the types of driven array antenna?

a) Rectilinear antenna

b) Broadside antenna

c) End fire antenna

d) log periodic antenna

View Answer

Answer:a

Explanation: Each element in a driven array antenna receives RF energy from the transmission line, and different arrangements of the elements produce different degrees of directivity and gain. The three basic types of driven arrays are the collinear, the broadside, and the end-i re. A fourth type is the wide-bandwidth log-periodic antenna.

8. What is the length of the shortest element in the yagi antenna?
a) One quarter the wavelength of the highest frequency
b) One quarter the wavelength of the lowest frequency
c) One half the wavelength of the highest frequency
d) One half the wavelength of the lowest frequency
View Answer

Answer: c

Explanation: The lengths of the driven elements vary from long to short and are related logarithmically. The longest element has a length of one-half wavelength at the lowest frequency to be covered, and the shortest element is one-half wavelength at the higher frequency. The spacing is also variable.

Microwave Engineering Questions and Answers – Antenna Gain and Efficiency

This set of Microwave Engineering Multiple Choice Questions & Answers (MCQs) focuses on "Antenna Gain and Efficiency".

1. A___________is a device that converts a guided electromagnetic wave on a transmission line into a plane wave propagating in free space.
a) Transmitting antenna
b) Receiving antenna
c) Radar

d) Mixer

View Answer

Answer: a

Explanation: A transmitting antenna is a device that converts a guided electromagnetic wave on a transmission line into a plane wave propagating in free space. It appears as an electrical circuit on one side, provides an interface with a propagating plane wave.

2. Antennas are bidirectional devices.

a) True

b) False

View Answer

Answer: a

Explanation: Antennas can be used both as transmitters and receivers. As transmitters they radiate energy to free space and as receivers they receive signal from free space. Hence, they are called bidirectional devices as they are used at both transmitting end and receiving end.

3. Dipole antennas are an example for:

a) Wire antennas

b) Aperture antennas

c) Array antennas

d) None of the mentioned

View Answer

Answer: a

Explanation: Dipoles, monopoles, oops, Yagi-Uda arrays are all examples for wire antennas. These antennas have low gains, and are mostly used at lower frequencies.

4. __________antennas consist of a regular arrangement of antenna elements with a feed network

a) Aperture antennas

b) Array antennas

c) Printed antennas

d) Wire antennas

View Answer

Answer: b

Explanation: Array antennas consist of a regular arrangement of antenna elements with a feed network. Pattern characteristics such as beam pointing angle and side lobe levels can be controlled by adjusting the amplitude and phase excitation of array elements.

5. A parabolic reflector used for reception with the direct broadcast system is 18 inches in diameter and operates at 12.4 GHz. The far-field distance for this antenna is:

a) 18 m

b) 13 m

c) 16.4 m

d) 17.3 m

View Answer

Answer: d

Explanation: Far field distance for a reflector antenna is given by $2D^2/\lambda$. D is the diameter and λ is the operating signal wavelength. Substituting in the above expression, far field distance is 17.3 m.

6.__________of an antenna is a plot of the magnitude of the far field strength versus position around the antenna.

a) Radiation pattern

b) Directivity

c) Beam width

d) None of the mentioned

View Answer

Answer: a

Explanation: Radiation pattern of an antenna is a plot of the magnitude of the far field strength versus position around the antenna. This plot gives the detail regarding the region where most of the energy of antenna is radiated, side lobes and beam width of an antenna.

7. Antennas having a constant pattern in the azimuthal plane are called ______________

a) High gain antenna

b) Omni directional antenna

c) Unidirectional antenna

d) Low gain antenna

View Answer

Answer: b

Explanation: Omni directional antennas radiate EM waves in all direction. If the radiation pattern for this type of antenna is plotted, the pattern is a constant signifying that the radiated power is constant measured at any point around the antenna.

8. Beamwidth and directivity are both measures of the focusing ability of an antenna.

a) True

b) False

View Answer

Answer: a

Explanation: Beamwidth and directivity are both measures of the focusing ability of an antenna. An antenna with a narrow main beam will have high directivity, while a pattern with low beam will have low directivity.

9. If the beam width of an antenna in two orthogonal planes are 30^0 and 60^0. Then the directivity of the antenna is:

a) 24

b) 18

c) 36

d) 12

View Answer

Answer: b

Explanation: Given the beam width of the antenna in 2 planes, the directivity is given by

$32400/\theta*\emptyset$, where $\theta,\emptyset$ are the beam widths in the two orthogonal planes. Substituting in the equation, directivity of the antenna is 18.

10. If the power input to an antenna is 100 mW and if the radiated power is measured to be 90 mW, then the efficiency of the antenna is:
a) 75 %
b) 80 %
c) 90 %
d) Insufficient data
View Answer

Answer: c
Explanation: Antenna efficiency is defined as the ratio of radiated power to the input power to the antenna. Substituting the given data in the efficiency equation, the efficiency of the antenna is 90%.

Microwave Engineering Questions and Answers – Antenna Gain and Efficiency

This set of Microwave Engineering Multiple Choice Questions & Answers (MCQs) focuses on "Antenna Gain and Efficiency".

1. A___________is a device that converts a guided electromagnetic wave on a transmission line into a plane wave propagating in free space.
a) Transmitting antenna
b) Receiving antenna
c) Radar
d) Mixer
View Answer

Answer: a

Explanation: A transmitting antenna is a device that converts a guided electromagnetic wave on a transmission line into a plane wave propagating in free space. It appears as an electrical circuit on one side, provides an interface with a propagating plane wave.

2. Antennas are bidirectional devices.

a) True

b) False

View Answer

Answer: a

Explanation: Antennas can be used both as transmitters and receivers. As transmitters they radiate energy to free space and as receivers they receive signal from free space. Hence, they are called bidirectional devices as they are used at both transmitting end and receiving end.

3. Dipole antennas are an example for:

a) Wire antennas

b) Aperture antennas

c) Array antennas

d) None of the mentioned

View Answer

Answer: a

Explanation: Dipoles, monopoles, oops, Yagi-Uda arrays are all examples for wire antennas. These antennas have low gains, and are mostly used at lower frequencies.

4. __________antennas consist of a regular arrangement of antenna elements with a feed network

a) Aperture antennas

b) Array antennas

c) Printed antennas

d) Wire antennas

View Answer

Answer: b

Explanation: Array antennas consist of a regular arrangement of antenna elements with a feed network. Pattern characteristics such as beam pointing angle and side lobe levels can be controlled by adjusting the amplitude and phase excitation of array elements.

5. A parabolic reflector used for reception with the direct broadcast system is 18 inches in diameter and operates at 12.4 GHz. The far-field distance for this antenna is:

a) 18 m

b) 13 m

c) 16.4 m

d) 17.3 m

View Answer

Answer: d

Explanation: Far field distance for a reflector antenna is given by $2D^2/\lambda$. D is the diameter and λ is the operating signal wavelength. Substituting in the above expression, far field distance is 17.3 m.

6.__________of an antenna is a plot of the magnitude of the far field strength versus position around the antenna.

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b) Directivity

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Explanation: Radiation pattern of an antenna is a plot of the magnitude of the far field strength versus position around the antenna. This plot gives the detail regarding the region where most of the energy of antenna is radiated, side lobes and beam width of an antenna.

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a) 75 %

b) 80 %

c) 90 %

d) Insufficient data

View Answer

Answer: c

Explanation: Antenna efficiency is defined as the ratio of radiated power to the input power to the antenna. Substituting the given data in the efficiency equation, the efficiency of the antenna is 90%.

Microwave Engineering Questions and Answers – Wireless Communication

This set of Microwave Engineering Multiple Choice Questions & Answers (MCQs) focuses on "Wireless Communication".

1. Most of the wireless systems today operate at a frequency of about:

a) 800 MHz

b) 100 MHz

c) 80 MHz

d) None of the mentioned

View Answer

Answer: a

Explanation: With all advancement in wireless communication today, the need of the hour is higher data rates of transmission and reception. These higher data rates can be achieved only at microwave frequency range and in giga hertz frequency range.

2. Point to point communication systems use low gain antennas for communication.

a) True

b) False

View Answer

Answer: b

Explanation: In point to point communication a single transmitter communicates with a single receiver. Such systems use high gain antennas to maximize received power and minimize interference with other radios.

3. In this method of wireless communication, communication happens only in one direction:

a) Simplex

b) Duplex

c) Half duplex

d) None of the mentioned

View Answer

Answer: a

Explanation: In simplex systems, communication happens only in one direction that is from the transmitter to the receiver. Examples for this type of communication include radio, television and paging systems.

4. The power density radiated by an isotropic antenna is given by the relation:

a) $P_t/4\pi R^2$

b) $P_t/4R^2$

c) P_t/R^2

d) None of the mentioned

View Answer

Answer: a

Explanation: An isotropic antenna radiates energy equally in all the directions. Hence, the power density radiated at a distance R is given by the relation $P_t/4\pi R^2$.

5. The power received by a receiving antenna given that P_t is the transmitted power is:

a) $G_rG_t\lambda^2p_t/ (4\pi R)^2$

b) $G_t\lambda^2p_t/ (4\pi R)^2$

c) $G_r\lambda^2p_t/ (4\pi R)^2$

d) None of the mentioned

View Answer

Answer: a

Explanation: The power received by a receiving antenna given that P_t is the transmitted power is $G_rG_t\lambda^2pt/ (4\pi R)^2$. Here G_r is the gain of the receiving antenna; G_t is the gain of the transmitting antenna. R is the distance between the transmitting and receiving antenna.

6. If the distance between a transmitting station and receiving station is 1 Km and if the antennas are operating at a wavelength of 5 cm, then the path loss is:

a) 108 dB

b) 12 dB

c) 45 dB

d) 48 dB

View Answer

Answer: a

Explanation: Path loss is given by the expression 20 log $(4\pi R/\lambda)$ in db. Substituting the given values in the above expression, the path loss is 108 dB.

7. The amount of power by which the received power must be greater than the threshold level required to maintain a minimum quality of service is called ________

a) Line loss

b) Link budget

c) Link margin

d) None of the mentioned

View Answer

Answer: c

Explanation: Link margin is the amount of power by which the received power must be greater than the threshold level required to maintain a minimum quality of service. Link margin signifies the minimum amount of power required to sustain communication maintaining a minimum quality of service.

8. Link margin that is used to account for fading effects is called fade margin.

a) True

b) False

View Answer

Answer: a

Explanation: Link margin that is used to account for fading effects is called fade margin. Satellite links operating at frequencies of above 10 GHz require a fading margin of about 20dB or more to account for attenuation during heavy rain.

9. One of the most important requirements of a radio receiver is high gain.

a) True

b) False

View Answer

Answer: a

Explanation: Radio receivers must have very high gain of about 100 dB in order to detect the very low power level of the received signal to a level near its original baseband value.

10. A radio receiver operating at microwave frequencies must have very high selectivity.

a) True

b) False

View Answer

Answer: a

Explanation: Today, most of the applications use wireless communication at microwave frequency. Hence space is a sea of EM waves. In order to receive only the desired signal in the desired range of frequencies, the radio receiver must have high sensitivity.

Microwave Engineering Questions and Answers – Noise Characteristics of Receivers

This set of Microwave Engineering Multiple Choice Questions & Answers (MCQs) focuses on "Noise Characteristics of Receivers".

1. The noise power will determine the maximum detectable signal level for a receiver.
a) True
b) False
View Answer

Answer: b
Explanation: The noise power will determine the minimum detectable signal level of the receiver for a given transmitter power, maximum range of a communication link. There is a limit on the maximum noise that can be associated with a signal in spite of which the signal can be recovered from the noise.

2. Equivalent noise temperature of a transmission line connecting the antenna to the receiver is:
a) T_P (L_P-1)
b) T_P (L_P + 1)
c) T_P/ (L_P-1)
d) T_P / (L_P +
1) View
Answer

Answer: a
Explanation: The transmission line connecting the antenna to the receiver has a loss of L_T and is at a physical temperature T_P. its noise equivalent temperature is given by T_P (L_P-1).

3. In a receiver, if the noise figure of the mixer stage in the receiver is 7 dB, then the equivalent noise temperature is given that the receiver is operating at 290 K:

a) 1163 K

b) 1789 K

c) 1000 K

d) 1234 K

View Answer

Answer: a

Explanation: Equivalent noise temperature for a given noise figure is given by To (F_M-1). F_M is the noise figure in dB. Substituting the given values for noise figure and temperature, noise equivalent temperature is 1163 K.

4. If a transmission line connecting the antennas to the receiver has a loss of 1.5 dB, given the physical temperature is 27^0C, noise equivalent temperature is:

a) 123 K

b) 145 K

c) 345 K

d) 234 K

View Answer

Answer: a

Explanation: The noise equivalent temperature of the transmission line is given by $T_P(L_P-1)$. Converting the value from dB scale and substituting, noise equivalent temperature is 123 K.

5. Given that the antenna efficiency is 0.9, equivalent brightness temperature is 200 K; physical temperature is 300 K, noise temperature of an antenna is:

a) 220 K

b) 210 K

c) 240 K

d) None of the mentioned

View Answer

Answer: b

Explanation: Noise temperature of an antenna is given by rad T_b + (1- rad) T_P. T_b is the equivalent brightness temperature and T_P is the physical temperature. Substituting the given values, noise temperature of the antenna is 210 K.

6. If a receiver is operating at a bandwidth of 1 MHz and has antenna noise temperature of 210 K, then the input noise power is:

a) -90 dBm

b) -115 dBm

c) -56 dBm

d) -120 dBm

View Answer

Answer: b

Explanation: Input noise power is given the expression kBTa) Here k is the Boltzmann‟ s constant, B is the operational bandwidth of the antenna and TA is the antenna noise temperature. Substituting in the above expression, input noise power is -115 dBm.

7. Antenna noise temperature of a system is 210 K, noise temperature of transmission line is 123 K, loss of a transmission line connecting the antenna to receiver is 1.41 and noise temperature of the receiver cascade is 304 K. then the total system noise temperature is:

a) 840 K

b) 762 K

c) 678 K

d) 1236 K

View Answer

Answer: b

Explanation: The total system noise temperature is given by the expression TA+TTL+LTTREc) TA is the antenna noise temperature, TTL is the transmission line noise temperature, TREC is the noise temperature of receiver cascade. Substituting the given values, total system noise temperature is 762 K.

8. If the received power at antenna terminals is -80dBm, and if the input noise power is -115 dBm, then the input SNR is:
a) 45 dB
b) -195 dB
c) -35 dB
d) 35 dB
View Answer

Answer: d
Explanation: Input SNR of a system is (Si-Ni) in dB. Substituting the given signal power and noise power in dB, input SNR of the system is 35 dB.

9. A receiver system is operating at a bandwidth of 1 MHz and has a total system noise temperature of 762 K. then the output noise power is:
a) -110 dBm
b) -234 dBm
c) -145 dBm
d) -124 dBm
View Answer

Answer: a
Explanation: Output noise power of a receiver system is kBT_{sys}. B is the operating bandwidth and T_{sys} is the total system noise temperature. Substituting the given values in the given equation, output noise power is -110 dBm.

10. If the received power at the antenna terminals is Si=-80 dBm and the output noise power is -110 dBm then the output signal to noise ratio is given by:
a) 30 dB
b) -30 dB
c) 35 dB
d) -35 dB
View Answer

Answer: a

Explanation: Output signal to noise ratio in dB is given by (So-No). Substituting the given values in the above equation, the output SNR is 30 dB.