Chapter 16: Antenna

MULTIPLE CHOICE

1. The real part of an antenna's input impedance is due to:
   a. the radiated signal  
   b. the reflected signal  
   c. the SWR  
   d. all of the above  
   ANS: A

2. A half-wave dipole is sometimes called:
   a. a Marconi antenna  
   b. a Hertz antenna  
   c. a Yagi antenna  
   d. none of the above  
   ANS: B

3. The end-to-end length of a half-wave dipole antenna is actually:
   a. one wavelength  
   b. one half-wavelength  
   c. slightly longer than a half-wavelength  
   d. slightly shorter than a half-wavelength  
   ANS: D

4. The radiation of energy from an antenna can be seen in the:
   a. standing wave pattern around the antenna  
   b. SWR along the feed cable  
   c. radiation resistance of the antenna  
   d. $I^2R$ loss of the antenna  
   ANS: C

5. Measured on the ground, the field strength of a horizontally polarized half-wave dipole antenna is strongest:
   a. in one direction  
   b. in two directions  
   c. in all directions  
   d. depends on the number of elements  
   ANS: B

6. The ability of an antenna to radiate more energy in one direction than in other directions is called:
   a. directivity  
   b. selectivity  
   c. active antenna  
   d. resonance  
   ANS: A

7. The front-to-back ratio of a half-wave dipole antenna is:
   a. 0 dB  
   b. 3 dB  
   c. 10 dB  
   d. infinite  
   ANS: A

8. An antenna's beamwidth is measured:
   a. from $+90^\circ$ to $-90^\circ$  
   b. from front to back  
   c. between half-power points  
   d. between the minor side-lobes  
   ANS: A
9. ERP stands for:
   a. Equivalent Radiation Pattern  
   b. Effective Radiation Pattern  
   c. Equivalent Radiated Power  
   d. Effective Radiated Power  

   ANS: D

10. "Ground Effects" refers to the effects on an antenna's radiation pattern caused by:
   a. radio signals reflecting off the ground  
   b. buildings and other structures on the ground  
   c. fading  
   d. faulty connection of the feed cable ground  

   ANS: A

11. A 1-MHz monopole antenna must be:
   a. mounted vertically  
   b. mounted horizontally  
   c. at least one half-wavelength long  
   d. at least one wavelength long  

   ANS: A

12. The typical antenna in an AM radio is a:
   a. dipole  
   b. folded dipole  
   c. ferrite "loop-stick"  
   d. none of the above  

   ANS: C

13. The polarization of plane waves received from a satellite is changed by:
   a. gamma rays  
   b. Faraday Rotation  
   c. helical rotation  
   d. the distance traveled  

   ANS: B

14. A nonresonant antenna:
   a. will not transmit  
   b. will not receive  
   c. will cause SWR on the feed cable  
   d. all of the above  

   ANS: C

15. At resonance, the input impedance to a lossless antenna should be:
   a. resistive  
   b. inductive  
   c. capacitive  
   d. infinite  

   ANS: A

16. An antenna can be matched to a feed line using:
   a. a shorted stub  
   b. a loading coil  
   c. an LC network  
   d. all of the above  

   ANS: D

17. As the length of a "long-wire" antenna is increased:
   a. the number of lobes increases  
   b. efficiency decreases  

   ANS: C
b. the number of nodes decreases  

ANS:  A

18. Arrays can be:
   a. phased  
   b. driven
   c. parasitic
   d. all of the above

ANS:  D

19. An array with one driven element, a reflector, and one or more directors is called a:
   a. Marconi  
   b. Yagi  
   c. Log-Periodic Dipole
   d. stacked array

ANS:  B

20. LPDA stands for:
   a. Low-Power Dipole Array  
   b. Low-Power Directed Array
   c. Log-Periodic Dipole Array
   d. Log Power Dipole Array

ANS:  C

21. The radiated beam from a parabolic "dish" transmitting antenna is:
   a. collimated  
   b. phased
   c. dispersed
   d. none of the above

ANS:  A

22. The energy picked up by a parabolic antenna is concentrated at the:
   a. center  
   b. edges
   c. focus
   d. horn

ANS:  C

23. Antennas are often tested in:
   a. an echo chamber  
   b. an anechoic chamber
   c. a vacuum chamber
   d. an RF reflective chamber

ANS:  B

24. Field strength at a distance from an antenna is measured with:
   a. a slotted line  
   b. a dipole
   c. an EIRP meter
   d. a field-strength meter

ANS:  D

COMPLETION

1. An antenna is the interface between the transmission line and ____________________.
   
   ANS:  space

2. Hertz antenna is another name for a half-wave ____________________.
3. The length of a half-wave dipole is about ________________% of a half-wave in free space.
   ANS: 95

4. The ________________ resistance is the portion of an antenna's input impedance due to transmitted
   radio waves leaving the antenna.
   ANS: radiation

5. Input impedance at the center feed point of a resonant half-wave dipole is about ________________
   Ω.
   ANS: 70

6. Input impedance at the center feed point of a resonant folded dipole is about ________________ Ω.
   ANS: 280 – 300

7. The vertical angle of radiation is called the angle of ________________.
   ANS: elevation

8. Antenna radiation patterns are typically drawn on graphs with ________________ coordinates.
   ANS: polar

9. As compared to a ________________ source, a half-wave dipole has a gain of about 2 dBi.
   ANS: point
   isotropic

10. Antenna gain measured in ________________ is with reference to a half-wave dipole.
    ANS: dBd

11. ________________ is the same as the gain for a lossless antenna.
    ANS: Directivity

12. The front-to-back ratio of a half-wave dipole is ________________ dB.
    ANS: 0

13. The ________________ of a directional antenna is the angle between its half-power points.
    ANS: beamwidth
14. ERP stands for ____________________ radiated power.
   ANS: effective

15. ERP is the power input to the antenna multiplied by the antenna’s _________________.
   ANS: gain

16. A ________________ is required to connect a coaxial cable to a center-fed dipole antenna.
   ANS: balun

17. A horizontally mounted dipole will radiate waves with ________________ polarization.
   ANS: horizontal

18. A folded dipole has ________________ bandwidth than a standard dipole.
   ANS:
      wider
      greater
      more

19. A monopole antenna is typically mounted in the ________________ direction.
   ANS: vertical

20. The length of a typical monopole antenna is ________________ wavelength.
   ANS:
      one-quarter
      1/4

21. A monopole antenna mounted high on a tower typically uses a ________________ plane.
   ANS: ground

22. A vertical antenna has an ________________ radiation pattern for ground-based receivers.
   ANS: omnidirectional

23. The number of driven elements in a Yagi antenna is typically ________________.
   ANS: one

24. The reflector on a Yagi antenna is called a ________________ element.
   ANS: parasitic

25. An LPDA is a ________________ dipole array.
ANS: log-periodic

26. If an LPDA had five elements, the number of driven elements it had would be ____________________.
   ANS: five

27. All the waves that hit the surface of a parabolic antenna merge at the ____________________.
   ANS: focus

28. A ____________________ beam has all its individual rays parallel to each other.
   ANS: collimated

29. A microwave ____________________ antenna is essentially an extension of a waveguide.
   ANS: horn

30. An ____________________ chamber is often used to test microwave antennas.
   ANS: anechoic

SHORT ANSWER

1. Calculate the physical length of a half-wave dipole for use at 300 MHz.
   ANS:
   475 millimeters

2. How much power will a 95% efficient antenna radiate if driven with 100 watts?
   ANS:
   95 watts

3. If an antenna has 10.14 dB of gain compared to a point source, how much gain does it have compared to a half-wave dipole?
   ANS:
   8 dB

4. What is the ERP of an antenna with 10 dBi of gain and driven by one watt?
   ANS:
   10 watts

5. A resonant antenna has an input impedance of 100 ohms and is driven by 100 watts. What is the RMS current in the antenna?
   ANS:
   1 ampere
6. A resonant antenna has an input impedance of 100 ohms and is driven by 100 watts. What is the RMS voltage at the feed-point of the antenna?

ANS: 
100 volts